2006 WESTSIDE INTEGRATED WATER RESOURCES PLAN

Adopted May 4, 2006
by the
San Luis & Delta-Mendota Water Authority
Board of Directors

www.sldmwa.org

DISCLAIMER

This document is intended to provide information to help guide future water management and planning decisions. It does not cause or require any decision-making. Any action discussed in it, if advanced, will be subject to all applicable legal requirements.

To serve as a useful planning tool, the Plan must be flexible, and the Authority expects to update this document from time to time as information is developed, new projects are identified or circumstances within the region change. Similarly, while every effort was made to offer current and accurate information, the Authority expects to issue updates if information becomes outdated or errors are discovered. In sum, the Plan will be a “living” document that will continue to develop and change over time.

RESOLUTION NO. 2006 – 257

RESOLUTION ADOPTING SAN LUIS & DELTA-MENDOTA WATER AUTHORITY 2006 WESTSIDE INTEGRATED WATER RESOURCES PLAN

WHEREAS, the Board of Directors of the San Luis & Delta-Mendota Water Authority (the "Board" and the "Authority," respectively) has considered that certain proposal developed by staff and designated as the 2006 Westside Integrated Water Resources Plan.

WHEREAS, regulations implementing certain provisions of the Central Valley Project Improvement Act, water quality regulations in the San Francisco Bay/Sacramento-San Joaquin Delta, and biological opinions issued under the Endangered Species Act all have significantly reduced CVP water supply and supply reliability in the region served by the Authority, at the same time as San Joaquin River water quality regulation, statutory and regulatory requirements for drainage service, and regulatory and contractual requirements for water conservation have led to enhanced scrutiny of available water resource management.

WHEREAS, no single project or type of project is sufficient to ameliorate water shortages within the service area of the Authority, such that projects for supply augmentation, conveyance expansion, groundwater management, storm water management, conservation, recycling, conjunctive use, water importation, surface storage, and transfers all will be required.

WHEREAS, the 2006 Westside Integrated Water Resources Plan is a regional blueprint that guides resource management in the context of environmental and socioeconomic factors to identify projects that reduce the imbalance between water demand and supply while improving environmental and socio-economic status through a series of drainage, flood control, groundwater management, land use, water conservation, water quality, water supply, and water use efficiency proposals.

WHEREAS, the overarching goal of the Plan is to minimize regional conflict by addressing the most acute sources of tension affecting our agricultural, municipal, and environmental water use, namely, water supply, water supply reliability, drainage, and water quality, such that projects implemented pursuant to the Plan carefully match the opportunities created by some stakeholders with the needs of others.

WHEREAS, the 2006 Westside Integrated Water Resources Management Plan does not authorize any discrete or specific project by the Authority or any other party and all such projects shall be subject to review pursuant to the California Environmental Quality Act before they are implemented.

WHEREAS, adoption of the plan is with respect to the public affairs of the Authority and in the interest thereof.

NOW, THEREFORE, BE IT RESOLVED, AS FOLLOWS:

Section 1. The facts stated in the recitals above are true and correct, and the Board so finds and determines.

Section 2. The Board hereby approves and adopts the form of 2006 Westside Regional Water Resources Plan as and for the plan of the Authority, subject to finalization by the Executive Director.

Section 3. The Executive Director, Assistant Executive Director, Water Policy Administrator, and such other employees or consultants of the Authority as they may designate are hereby authorized and directed to take such actions as may be reasonable or necessary to implement the 2006 Westside Regional Water Resources Plan and the intent of this Resolution.

PASSED and ADOPTED this 4th day of May, 2006.

Michael Stearns, Chairman

Attest:

Daniel G. Nelson, Secretary

* * * * *

I hereby certify that the foregoing Resolution No. 2006-257 was duly and regularly adopted by the Board of Directors of the San Luis & Delta-Mendota Water Authority at the meeting thereof held on the 4th day of May, 2006.

Daniel G. Nelson, Secretary

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DEFINITIONS:

AB303 – Local Groundwater Management Assistance Act of 2000
CCID – Central California Irrigation District
CDFG – California Department of Fish & Game
CVP – Central Valley Project
CVPIA – Central Valley Project Improvement Act
Delta – Sacramento-San Joaquin Bay-Delta
Divisions – Discrete sub-areas within the Water Authority
DMC – Delta-Mendota Canal
DOI – Department of Interior
DWR – California Department of Water Resources
ESA – Endangered Species Act
EWA – Environmental Water Account
FCWD – Firebaugh Canal Water District
IRP – Integrated Resources Plan
JPA – Joint Powers Authority
M&I – Municipal and Industrial
MCAG – Merced County Association of Governments
Member Agencies – Members of the Water Authority (see Appendix A)
MP – Monitoring Program
O&M – Operations & Maintenance
PDD – Panoche Drainage District
PAEP – Project Assessment Evaluation Plans
PEIS – CVPIA Programmatic Environmental Impact Statement
Plan – Westside Integrated Water Resources Plan
Prop 13 – Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act
QAPP – Quality Assurance Program Plan
Region – Sum of Service Areas of SLDMWA Member Agencies
RWSDP – Level 2 & Level 4 Refuge Water Supply Diversification Program
SCVWD – Santa Clara Valley Water District
SJRIP – San Joaquin River Improvement Project
SJRECWA – San Joaquin River Exchange Contractors Water Authority
SJRWQG – San Joaquin River Water Quality Group
SJVRWQCB – San Joaquin Valley Regional Water Quality Control Board
SLC – San Luis Canal (Federal) & California Aqueduct (State) Joint-Use Facility
SLR – San Luis Reservoir
SLRLPIP – San Luis Reservoir Low-Point Improvement Project
SWP – State Water Project
SWRCB – State Water Resources Control Board
TMDL – Total Maximum Daily Load

USBR – United States Bureau of Reclamation
USFWS – United States Fish & Wildlife Service
Water Authority – San Luis & Delta-Mendota Water Authority
WRDP – Westside Regional Drainage Plan
WRDPJPA – Westside Regional Drainage Plan Joint Powers Authority
WTP – SJRECWA and Water Authority Water Transfer Program
WWD – Westlands Water District

SECTION A: REGIONAL AGENCY

A.1 REGIONAL AGENCY

The San Luis & Delta-Mendota Water Authority was established in January of 1992 and consists of 32 Member Agencies representing approximately 2,100,000 acres of federal and exchange water service contractors within the western San Joaquin Valley from the City of Tracy in the north to Kettleman City in the south, as well as portions of Monterey, San Benito, Santa Cruz, and Santa Clara counties (Appendix A-1). The Water Authority is responsible for delivery of approximately 3,000,000-acre feet of water to our Member Agencies. Of this amount, 2,500,000-acre feet are delivered to highly productive agricultural lands, 150,000 to 200,000-acre feet for M&I uses, and between 250,000 to 300,000 acre-feet are delivered to wildlife refuges for habitat enhancement and restoration.

One of the primary purposes of establishing the Water Authority was to assume the O&M responsibilities of certain USBR CVP facilities, with the goal of increasing reliability of the facilities and containing costs. In addition, the Water Authority serves the information and representation needs of our members by developing information and protecting the common interests on a variety of issues such as: Sacramento and San Joaquin Delta exports, water supply, water quality, water development, conservation, distribution, drainage, contractual rights, surface and groundwater management, and any other common interest of the member agencies. This information is made available to members, the general public, and legislative, regulatory and judicial bodies.

The governing body of the Water Authority consists of a 19 member Board of Directors classified into five Divisions (Appendix A-1) with directors selected from within each Division. Divisions were established by location and type of water contract. Each Director, and respective Alternate Director, is a member of the governing body or an appointed staff member of his or her agency. The Board is supported by standing committees that synthesize various technical and policy issues, such as financial and water related matters, and make recommendations for the full Board's consideration. Other standing committees direct the affairs of sub-groups of members, such as the Grassland Basin Drainage Management Activity Agreement, subject to review and approval by the full Board. In addition, working groups and steering committees are formed as necessary to focus on matters of particular expertise such as water quality and groundwater management.

The Water Authority assumed responsibility for the O&M of the certain south-of-Delta federal facilities in phases. In October of 1992, the Water Authority entered into the first of a multi-phased Cooperative Agreement with the USBR, with the first phase for the O&M of the DMC. The purpose of this Agreement was to provide the personnel, materials, supplies and equipment necessary to properly operate, maintain and repair certain portions of the Delta Division, San Luis Unit, and West San Joaquin Divisions of the CVP.

In October of 1993 the second phase was initiated. This included the addition of the Tracy Pumping Plant, O'Neill Pumping and Generating Plant, Tracy O&M Facilities, and the San

Luis Drain to the list of facilities the Water Authority was to operate and maintain. The maintenance functions at the Tracy Fish Facility were included in this phase as well.

October of 1994 saw the third phase begin. This included the added maintenance responsibilities for the Delta Cross Channel and the two fish release sites on the Delta. In October of 1996 the O&M of the Mendota Pool and Kesterson Reservoir were also included.

In March of 1998 the Water Authority entered into a Transfer Agreement with the USBR wherein all O&M costs related to the above referenced facilities are now funded directly by the water users themselves. The Water Authority continues to perform O&M of the Tracy Fish Facility, Delta Cross Channel and fish release sites under a separate Service Contract with funding provided by the USBR.

The Water Authority, with its current staffing of 88 employees, will continue to provide the leadership necessary to pursue additional reliable water supply for its Member Agencies and deliver the water with a reliable system in a cost efficient manner. As part of this mission, the Water Authority has worked on behalf of and in concert with its Member Agencies on the development of the 2005 Westside Integrated Water Resources Plan.

A.2 MANAGEMENT RESPONSIBILITIES RELATED TO WATER

The Water Authority's membership includes a wide array of agencies created under California law to serve the needs of their particular landowners and residents. The legal authorities for our Members Agencies and a brief synopsis of the water-related powers of each follow: There are 18 Members Agencies formed under the California Water District Law (WC 34000, *et seq*.). These districts are authorized to acquire works and to produce, store and distribute water for irrigation, domestic, M&I purposes, and provide drainage or reclamation works incidental thereto (WC 35401). Two Members Agencies are County Water Districts formed under WC 30000, *et seq.*, authorized to furnish water for any present or future beneficial use; acquire, appropriate, control, conserve, store and supply water, including drainage and flood waters; drain and reclaim lands, use water under district control for recreational purposes (WC 31020-31023; 31033; 31040-31052). There are 8 Members Agencies formed under the Irrigation District Law (Water Code Section 20500, *et seq.)*, authorized to furnish sufficient water for, and put water to, any beneficial use and to control. distribute, store, spread, treat, recapture any water for beneficial use (WC 22075. *et seq*.). Reclamation District 1606 has the powers of a Reclamation district formed under WC 50000, *et seq*., to reclaim and protect land from overflow and to irrigate lands within or outside the District (WC 50300, 50910, 50912).

Two Members Agencies are authorized under special acts. Santa Clara Valley Water District was formed under the Santa Clara Valley Water District Act (WC Appendix 60-1, *et seq*.) and authorized to store water in surface or underground reservoirs for the common benefit of the district, to conserve and reclaim water for present and future use; to acquire water and water rights, import water and conserve water for a sufficient supply for every present or future beneficial use of the lands or inhabitants within the district; to control flood and storm waters; protect watercourses and watersheds of streams flowing into the district; conserve flood and storm waters for beneficial uses; increasing and preventing of waste or diminution of water supply; obtain, retain and reclaim storm, flood or other waters (Section 4). The

Pajaro Valley Water Management Agency was formed under the Pajaro Valley Water Management Agency Act (WC Appendix 124, *et seq.*), upon a finding that the management of water resources within the Agency for agricultural, municipal, industrial and other beneficial uses is in the public interest and for the common benefit of all water users within the Agency. The purpose of the Agency is to efficiently and economically manage existing and supplemental water supplies in order to prevent further increase in overdraft and to provide sufficient water supplies for present and anticipated needs. The Agency also is directed to utilize underground storage for supplemental water (WC Appendix 124-102).

The City of Tracy is a municipal corporation organized under California law and empowered by California Constitution Article XI Section 9(a) to establish, purchase and operate public works to furnish its inhabitants with water; development and distribution of water for use by its inhabitants is within the general powers of the City.

Two Members Agencies are mutual water companies. These are corporations formed under California law for the general purpose of securing and distributing water for the irrigation and cultivation of lands for the benefit of their shareholders, without profit. Rules and regulations state the additional purpose of effecting adequate and uniform drainage and to cooperate with landowners to reduce high ground water tables. California Government Code Section 6525 provides that a mutual water company may enter into a joint powers agreement with any public agency for the purpose of jointly exercising powers common to both.

In addition to the specific powers described above, the Members Agencies are empowered to enter into contracts, undertake acts necessary to their purposes, and to exercise a variety of related powers. A listing of all member agencies is attached as Appendix A-1.

A.3 PARTICIPATION IN PLAN DEVELOPMENT

The genesis of the 2005 Westside Integrated Water Resources Plan was an effort undertaken by USBR, the Water Authority, and other local stakeholders beginning in 2001 to develop an Integrated Regional Plan to provide guidance for future water management and planning decisions. The original IRP serves as the basis for the current version, which has evolved through a series of stakeholder driven revisions, the last occurring in October 2003.

The Water Authority embarked on the current revision effort in the fall of 2004 by soliciting ideas for projects that furthered the goals identified in the Draft 2003 Westside Integrated Resources Management Plan. Initial inquires were made to key Member Agencies' managers and staff whom had expressed interest in updating the 2003 IRP and, on September 23, 2004, a scoping session was scheduled. The session produced several project ideas, which were then electronically distributed to the Water Authority's entire membership on September 30, 2004 for consideration and further input.

On February 28, 2005 the Water Authority held its first formal Proposition 50, Chapter 8 Integrated Regional Water Management grant application workshop, the purpose of which was to filter the many project ideas we had received during the prior five months and assign tasks relative to the IRP update. On March 21, 2005 the Water Authority sent, through traditional means, another notice regarding the effort to revise the IRP, a tentative time schedule, and solicitation for comments. Examples of correspondence can be found in Appendix A-2.

SECTION B: REGIONAL DESCRIPTION

B.1.1 IMPORTANCE OF REGIONAL WATER RESOURCE INTEGRATION

This region is defined as the sum of the areas served by the Water Authority's Member Agencies (Appendix A-1). The region, which encompasses approximately 3,300 square miles of land on the Westside of the San Joaquin Valley and Central Coast, serves a multitude of interests through agricultural, municipal, industrial, and habitat management endeavors. In this vast area, great diversity exists through a spectrum of issues ranging from resource management responsibilities, resource abundance, or lack thereof, and the problems that arise from resource usage to socio-economic status, cultural background, ethnicity, and development. While this diversity poses challenges it also creates opportunities.

As diversity creates opportunity, commonality spurs kinship. Of the many features shared by the Region, perhaps none is more important than the desire to venture for improvement and mutual benefit. The Region has a long history of collaborating on local, regional, state, and federal matters. This willingness to work cooperatively to solve local problems with regional solutions provides the Region with a unique foundation from which to develop and implement plans that generate broad benefit. In addition to shared opinions toward water management objectives, the Region also shares institutional commonalities such as chronic water supply shortages, unreliable conveyance ability, and reliance upon imported water to meet the majority, if not all, of their water supply demands. These ingredients produce a recipe deliciously appropriate to serve the Regional needs through a series of integrated solutions upon which we will expand further in Section D.

B.2.0 REGIONAL CHARACTERISTICS

B.2.1 Regional Boundaries

The Region stretches from the City of Tracy in San Joaquin County at the north to Highway 41 and Kettleman City in Kings County to the South. On the East, the Region is generally bounded by the San Joaquin River and to the west by the Coast Range. The Region also encompasses the parts of Monterey, San Benito, Santa Clara, and Santa Cruz counties that are a part of the CVP's San Felipe Project. A map of the Region illustrating its external and internal boundaries can be found in Appendix A-1.

B.2.2 CVP Background

The CVP was conceived, designed and constructed to create greater economic development in California. The first legislation authorizing development of the CVP was passed in 1935 and at least 15 acts of Congress have authorized additional development. Initial project features included Shasta Dam for flood control, navigation and water storage and a canal system to deliver water from Lake Shasta and the Delta to the northern San Joaquin Valley.

B.2.3 Major Water Related Infrastructure

The DMC was completed in 1951. Diversion of Trinity River flows to the Central Valley began in 1963. San Luis Dam and Reservoir, owned jointly with the State, were completed in 1967. The SLC was completed in 1968 and the Coalinga Canal, a branch of the SLC, was completed in 1973. Water delivery facilities providing irrigation service to lands in the San Luis Unit were not completed until the 1980s. The San Felipe Unit, delivering water to Santa Clara and San Benito counties on the California central-coast, came on line in 1987.

B.2.4 Major Land Use Divisions

Generally speaking, land use Divisions within the Region mirror those established by Congress for the CVP. A list of Water Authority Member Agencies segregated by Water Authority Divisions is provided in Appendix A-1, along with a map. Minor differences exist such as Pacheco Water District, which the Water Authority views as a Lower DMC Division agency while USBR designates them as San Luis Unit. Pleasant Valley Water District is categorized as a SLC Division agency by the Water Authority but not listed by USBR as they currently have no CVP water supply. Additionally, the Delta Division includes the Coelho Family Trust, which is not a member of the Water Authority and the Water Authority includes the Turner Island Water District, which is not a CVP contractors. The small size of the last two contractors, lack of CVP supply to Pleasant Valley, and mere nomenclature designation for Pacheco makes these differences insignificant in the forthcoming analyses.

B.3.1 REGIONAL WATER RESOURCES SUMMARY

Water use in the CVP Westside region is dependent upon land use, which is characterized as agricultural, M&I, or habitat management. Agricultural water use occurs on approximately 850,000 irrigated acres on the Westside. The current M&I water supply provides a portion of the water supply needs for approximately two million people in Santa Clara and San Benito Counties as well as the San Joaquin Valley. Water use for habitat management occurs on approximately 120,000 acres of refuge lands.

The Westside water supply is comprised of CVP water, groundwater, and local surface water. Since 1989, CVP water supply allocations have decreased significantly for Westside CVP contractors. Current water supply modeling efforts have shown that this decline is primarily attributable to implementation of the following laws and regulations:

- State Water Resources Control Board water quality standards for the Bay-Delta; Decision-1485 and Decision-1641.
- State and Federal Endangered Species Act provisions.
- Central Valley Project Improvement Act (P.L. 102-575) implementation.

Prior to the State Water Resources Control Board adopting water quality standards, the listing of several species as either threatened or endangered, and the passage of the CVPIA, Westside agricultural contractors received 100% percent of their CVP contracted supply in almost every year since deliveries to the region began in June, 1951. The only supply shortages experienced occurred as a result of severe drought conditions. Today, the long-term average allocation has been reduced to approximately 70 percent. The current M&I long-term average supply allocation has been reduced to approximately 90 percent under current conditions.

In addition to reduced CVP supply allocations, groundwater supplies in the region are declining due to a long-term overdraft condition caused by over-pumping. To protect the long-term sustainability of this resource, groundwater pumping has been significantly reduced, especially when compared to historic use. This, however, has further reduced available water supplies in the region.

B.3.2.0 Laws and Regulations Affecting Westside Water Supplies

B.3.2.1 Bay-Delta Water Quality Standards

Beneficial uses of water in and from the Delta system can be adversely affected by decreased water quality, as well as additional obligations being imposed on the CVP to meet existing or new water quality objectives. Water quality problems in the Delta are caused by reduced freshwater inflow, by seawater intrusion, by water quality degradation in rivers flowing into the Delta and by contributions of unwanted constituents from land use practices and other activities within the Delta.

B.3.2.2 Water Quality Control Plan and D-1485

In 1978, the SWRCB released Water Rights Decision 1485. The decision set flow and water quality standards for the protection of beneficial uses in and from the Delta and required the SWP and CVP to meet those standards as water rights conditions for the projects. The standards were based on the premise that beneficial uses would be protected at a level equal to the protection received had the CVP and SWP never been in operation and had construction of those two projects never taken place.

In 1986, the California Court of Appeal issued a decision authorizing the SWRCB to modify water right permits to implement Delta water quality standards and to develop the standards to protect fish and wildlife. These standards, however, could not be established solely to protect Delta water users from the impacts of the SWP and CVP. Consequently, in 1987, the SWRCB began a formal proceeding to reconsider the D-1485 standards, establish new standards if needed, and develop a program of implementation.

In the same year as the Court of Appeal decision, USBR and the State of California entered into a Coordinated Operations Agreement (COA) that sets the responsibility of the CVP and SWP for applicable Delta water quality standards. The COA provides the basis for CVP and SWP operations to ensure an equitable share of water supply for each project, while guaranteeing that the systems operate more efficiently during droughts than if they were to operate independently.

B.3.2.3 Water Quality Control Plan and D-1641

After a great deal of controversy between the U.S. Environmental Protection Agency and the State of California in the early 1990's, the historic Bay-Delta Accord was signed in 1994. The following year, the SWRCB adopted a new Water Quality Control Plan (WQCP) based on the Accord.

In December 1999, the SWRCB issued D-1641. That decision assigned interim responsibility to the CVP and SWP to meet the flow and water quality objectives in the WQCP. The decision also approved certain agreements involving the responsibility of the CVP and SWP towards certain other water right holders for meeting those objectives. Phase 8 of the Bay-Delta water right hearings was intended to address the responsibilities of remaining water-right holders in meeting the objectives in the 1995 WQCP. The CVP, SWP, and the remaining upstream water right holders reached an agreement on Phase 8 in late December 2002 to stay the SWRCB's Phase 8 proceedings. To meet the CVP's obligation assigned under D-1641, more CVP water is needed than the amounts of water previously required to meet the standards under D-1485.

B.3.2.4 Endangered Species Act

The ESA has reduced Westside water supplies for both agricultural and M&I water users. The 1989 listing of the Sacramento winter-run Chinook salmon as a "threatened" species was the first listing to affect the CVP. In 1994, this listing was upgraded to "endangered". Management actions intended to protect this species have required structural and operational changes to maintain flows and lower water temperatures below Shasta Dam. Because a supply of cold water must be maintained in Lake Shasta for downstream temperature control, less water is available for agricultural and M&I water supply. Additional ESA listings include the Delta Smelt in 1993, Central Valley Steelhead trout in 1998, and the spring run Chinook salmon in 1999.

In order to minimize take of listed species, the CVP and SWP diversions from the Delta at the federal Tracy Pumping Plant (Tracy) and the Banks Pumping Plant (Banks) have been reduced and sometimes curtailed altogether, especially for Delta Smelt and winter run Chinook salmon. The 1994 Bay-Delta Accord and the CALFED ROD, discussed below, established principles for water management to minimize and eventually mitigate the effect of ESA provisions on water supply.

B.3.2.5 CVPIA Provisions Affecting CVP Water Supply

A number of key CVPIA provisions directly affect water supply availability for agricultural and M&I water users including:

- Section 3404(a), which precludes the issuance of any new short term, temporary, or long term CVP contracts for any purpose other than fish and wildlife.

- Section 3406(b)(2), which authorizes and directs the dedication of up to 800 TAF of CVP water for environmental purposes.
- Section 3406(b)(23), which addresses restoration efforts for the Trinity River Division.
- Section 3406(d)(1), which requires firm CVP water supplies amounting to 480 TAF to be delivered to federal, state and some private wildlife refuges.

Section 3404(a) precludes the issuance of any new CVP contracts until after completion of the many and varied goals of the CVPIA. Pajaro Valley Water Management Agency, an authorized participant in the San Felipe Project, was about to initiate the contracting process for an allocation of CVP water for agricultural use when passage of the CVPIA occurred, putting those plans on hold indefinitely.

Pursuant to Section 3406(b)(2), Interior has been dedicating and managing CVP water since 1993, the first water year following passage of the CVPIA. Since enactment of the statute, Interior has pursued ways to utilize (b)(2) water in conjunction with modification of CVP operations and water acquisitions to meet the goals of the CVPIA.

Section 3406(b)(23) of the CVPIA requires Interior to complete a flow study and make a recommendation regarding increased flows in the Trinity River to restore fisheries. Increased flow need was developed in the Trinity River Flow Evaluation Study and recommended in the Trinity River Mainstream Fishery Restoration Draft EIS/EIR. Interior adopted on December 19, 2000 the Trinity River Mainstem Fishery Restoration Program Record of Decision ("ROD"), which proposed implementation of the increased flow regime. CVP water and power users filed suit in January 2001 and a U.S. District Court issued a preliminary injunction in March 2001. On July 5, 2005, the U.S. District Court entered an amended final judgment, which resolved the legal challenges to ROD. Thus, Interior will be implementing a Program that seeks to increase Chinook salmon production primarily by making annual instream flow releases from the CVP's Trinity River Division ("TRD") that range from 369,000 acre-feet of water in critically dry years to 815,000 AF in extremely wet years. The increased flow releases from the TRD will reduce the amount of CVP water that can be diverted into the Sacramento River and thence from the Delta for irrigation deliveries to South-of-Delta agricultural contractors.

Section 3406(d)(1) of the CVPIA requires firm water supplies to be delivered to federal, state and some private wildlife refuges, as defined in the CVPIA. This supply is referred to as “Firm Level 2” as outlined in the Refuge Water Supply Report and the San Joaquin Basin Action Plan and is greater than the amount of CVP water previously delivered to the refuges (USBR, 1989; USBR and California Department of Fish and Game, 1989). Historically, most of the refuges received irrigation tail water for much of their supply, but the CVPIA requires water sources of suitable quality and at a level of reliability greater than that for agricultural contractors. Because CVP water has been supplied to the refuges to meet Level 2 requirements, the ability of the CVP to deliver water to its agricultural and M&I contractors has declined.

The CVPIA also includes several provisions to increase agricultural and M&I water costs. Important provisions include restoration fees, tiered water pricing, conservation requirements and additional water acquisition for wildlife refuges for Level 4 requirements [CVPIA 3406(d)(2)].

B.3.3.0 Scope of the Westside Water Supply Gap Analysis

B.3.3.1 Definition of Geographical Region Considered in Gap Analysis

The Westside region is generally defined as those lands receiving CVP water pumped from the Delta through the Tracy Pumping Plant and conveyed via the DMC and SLC to serve irrigation, municipal, industrial, and habitat purposes. The majority of the region falls within the San Joaquin Valley of California's Central Valley, to the west of the San Joaquin River. Included in the Westside region, for purposes of this analysis, are the north Central Coast and South Bay areas, both served by the CVP's San Felipe Unit.

The Water Supply Gap analysis focuses on CVP export contractors who have had their water supplies adversely affected by the ESA, CVPIA, D-1641, and other state and federal regulations. The water supply needs of the San Joaquin River Exchange Contractors and local refuges are not included in this report because their water supplies have not been impacted by the CVPIA or other regulatory actions cited in this Plan. The Westside regional agencies analyzed in this report are shown in Table B-1.

The Westside region is generally defined as those lands receiving CVP water pumped from the Delta through the Tracy Pumping Plant and conveyed via the DMC and SLC to serve irrigation, municipal, industrial, and habitat purposes. The majority of the region falls within the San Joaquin Valley of California's Central Valley, to the west of the San Joaquin River. Included in the Westside region, for purposes of this analysis, are the north Central Coast and South Bay areas, both served by the CVP's San Felipe Unit.

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The Pajaro Valley Water Management Agency (PVWMA) has had the potential for a CVP water supply affected by the CVPIA prohibition on new CVP contracts. To compensate, PVWMA has striven to obtain supplemental surface water by purchasing a portion of the Mercy Springs Water District contract and through other collaborative efforts with various CVP contractors. PVWMA has determined that importation of supplemental surface water is needed to stop further intrusion of seawater caused by the overdraft of regional groundwater and to protect the local $500 million annual farm economy. In order to deliver imported supplemental water supplies, including the supply acquired from Mercy Springs, conveyance facilities will have to be constructed to connect the PVWMA with the San Felipe Project. Because no physical connection exists at this time, this Plan does not currently address water resource issues within the PVWMA.

The Westside region receives water pumped from the Delta by the Tracy Pumping Plant and conveyed via the DMC, by gravity, up to 116 miles to the Mendota Pool in the San Joaquin River. The Tracy Pumping Plant and the canal immediately downstream were designed to carry 4,600 cubic feet per second (cfs), but physical and institutional factors now limit that capacity. Water is delivered to users at numerous turnouts. The O'Neill Pumping Plant, located at mile 70, can pump up to 4,200 cfs to storage in San Luis Reservoir. San Luis Reservoir withdrawals are conveyed south in the SLC, or west to Santa Clara and San Benito Counties (the San Felipe Division) via the Pacheco Tunnel and to CVP contractors on the lower DMC and Mendota Pool.

The Westside region receives water pumped from the Delta by the Tracy Pumping Plant and conveyed via the DMC, by gravity, up to 116 miles to the Mendota Pool in the San Joaquin River. The Tracy Pumping Plant and the canal immediately downstream were designed to carry 4,600 cubic feet per second (cfs), but physical and institutional factors now limit that capacity. Water is delivered to users at numerous turnouts. The O'Neill Pumping Plant, located at mile 70, can pump up to 4,200 cfs to storage in San Luis Reservoir. San Luis Reservoir withdrawals are conveyed south in the SLC, or west to Santa Clara and San Benito Counties (the San Felipe Division) via the Pacheco Tunnel and to CVP contractors on the lower DMC and Mendota Pool.

B.3.3.2 Regional Agencies Included in the Westside Water Supply Gap Analysis

Lands addressed in the analysis are within three areas of the CVP: the Delta Division, San Luis Unit and San Felipe Division of the CVP. These lands receive surface water from the federal CVP under several varying types of contracts and agreements with the Department of Interior, including CVP water service contracts for irrigation and M&I water, water rights settlement contracts, exchange contracts, and refuge water supply settlement agreements and contracts. The Westside lands are also served partially with water from local supplies and local groundwater.

This analysis specifically focuses on agricultural lands and M&I service areas within the Water Authority served by CVP water service contracts. Lands served solely by exchange contracts or refuge water supply agreements are not included because their water supplies are rarely affected by regulatory or hydrologic constraints. Irrigated areas served by the Cross Valley Canal and the Friant Division of the CVP and not within the Water Authority are also not included.

Table B-1 lists the agricultural and M&I water users included in the Westside water supply gap analysis.

TABLE B-1
CVP Westside Water Supply Gap Analysis
Agricultural and M&I Water Users

CVP AGRICULTURAL CONTRACTORS	
San Luis Unit	**San Felipe Division**
Westlands Water District	San Benito County Water District
San Luis Water District	Santa Clara Valley Water District
Panoche Water District	Pajaro Valley Water Management Agency
Pacheco Water District	
Southern DMC – Delta Division	**Northern DMC – Delta Division**
Fresno Slough Water District	Banta-Carbona Irrigation District
James Irrigation District	Centinella Water District
Reclamation District 1606	Del Puerto Water District
Tranquillity Irrigation District	Patterson Irrigation District
Widren Water District	Byron Bethany Irrigation District (CVP)
Oro Loma Water District	Westside Irrigation District
Mercy Springs Water District	West Stanislaus Irrigation District
Eagle Field Water District	
Laguna Water District	
Broadview Water District	
Coelho Family Trust	

B.3.3.3 Westside Water Use Characterization

Water use in the Westside region is dependent upon land use, characterized as agricultural and M&I for purposes of this analysis. Presently, agricultural water use occurs on about 850,000 irrigated acres in the region. Today, the M&I water supply provides a portion of the water needs for 1.9 million people in Santa Clara and San Benito Counties as well as the San Joaquin Valley. While the focus of this water supply analysis is on Westside water use, it is important to note lands outside of the Westside region are supported by activity associated with land and water use within the Westside. For example, there are areas in Fresno County that are not in the CVP Westside region that experience significant economic activity due to regional agricultural activity generated by CVP water supplies.

B.3.4.1 Westside Water Supply Gap Analysis

The Water Supply Gap Analysis estimates water supply, potential water use and shortages ("the gap") under 1999 and 2025 conditions. Potential water use is based on expected land use, application rates, population and existing economic factors and assumes that supply does not limit potential use. Potential water use does not consider any change in demand caused by future economic factors. The agricultural and M&I gap analyses are based on USBR's *Water Needs Analysis* and public water user planning documents.

B.3.4.2 Agricultural Gap

The gap analysis was completed for potential agricultural water use at 1999 and 2025 levels of development. The total water supply available for agricultural use comprises CVP water, groundwater and other local supplies. The gap is the difference between potential water use and supplies under a range of CVP water supply allocations. The analysis does not consider willingness or ability to pay for supplies to eliminate the water supply gap. The analysis requires data for four determinants of agricultural water use and supply.

- The amount of irrigated acreage and types of crops served.
- Potential use for agricultural water.
- The amount of non-CVP water supplies available to serve the acreage.
- The amount of CVP water supply.

B.3.4.3 Agricultural Data and Water Requirements

Irrigated acreage data for 1999 was obtained from district records. The data is actually harvested acreage, including acres harvested more than once (multiple-cropped acres) in 1999. For example, if an acre of lettuce is harvested in the spring and the same acre is replanted to grains and harvested in the fall, two irrigated acres are counted. Therefore, the amount of harvested acres typically exceeds the amount of land irrigated to produce those harvests.

The 1999 harvested acreage data did not include acreage that was not harvested because of a water shortage in 1999. The shortage, reflective of a CVP allocation 30 percent below full contract entitlement, is representative of the chronic shortages experienced by the region. The Westside districts estimated 49,709 acres were fallowed in 1999 as a result. This acreage was added into the total 1999 acreage to obtain an estimate of potential irrigated acreage if water supply had not been a limiting factor.

Irrigated pasture is not actually harvested but is included as irrigated acreage in the analysis. However, the 1999 harvested acreage data did not include other irrigated acreage that was not harvested. This acreage is primarily immature, non-bearing fruit trees and vines that did not produce a crop in that year. Westside water users estimated an additional 30,000 acres for this irrigated land in 1999.

The acreage data also allowed for 14,000 acres of land retired under the Westlands WD land acquisition program. The acreage was not included in the 1999 total. Acreage totals are shown by district in Appendix B; Table A-1 for Service Contractors; Table A-2 for Water Rights Settlement Contractors; Table A-3 for acreage totals by district and crop type.

Stoddard and Associates (1999) developed an acreage forecast for 2025 for the Water Needs Analysis (USBR 2000). The analysis measures all acreage that would be irrigated if water were available. Therefore, an adjustment for fallowed or unharvested irrigated acreage was not required. The 2025 acreage forecast totals are shown in Tables A-1 and A-2 of Appendix B.

The agricultural potential water use calculation is demonstrated in Table B-2. Potential use is based on irrigated acreage and water use per irrigated acre. Water use per irrigated acre includes crop consumptive use (or crop evapotranspiration), water required for leaching salts from the root zone, and additional water for cultural practices such as cooling and frost control. On-farm potential use accounts for conveyance losses and on-farm irrigation efficiency.

TABLE B-2
Irrigated Acreage and Water Potential Use in AF, 1999 and 2025 Conditions

	1999	**2025**
Irrigated Acres [1]	928,706	915,016
Crop Consumptive Use (Evapotranspiration, ET), AF/acre	x 2.25	x 2.25
Total ET, AF	2,089,589	2,058,786
Effective Precipitation (EP) @ 0.3 AF/acre	- 278,612	- 274,505
Leaching Requirement (LR) @ 0.108 AF/acre	+ 100,300	+ 98,822
Cultural Practices (CP)	+ 55,000	+ 55,000
Total Crop Water Need *(ET-EP+LR+CP)*	1,966,277	1,938,103
On-Farm Efficiency	÷ 77%	÷ 85%
Delivery Potential Use	2,553,606	2,280,121
Conveyance Losses @ 3.5% of Delivery Potential use	+ 89,376	+ 79,804
Total Agricultural Water Potential Use	**= 2,642,983**	**= 2,359,925**

[1] In 1999 49,709 acres were fallowed and 30,000 acres of irrigated land were not harvested (928,706 = 848,997 + 49,709 + 30,000).

Crop consumptive use accounts for most of the need for water. The Water Needs Analysis identified an average of 2.2 AF per acre of consumptive use was required. Stoddard and Associates estimated an average of 2.3 AF per acre. The gap analysis used an average of the two findings of 2.25 AF per acre. The analysis assumes a leaching requirement of 0.108 feet per acre and additional water for cultural practices of 55,000 AF in 1999 and 2025. Total farm agricultural delivery requirement excludes effective precipitation estimated to average 0.3 feet per acre and farm delivery requirements include a current on-farm irrigation efficiency of 77 percent, increasing to 85 percent in 2025.

Total water needed at the district level includes in-district conveyance losses of 3.5 percent. Accounting for these losses, total need at the district level is estimated to be about 2.64 MAF in 1999 and 2.36 MAF in 2025.

The CVP water supply contract amount for each Westside agricultural water district is shown in Tables A-1 and A-2 of Appendix B. Other limited supplies include groundwater and local surface water. Westside districts provided data on local supplies. Annual groundwater supplies for agricultural use on the Westside are assumed to equal average annual aquifer recharge, thus preventing long-term decline of groundwater levels. The safe groundwater yield estimates were included in the Water Needs Analysis. The amounts of local water supply and safe groundwater yield for each Westside agricultural contractor is shown in Tables A-1 and A-2 of Appendix B; summing of imported, local and groundwater supplies does not necessarily demonstrate total water availability as some districts utilize imported water for intentional groundwater recharge programs.

B*.3.4.4 Municipal Use of Agricultural Service Contract Water*

CVP agricultural water supplies are provided under contracts settling or exchanging water rights claims (non-project supplies) or agricultural service contracts (project supplies). Most contractors have either exchange or water service contracts. A few contractors have both settlement and water service contracts. Within the Westside, M&I use is also authorized in contracts for agricultural water service. This potential municipal use of water is nonetheless included in the agricultural gap analysis to maintain a grouping of all CVP agricultural contract water.

Current municipal use of CVP agricultural water is shown in Table B-3.

TABLE B-3
Municipal Use of CVP Agricultural Water Contracts Included in Agricultural Gap Analysis
Recent CVP Delivery and Projected 2025 Use (AF)

Contractor	CVP Delivered Recently	2025 Projected Use
Broadview WD	23[a]	20
Del Puerto WD	12	12
Dept Veterans Affairs	33	450
Pacheco WD – SLU	12	80
Panoche WD – DMC & SLU	52	100
Byron Bethany Irrigation District (CVP)	657	420
San Luis WD – DMC & SLU	616	580
State of CA	6	10
Westlands WD	4,765	11,000
Total (included in Agricultural Gap Analysis)	**6,176**	**12,672**

[a] Data source for Broadview WD was their Conservation Plan.

All other data obtained from USBR's *CVP 2001 M&I Water Rates*.

B.3.4.5 Summary of Agricultural Gap Analysis

The results of the agricultural gap analysis are shown in Table B-4. The municipal gap is calculated separately from the agricultural service contract water that still serves agricultural uses.

Results are presented as what the water supply gap would be given a range of different water supply scenarios. 2000 CALSIM simulations estimate contractors will receive on average 59 percent of their CVP contract amount and 25 percent to 27 percent during an extended critical dry period. For the critical dry condition, 25 percent is used for this analysis. However, the minimum supply allocation in a single critical dry year could be as low as 0 percent. The total 1999 gap in average years is 1,110 TAF. In critical dry years the gap increases to 1,733 TAF. In 2025, the average gap is 832 TAF and 1,454 TAF in critical dry years. While there is less irrigated acreage predicted for 2025, the main reason for the decrease in the agricultural water supply gap is the assumption that agricultural water users will increase on-farm efficiency to 85 percent.

TABLE B-4
Summary of CVP Agricultural Water Supply Gap at Various CVP Allocations, TAF
1999 and 2025 Conditions

	100% Allocation		59% Allocation [1]		25% Allocation [1]	
	1999	**2025**	**1999**	**2025**	**1999**	**2025**
Surface Water	190	190	190	190	190	190
Groundwater	244	244	244	244	244	244
CVP [2]	1,835	1,829	1,100	1,096	479	478
Total Supply	**2,269**	**2,263**	**1,534**	**1,530**	**913**	**912**
Potential Use [3]	**2,643**	**2,360**	**2,643**	**2,360**	**2,643**	**2,360**
Agricultural Gap	374	97	1,109	830	1,730	1,448
Gap from the Municipal Use of Agricultural Water [4]	0	0	1	2	3	6
Total Agricultural Contract Gap	**374**	**97**	**1,110**	**832**	**1,733**	**1,454**

[1] CALSIM simulations estimate that contractors will receive about 59 percent allocation on a long-term average and 25 percent to 27 percent during a multi-year critical dry period.
[2] Included in the total CVP supply is water from Westside Water Rights Settlement Contracts totaling 40,813 AF as shown in Table A-2, Appendix B. This water is assumed to be reduced 25 percent when agricultural service contracts are reduced 55 percent or more.
[3] Calculation shown in Table B-2.
[4] The gap resulting from the municipal use of agricultural water is calculated separately because shortage provisions are equal to M&I service contracts.

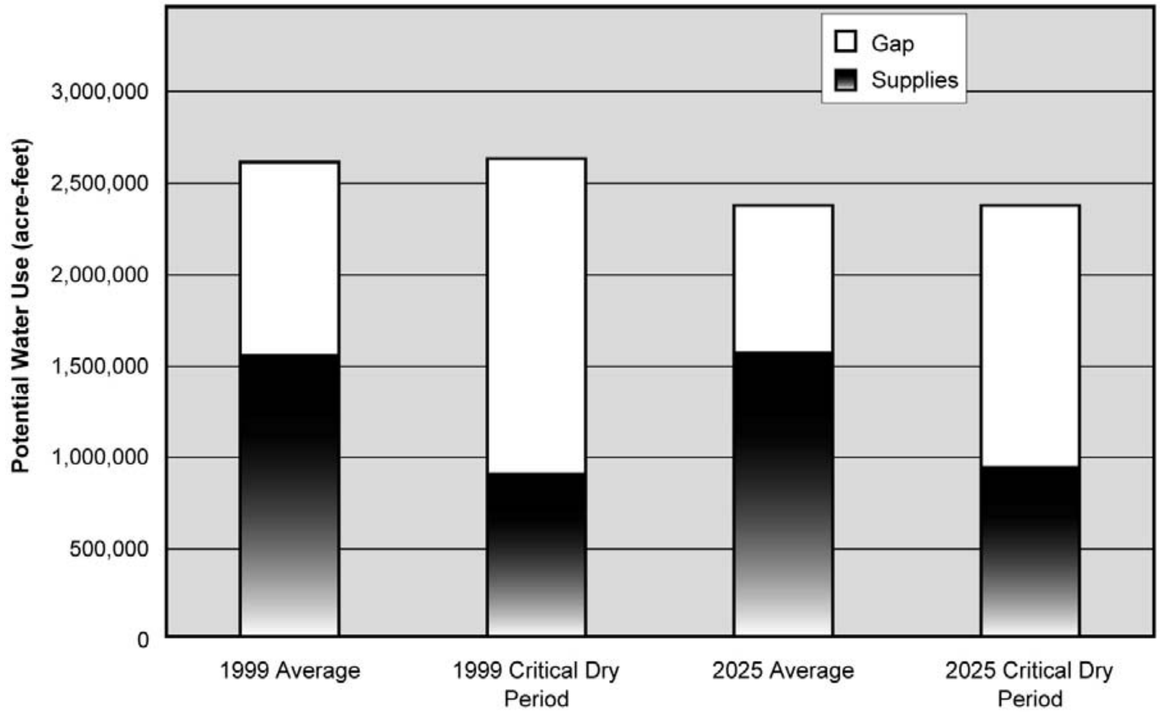

Figure B-1
Potential Agricultural Water Use, Available Supply, Water Supply Gap

B.4.0 ENVIRONMENTAL CHARACTERISTICS

B.4.1.0 DELTA DIVISION

B.4.1.1.1 Air Quality

This section discusses the air quality in the area of the Delta Division. Information in this section was summarized from the Draft CVPIA PEIS, Air Quality, Technical Appendix, Volume 6 (USBR 1997e) and has been updated as appropriate for more recent changes in air quality standards.

The area is located in the San Joaquin Valley Air Basin (SJVAB), which includes the southern portion of the Central Valley, including the lower slopes of the mountain ranges. The air quality of the SJVAB is regulated by the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), which has jurisdiction over Merced, Fresno, San Joaquin, and Stanislaus Counties. The entire SJVAB is designated non-attainment 1 with respect to federal and state ozone and particulate matter standards, and the urban area of Fresno is non-attainment for federal and state carbon monoxide standards.

B.4.1.1.2 Affected Environment

Most of the air pollutants in the area of the Delta Division are associated with both urban and agricultural land uses. In general, there are four basic land uses: irrigated agriculture; dryland agriculture (dry cropped, fallow, idle, or grazed land); M&I; and undeveloped (natural). The primary air pollutants include particulate matter (PM) and hydrocarbons or organic gases that may serve as ozone (O3) precursors.

Pollutants commonly associated with agricultural land uses include particulate matter, carbon monoxide (CO), nitrogen oxides (NOx), and ozone precursors. Particulate matter results from field burning, farm operations such as tilling, plowing, and the operation of farm equipment on loose earth, and entrained road dust releases, and fuels combustion in vehicles and farm equipment. Particulate emissions may also occur when fallowed fields do not have a crop cover to inhibit wind erosion. Carbon monoxide is released to the atmosphere during field burning and fuel combustion in farm equipment. Nitrous oxides are also released during field burning. Ozone precursors are released in farm equipment emissions and during the application of pesticides and fertilizers. The effect of these practices on air quality conditions may be influenced by meteorological conditions, the variability of emissions controls, and the adoption and enforcement of emissions regulations.

Many M&I practices result in hydrocarbon and particulate matter emissions. Sources of hydrocarbon emissions include fuel combustion in vehicles and industrial equipment, painting and solvent use, and residential heating. Sources of particulate matter emissions include dust entrained in pavement, structural and automobile fires, construction and demolition, residential fuel combustion, and fuel consumption in vehicles.

B.4.1.2.1 Biological Resources

The Delta Division is located in the western San Joaquin Valley and includes portions of San Joaquin, Stanislaus, Merced, and Fresno Counties and the service areas of the 20 DMC CVP contractors.

Baseline information on biological resources in the area was compiled primarily from existing literature and information gathered from water district general managers and staff. Data sources included the CVPIA Draft PEIS (USBR 1997a), Draft EA for Eastside/Westside Water Transfer/Exchange (Tetra Tech 2000), Draft Biological Opinion on Operation of the CVP and Implementation of the CVPIA (USBR and Service 2000), A Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988), vegetation categories derived from CALVEG data (Matyas and Parker 1980), the CDFG California Natural Diversity Database, and the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California.

B.4.1.2.2 Affected Environment

Historically, the area surrounding the Delta Division contained a diverse and productive patchwork of aquatic, wetland, riparian forest, and terrestrial habitats that supported abundant populations of resident and migratory species of wildlife (Tetra Tech 2000). Huge herds of pronghorn antelope, Tule elk, and mule deer grazed the prairies, and large flocks of waterfowl used the extensive wetlands. The major natural plant communities included grasslands, vernal pools, marshes, and riparian forests. Agricultural development and the conversion of natural habitat to agricultural uses began in the early to mid-1800s and intensified in the later 1800s, when the railroads provided the means to transport agricultural products to much larger markets.

Land uses in the region include agricultural, residential, and M&I uses. Over the years, land has been converted from native habitats to cultivated fields, pastures, residences, water impoundments, flood control structures, and other developments. Agricultural land comprises the majority of area and includes row crops, pastures, orchards, and vineyards. Almost half of the irrigated acreage in the San Joaquin region is planted with grains, hay, and pasture (USBR 1997a). Orchards are planted on about one-third of the irrigated acres, with cotton and row crops grown on most of the remaining lands. As a result of this historical conversion of native habitats, many species have been displaced or extirpated from the region.

B.4.1.2.3 Fisheries

On the arid west side of the San Joaquin River basin, relatively small intermittent streams drain the Coast Ranges but rarely reach the San Joaquin River. On the east side, numerous streams and three major rivers drain the western Sierra Nevada and provide flow to the San Joaquin River. The lower San Joaquin River is located within the Delta Division beginning at the Mendota Pool. Mud and Salt Sloughs are tributaries to the San Joaquin River that receive drainage (including tile water and tailwater) from the northern districts, as well as other drainage from their watersheds.

Historical fishery resources within the area were different from the fishery resources present today (USBR 1997a). Many native species have declined in abundance and distribution, and several introduced species have become well established. The major factors producing changes in aquatic habitat within the project area are habitat modification, species introduction, and over-fishing of fishery resources that originate in the area. These factors and anthropogenic activities within the area have adversely affected the fisheries resources in the area.

The San Joaquin River in the vicinity of the Delta Division is characterized as a warm-water, Deep-Bodied Fishes Zone composed of a variety of habitats, ranging from slow-moving backwaters with emergent vegetation to the shallow tule beds and deep pools of slow-moving water in the main river (Moyle 1976). The environment is dominated by a warm-water habitat, but also supports anadromous, cold-water Chinook salmon. The natural habitat and water quality of the river and Mud and Salt Sloughs have been highly modified by the addition of canals, agricultural drainwater, and seasonal regulation of main stem river flows.

The fish community in the area is dominated by introduced species and reduced populations of the remaining native warm-water species. Historically, the upper reaches of the San Joaquin River and its tributaries have provided habitat for Chinook salmon and steelhead trout. Spring-run Chinook historically used the upper reaches of the San Joaquin River, but was extirpated when Friant Dam was completed in 1949. Spring-run Chinook was probably eliminated by 1930 from the Stanislaus, Tuolumne, and Merced Rivers as a result of the construction of water storage facilities. Both fall-run Chinook salmon and steelhead trout continue to use these tributaries; their returns have been low for a number of years. The Merced River Fish Hatchery, operated by CDFG, produces fall-run Chinook salmon. This facility is the only salmon production facility located within the San Joaquin River basin.

Little information exists about fishery resources in water bodies located within the Delta Division. The intermittent streams located within the study area are not known to support anadromous fish and are unlikely to support populations of resident fish because of their hydrologic conditions, which are often characterized by low flows, increased temperatures, and reduced water quality. The numerous water conveyance facilities and water supply and drainage canals could support warm-water fish, such as bass, crappie, sunfish, catfish, and shad.

Laboratory and field research has demonstrated that elevated waterborne, dietary, or both concentrations of several trace elements in the San Joaquin Valley drainwaters are toxic to fish and wildlife. Selenium is the most toxic of these elements; other constituents include arsenic, boron, chromium, mercury, molybdenum, and salts (SJVDP 1990). The bio-accumulative food chain threat of selenium contamination on fish and aquatic birds has been well documented.

B.4.1.2.4 Palustrine Wetlands

Palustrine wetlands include any non-tidal wetlands not classified as lacustrine, estuarine or riverine and have no deepwater habitat associations. In the San Joaquin Valley, this classification includes both permanent and seasonal fresh emergent wetlands. With permanent fresh emergent wetlands, the topography is generally level or gently rolling. Wetlands follow basin contours or occur in conjunction with riverine or lacustrine environments. Subtypes of permanent emergent wetlands are generally classified by species presence, their association with specific terrestrial habitats, or both. Because emergent wetlands are typically inundated for most of the year, the roots of vegetation have evolved to thrive in an anaerobic environment. Characteristic floral species are erect, rooted hydrophytes dominated by perennial monocots such as the common tule, cattail, various sedges, and spike rushes. Permanent wetland habitat can occur on virtually any slope or exposure that provides a saturated depression. Seasonal fresh emergent wetlands most often occur in grassland and saltbush areas. A broad description of a seasonal wetland would include any area that ponds water during the wet season. Vegetation may vary from Italian rye grass in the driest areas to spike rush in the wettest. Cattail species are conspicuously absent from seasonal wetlands as they are indicative of permanent wetlands. These wetlands were historically composed of vast areas that, although inundated only periodically, provided crucial seasonal habitat for many wildlife species, most conspicuously for waterfowl and other migrants. They can occur as a subtype in almost any community.

B.4.1.2.5 Vernal Pools

Vernal pools are seasonal wetlands that form in shallow depressions underlain by a substrate near the surface that restricts the percolation of water. They are characterized by a barrier to overland flow that causes water to collect and pond. These depressions fill with rainwater and runoff from adjacent areas during the winter and may remain inundated until spring or early summer, sometimes filling and emptying during the wet season.

Prior to the era of the plow in the Central Valley, two forms of vernal pool were historically widespread in the grassland and saltbush regions of the San Joaquin River basin. The "valley" pool was typically found in areas with saline or alkaline soils such as basins or low-lying plains. "Terrace" pools were common in the neutral or slightly acidic soils of the more upland grasslands of the California prairie.

Vernal pools undergo four distinct annual phases: wetting, inundation, drying and drought. Each phase can be crucial to the life cycle of the species of plant and animal that have evolved in a given pool type. Although the vegetation composition of vernal pools varies with pool type, land use practices, annual rainfall and temperature variation, the vegetation in relatively undisturbed vernal pools is typically characterized by native annual species, many of which are endemic to vernal pools or vernal pool-swale systems and many of which are obligate symbiotes. Annual grasses are conspicuously absent as a descriptive species of vernal pools.

B.4.1.2.6 Riparian Habitat

The Central Valley's riparian habitats are dominated by cottonwood and willow near watercourses. Sycamore, box elder, and valley oak dominate the less frequently flooded higher terraces. Floodplain habitats above the riparian zone typically do not support wetland vegetation, but are hydrologically connected to rivers and riparian forests by periodic flooding and can be considered with them as an ecological unit. Streams historically flooded during the winter rainy season sometimes dry up partially or completely during summer droughts.

Riparian vegetation occurs in valleys and bottomlands bordered by gently sloping alluvial fans and dissected terraces and coastal plains. Riparian vegetation generally consists of woodlands or forests of broad-leaved deciduous hardwood trees as the overstory, with a variety of shrubs and vines composing the midstory, and a few grass and forb species and vines composing the understory. The floodplains of riparian communities are usually well-developed. Fluvial processes such as flooding, with its resulting sediment deposition and bank erosion, create three characteristic riparian landforms: gravel point bars, low terraces, and high terraces. Each landform has a different hydrology because of its physical relationship to the aquifer and flooding.

B.4.1.2.7 Grassland, Herbaceous and Unknown Rangeland

Grasslands in the Central Valley were originally dominated by native perennial grasses such as needlegrass and alkali sacaton. Currently, grassland vegetation is characterized by a predominance of annual or perennial grasses in an area with few or no trees and shrubs.

Annual grasses found in grassland vegetation include wild oats, soft chess, ripgut grass, medusa head, wild barley, red brome, and slender fescue. Perennial grasses found in grassland vegetation are purple needlegrass, Idaho fescue, and California oatgrass. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lilies, popcornflower, and California poppy. Vernal pools found in small depressions with an underlying impermeable layer are isolated wetlands within grassland vegetation.

Rangeland communities are composed of similar grasses, grass-like plants, forbs, or shrubs, which are grazed by livestock. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lily, popcornflower, and California poppy. Most of the grasslands in California are dominated by naturalized annual grasses with perennial grasses existing in relict prairie communities or on sites with soil or water conditions unfavorable for annual grasses, such as on serpentine. Grassland vegetation occurs from sea level to about 3,900 feet in elevation. Grassland communities as a whole have relatively high species diversity when compared to other California plant communities.

Grassland habitats are important foraging areas for black-shouldered kite, red-tailed hawk, Swainson’s hawk, northern harrier, American kestrel, yellow-billed magpie, loggerhead shrike, savannah sparrow, American pipit, mourning dove, Brewer’s blackbird, red-winged blackbird, and a variety of swallows. Birds such as killdeer, ring-necked pheasant, western kingbird, western meadowlark, and horned lark nest in grassland habitats. Grasslands also provide important foraging habitat for the coyote and badger because this habitat supports large populations of small prey species, such as the deer mouse, California vole, pocket gopher, and California ground squirrel. Common reptiles and amphibians of grassland habitats include western fence lizard, common kingsnake, western rattlesnake, gopher snake, common garter snake, western toad, and western spadefoot toad.

B.4.1.2.8 Agricultural Communities

Agricultural communities within the project area are very diversified, and almost half of the irrigated acreage in the San Joaquin region is planted with grains, hay, and pasture (USBR 1997a). Orchards are planted on about one-third of the irrigated acres, with cotton and row crops grown on most of the remaining lands.

Although natural communities provide the highest value for wildlife, many of these historic natural habitats have been largely replaced by agricultural habitats with varying degrees of benefits to wildlife. The intensive management of agricultural lands, including soil preparation activities, crop rotation, grazing, and the use of chemicals, effectively reduces the value of these habitats for wildlife. However, many wildlife species have adapted to some degree to particular crop types and now use them for foraging and nesting. Orchards, vineyards, and cotton fields generally provide relatively low-quality wildlife habitat because the frequent disturbance results in limited foraging opportunities and a general lack of cover. Pasture and row crops provide a moderate-quality habitat with some limited cover and foraging opportunities.

B.4.1.2.9 Cropland and Pasture

Pasture habitat can consist of both irrigated and unirrigated lands dominated by perennial grasses and various legumes. The composition and height of the vegetation, which varies with management practices, also affects the wildlife species composition and relative abundance. Irrigated pastures may offer some species habitats that are similar to those of both seasonal wetlands and unirrigated pastures. The frequent harvesting required, which reduces the overall habitat quality for ground-nesting wildlife, effectively reduces the value of the habitat. Irrigated pastures provide both foraging and roosting opportunities for many shorebirds and wading birds, including black-bellied plover, killdeer, long-billed curlew, and white-faced ibis. Unirrigated pastures, if lightly grazed, can provide forage for seed-eating birds and small mammals. Ground-nesting birds, such as ring-necked pheasant, waterfowl, and western meadowlark, can nest in pastures if adequate vegetation is present. Small mammals occupying pasture habitat include California voles, Botta’s pocket gophers, and California ground squirrels. Raptors including red-tailed hawks, white-tailed kites, and prairie falcons prey upon the available rodents. In areas where alfalfa or wild oats have been recently harvested, the large rodent populations can provide high-quality foraging habitat for raptors.

The habitat value in cropland is essentially regulated by the crop production cycle. Most crops in California are annual species and are managed with a crop rotation system. During the year, several different crops may be produced on a given parcel of land. Many species of rodents and birds have adapted to croplands, which often requires that the species be controlled to prevent extensive crop losses. This may require intensive management and often the use of various pesticides. Rodent species that are known to forage in row crops include the California vole, deer mouse, and the California ground squirrel. These rodent populations are preyed upon by Swainson’s hawks, red-tailed hawks, and black-shouldered kites.

B.4.1.2.10 Orchards and Vineyards

Orchard-vineyard habitat consists of cultivated fruit or nut-bearing trees or grapevines. Orchards are typically open, single-species, tree-dominated habitats and are planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between vineyard and orchard rows to reduce erosion. In vineyards, the rows under the vines are often sprayed with herbicides to prevent the growth of herbaceous plants.

Wildlife species associated with vineyards include the deer mouse, California quail, opossum, raccoon, mourning dove, and black-tailed hare. Nut crops provide food for American crows, scrub jay, northern flicker, Lewis’ woodpecker, and California ground squirrel. Fruit crops provide additional food supplies for yellow-billed magpies, American robin, northern mockingbird, black-headed grosbeak, California quail, gray squirrel, raccoon, and mule deer. Loss of fruit to grazers often results in species management programs designed to force these species away from the orchards.

B.4.1.2.11 Idle or Retired Farmland

Lands of this category are similar to abandoned farmlands in the ruderal or unknown rangeland category, but with less time out of agricultural production. Similarly, the habitat value of these lands may vary with land management practices.

B.4.1.2.12 Areas Not Affected by the Use of CVP Water

Four natural areas in the vicinity of the project area that are managed as uplands do not receive water from the DMC (Wilbur 2000). These areas include the Little Panoche, Lower Cottonwood Creek, O'Neill Forebay, and Upper Cottonwood Creek Wildlife Management Areas. The Upper and Lower Cottonwood Creek Wildlife Management Areas are located adjacent to San Luis Reservoir. The O'Neill Forebay Wildlife Management Area is located adjacent to O'Neill Forebay. The Little Panoche Wildlife Management Area is located on Little Panoche Creek in the hills approximately 10 miles southwest of the Eagle Field Water District.

B.4.1.2.13 Areas Affected by the Use of CVP Water

Each of the Delta Division contractors and several Significant Natural Areas in the proximity of the DMC use CVP water. The following sections describes several of the larger Significant Natural Areas affected by CVP water.

B.4.1.2.14 Significant Natural Areas

The 77 Significant Natural Areas[1] in the San Joaquin Valley, while scattered throughout the region, are also concentrated in the grasslands of the San Joaquin Valley in freshwater marsh, valley sink scrub, and grassland vernal pool habitats. These areas are important to waterfowl and shorebirds that winter and nest in the San Joaquin Valley, as well as for several special-status species, including the giant garter snake, Swainson's hawk, tricolored blackbird, colusa grass, delta button celery, San Joaquin woolythreads, and soft birds-beak. Historically, the San Joaquin River basin was a large floodplain of the San Joaquin River that supported vast expanses of permanent and seasonal marshes, lakes, and riparian areas. Almost 70 percent of the basin has been converted to irrigated agriculture, with wetland acreage estimated to have been reduced to approximately 120,300 acres. In combination with the adjacent uplands, the wetland complex is referred to as "the Grasslands" and consists of approximately 160,000 acres of private and public lands. Approximately 53,300

1 The Significant Natural Areas Program is part of the CDFG's Wildlife and Habitat Data Analysis Branch. It was legislatively established in 1981 (Fish and Game Code Sections 1930–1933) and mandated to develop and maintain a data management system for natural resources; identify the most "significant natural areas" in California; ensure the recognition of these areas; seek the long-term perpetuation of these areas; and provide coordinating services for other public agencies and private organizations interested in protecting natural areas. The Significant Natural Areas Program analyzes data from the California Natural Diversity Database. The following biological criteria are used to identify Significant Natural Areas: areas supporting extremely rare species or natural communities and areas supporting associations or concentrations of rare species or communities. Significant Natural Area data have been used for bioregional conservation planning, environmental review, designation of special-status areas on public lands and land acquisition planning.

acres of the Grasslands are permanently protected in state or federal wildlife refuges or in federal conservation easements.

Several Significant Natural Areas are present in the Delta Division or are located nearby. Significant Natural Areas present in the Delta Division include the Lower and Upper Cottonwood Creek Wildlife Management Areas, Mendota Wildlife Management Area, and O'Neill Forebay[2]. Significant Natural Areas present near the Delta Division include Los Banos Wildlife Management Area, Little Panoche Wildlife Management Area, Merced National Wildlife Refuge, North Grasslands Wildlife Management Area, San Joaquin River National Wildlife Refuge, San Luis National Wildlife Refuge, and Volta Wildlife Management Area.

B.4.1.2.15 Lower and Upper Cottonwood Creek Wildlife Management Areas

The Lower and Upper Cottonwood Creek Wildlife Management Areas are located in both Merced and Santa Clara Counties, approximately 36 miles east of the city of Gilroy. The Cottonwood Creek Wildlife Management Area consists of 6,315 acres of steep oak-grassland (upper unit) and steep hilly grassland (lower unit). The area is accessible only by foot. Wildlife in the area includes wild pigs, black-tailed deer, gray fox, and over 100 species of birds. Allowable recreational activities in the Cottonwood Creek Wildlife Management Areas include wildlife viewing, boat access (hand-carried only), fishing, hiking, and camping.

B.4.1.2.16 Mendota Wildlife Management Area

The 12,425-acre Mendota Wildlife Management Area is the largest publicly owned and managed wetland in the San Joaquin Valley (USBR 1997a). Established between 1954 and 1966, the refuge is located on a part of the Coelho Family Trust and is adjacent to the Fresno Slough Water District, the Tranquillity Public Utilities District, Reclamation District #1606, Tranquillity Irrigation District, and the 900-acre Alkali Sink Ecological Reserve. Approximately 8,300 acres of wetlands are maintained on the refuge, including almost 6,800 acres of seasonal wetlands, which are used by migratory ducks and shorebirds. To feed these animals, several crops, including corn, barley, milo, and safflower, are raised. Giant garter snakes have also been observed on the refuge. The water used to maintain these seasonal wetlands is purchased directly from the CVP (Huddleson 2000).

B.4.1.2.17 Los Banos Wildlife Management Area

Purchased in 1929, the Los Banos Wildlife Management Area was the first of a series of waterfowl refuges established in California to manage habitat for wintering waterfowl. Expanded from its original 3,000 acres, there are now 6,217 acres of wetland habitat, which includes lakes, sloughs, and managed marshes. The refuge provides habitat for western pond

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2 All of the areas discussed, except Lower and Upper Cottonwood Creek Wildlife Management Areas and the San Joaquin River National Wildlife Refuge, receive CVP water supplies to meet Level 2 requirements, in accordance with the CVPIA.

turtles, raccoons, striped skunks, beaver, muskrat, and over 200 varieties of bird species, including ducks, geese, shorebirds, coots, wading birds, and cranes. Pintail ducks and lesser snow geese are the most common waterfowl on the refuge. Swainson's hawks are known to nest near the refuge and to use the refuge for foraging. Other special-status species known to occur on the refuge include the giant garter snake and delta button celery (USBR 1997b).

B.4.1.2.18 Merced National Wildlife Refuge

The Merced National Wildlife Refuge was established in 1951 to alleviate crop depredation and provide waterfowl habitat (USBR 1997a). Originally a farm, the original 2,562-acre refuge has expanded over the years. The refuge now totals 8,234 acres, including the 2,464 Arena Plains Unit. This refuge is one of the most important wintering areas in California, supporting snow and Ross' geese, sandhill cranes, and variety of shorebirds. Public use facilities at the refuge include observation platforms, interpretive panels, and a public hunting area, which is open during the hunting season. The Merced National Wildlife Refuge is located approximately 13 miles east of the Del Puerto Water District.

B.4.1.2.19 North Grasslands Wildlife Management Area

The North Grasslands Wildlife Management Area was purchased by the State of California in April 1990 and is managed by the CDFG (USBR 1997a). It is located within five miles of the Del Puerto Water District and includes three separate units. The China Island and Salt Slough units contain 5,556 acres of primarily agricultural land and pasture, but also have extensive river and slough channels with riparian edges. These two units receive water directly from the CVP (Wilbur 2000); however, the Salt Slough unit does not have a firm historical water supply. North Grasslands Wildlife Management Area provides habitat for a variety of wildlife species. Ducks are the most common waterbirds using the refuge, but sandhill cranes, shorebirds, and geese, including the Aleutian Canada goose, are also common. Agricultural crops irrigated with water from the DMC feed wintering migratory birds.

B.4.1.2.20 San Luis National Wildlife Refuge Complex

The 26,609-acre San Luis National Wildlife Refuge Complex is located approximately six miles east of the Del Puerto Water District. The refuge is a mixture of managed seasonal and permanent wetlands, riparian habitat associated with three watercourses and native grasslands, alkali sinks and vernal pools. The San Luis National Wildlife Refuge buys water from the CVP to irrigate seasonal wetlands and cereal crops (Chouinard 2000). The refuge provides habitat for waterfowl, including ducks, geese, and shorebirds, as well as tule elk and other endangered species. The largest concentration of mallard-pintails and green-winged teal in the San Joaquin Valley is also found here. Major public use occurs in the refuge complex, including interpretive wildlife observation programs, hiking, fishing, waterfowl and pheasant hunting.

B.4.1.2.21 San Joaquin National Wildlife Refuge

The San Joaquin National Wildlife Refuge is located approximately 10 miles west of Modesto on Highway 132 and within the floodplain of the confluence of the San Joaquin, Stanislaus, and Tuolumne Rivers. Refuge lands consist of oak-cottonwood-willow riparian forest, pastures, agricultural fields, and wetlands. This refuge was established in 1987 with an original land base of 1,638 acres. Through recent land acquisitions, the refuge has increased to 6,642 acres with an approved refuge boundary of 12,877 acres. The San Joaquin River National Wildlife Refuge played a key role in the recovery and March 2001 delisting of the Aleutian Canada goose by providing critical habitat for the species. The lands in the refuge form a mosaic of riparian habitat, wetlands, and agricultural fields. It is the primary wintering site of 98 percent of the Aleutian Canada geese that winter in the valley, plus it is a major wintering and migration area for lesser and greater sandhill cranes, cackling Canada geese, and white-fronted geese. Because the refuge is near large population centers, opportunities exist for future public use, including wildlife observation and nature interpretation and education.

B.4.1.2.22 Volta Wildlife Management Area

The 3,000-acre Volta Wildlife Management Area is located approximately five miles east of the Centinella Water District. The refuge maintains more than 1,800 acres of wetlands, including 1,400 acres of moist soil plants; 720 acres of alkali sink habitat are preserved on the refuge as a rare ecological community (USBR 1997a). The Volta Wildlife Management Area provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, and wading birds. Black-necked stilts, sandpipers, dunlins, and dowitchers dominate shorebird species.

B.4.1.3.1 Soils and Geology

This section discusses the soils and geology within the Delta Division. Information in this section was summarized from the Draft CVPIA PEIS, Soils and Geology, Technical Appendix, Volume 2 (USBR 1997b).

B.4.1.3.2 Affected Environment

This section describes the soils and geologic conditions found within the Delta Division, which is located in the western San Joaquin Valley and includes portions of San Joaquin, Stanislaus, Merced, and Fresno Counties as well as the geographic service areas of the 20 DMC Unit contractors.

B.4.1.3.3 Soils

The soils of the San Joaquin Valley are divided into four physiographic groups: valley land soils, valley basin soils, terrace soils, and upland soils. Valley land and valley basin land soils comprise most of the San Joaquin Valley floor. In the vicinity of the DMC, valley land soils consist of deep alluvial and aeolian soils that make up some of the best agricultural land in California. Valley basin lands consist of organic soils of the delta, poorly drained soils, and saline and alkali soils in the valley trough and on the basin rims.

The San Joaquin Valley experiences drainage and soil salinity problems. Drainage problems are a result of irrigated agriculture in an area with shallow groundwater tables and little or no drainage outlet. In a large part of the valley, on the west side, shallow groundwater tables, salts imported by water deliveries, and accumulation of natural salts in soil and groundwater from irrigation threaten sustained agriculture.

Backlund and Hoppes (1984) estimated that about 2.4 million of the 7.5 million acres of irrigated cropland in the Central Valley have been affected by salt. These saline soils generally exist in the valley trough and along the eastern and western edges on both sides of the San Joaquin Valley. By the year 2000, it was projected that up to 918,000 acres of farmland in the San Joaquin Valley would be affected by high water tables less than five feet from the ground surface (San Joaquin Valley Drainage Program 1990). In addition to drainage, problems have occurred with the accumulation of toxic metals (arsenic, boron, molybdenum, and selenium) that have leached from natural deposits through the application of irrigation water.

Selenium in the soil is primarily a concern on the west side of the San Joaquin Valley. When the soils in this area are irrigated, selenium, other salts, and trace elements dissolve and leach into the groundwater (Gilliom et al. 1989). Over the past 30 to 40 years of irrigation, most soluble selenium has been leached from the soils into the shallow groundwater. It is drained from those soils when growers try to protect crop roots from salts and the high water table.

In areas with high selenium concentrations, selenium leached from the soils enters irrigation return flows and subsurface drainage flows. Irrigation of these soils further mobilizes selenium, facilitating its movement into shallow groundwater that is retained in poorly drained or mechanically drained soils. In the absence of adequate drainage facilities, leaching cannot fully remove the salts from these soils because water cannot percolate beyond one or more confining clay layers under the shallow groundwater aquifer.

B.4.1.3.4 Geology

The San Joaquin Valley is part of a large, northwest-to-southeast-trending asymmetric trough of the Central Valley, which has been filled with up to six vertical miles of sediment. This sediment includes both marine and continental deposits ranging in age from Jurassic to Holocene. The San Joaquin Valley lies between the Coast Ranges on the west, the Sierra Nevada on the east, and extends northwestward from the San Emigdo and Tehachapi Mountains to the Delta near the City of Stockton. The San Joaquin Valley is 250 miles long and 50 to 60 miles wide. The relatively flat alluvial floor is interrupted occasionally by low hills.

The San Joaquin Valley floor is divided into several geomorphic land types including dissected uplands, low alluvial fans and plains, river floodplains and channels, and overflow lands and lake bottoms. The alluvial plains cover most of the valley floor and comprise some of the most intensely developed agricultural lands in the San Joaquin Valley. In general, alluvial sediments of the western and southern parts of the San Joaquin Valley tend to have lower permeability than eastside deposits.

Near the valley trough, fluvial deposits of the east and west sides grade into fine-grained deposits. The San Joaquin Valley has several thick lakebed deposits. The deposit that most notably affects groundwater and confinement is the Corcoran Clay Member, deposited about 600,000 years ago. This clay bed, which is found in the western and southern portions of the valley, separates the upper semi-confined to unconfined aquifer from the lower confined aquifer (Page 1986). The clay bed covers approximately 5,000 square miles and is up to 160 feet thick beneath the present bed of Tulare Lake.

Subsidence occurs in the western San Joaquin Valley as a result of reduced groundwater elevations and the related compaction of the soil interstitial spaces that had previously been filled with groundwater. Land subsidence has caused substantial reductions in ground elevations in some locations.

B.4.1.4.1 Visual Resources

This section discusses the visual resources in the Delta Division. Information in this section is summarized from the Draft CVPIA PEIS, Visual Resources, Technical Appendix, Volume 6 (USBR 1997e).

B.4.1.4.2 Affected Environment

The San Joaquin River Region is lowland with predominantly flat and gently sloping terrain bordered by hills and low mountains. The valley is semi-arid to arid, and there are few natural lakes or perennial streams. The San Joaquin River is the principal water feature. A number of wetlands used as wildlife refuges are also located in the region. The valley area is developed predominantly for agricultural uses. It is sparsely to moderately populated, having one large urban area (metropolitan Fresno) and scattered small communities. The northern area of the region near the city of Tracy is developing rapidly.

There are CVP facilities within and in the vicinity of the Delta Division that are visual resources. They include the San Luis Reservoir and O'Neill Forebay within the Los Banos Creek State Recreation Area. The landscape in this area is considered common scenic to minimal scenic quality.

The area surrounding the Delta Division is predominantly of minimal scenic quality, with some areas of common scenic quality (U.S. Forest Service 1976). Interstate 5 provides panoramic view opportunities, some segments of which are designated scenic highways. Views of the DMC and California Aqueduct are the basis for the designation of Interstate 5 as a scenic highway. Similarly, views of San Luis Reservoir are important reasons for State Route 152 being designated a scenic highway.

Wildlife refuges in the region near the Delta Division are considered to have landscape variety that ranges from common scenic to distinctive scenic quality (U.S. Forest Service

1976). These areas provide visual contrast with surrounding agricultural lands primarily because of their vegetation and water. The scenic quality is enhanced seasonally by the large numbers and variety of waterfowl and seasonal wildflower displays, which attract substantial visitation, thereby increasing the viewer sensitivity of the area. The wildlife refuges served by the Delta Division create visual benefits.

B.4.2.0 SAN FELIPE DIVISION

B.4.2.1.1 Air Quality

San Benito and Santa Clara counties have similar climatological conditions but dissimilar air quality conditions. Most of the air pollutants in the study area may be associated with either urban or agricultural land uses. Pollutants commonly associated with agricultural land uses include particulate matter (PM) less than 10 microns (PM_{10}), carbon monoxide, nitrogen oxides, and ozone precursors. No clear relationship exists between agricultural acres and the occurrence or resulting concentrations of ozone and PM_{10} in the atmosphere. Several variables other than land uses can affect air quality conditions, and these variables may change over time.

B.4.2.1.2 Affected Environment

The following description of the Affected Air Resources is focused upon air quality in areas served by the San Felipe Project. This information is primarily based upon environmental documentation completed for the Monterey Bay Unified Air Pollution District, California Air Resources Board, San Benito County general plan, Santa Clara County general plan, and Pajaro Valley Water Management Agency.

B.4.2.1.3 Zone 6 of San Benito County Water District

Climate in San Benito County is characterized by westerly winds from the Pacific Ocean with rainfall from October through April. San Benito County is adversely affected by air emissions from Santa Clara and Monterey counties. The large amount of agricultural areas and open space in San Benito County help to remove particulates from the upwind counties. The area is part of the North Central Coast Air Basin and Monterey Bay Unified Air Pollution Control District.

Monterey Bay Unified Air Pollution District operates 10 monitoring stations including a station at Hollister. The National Park Service also operates a station at the Pinnacles National Monument. This district was named a Federal Maintenance Area for ozone in 1997. There have been violations of the ozone standards in the district and in San Benito County. However, the State Air Resources Board determined that most of these violations are due to emissions upwind of the North Central Coast Air Basin. The district is encouraging the land use agencies to consider air quality issues when considering land use changes, expansion of public transportation within this air basin, and expansion of public education programs. This will be especially important as residential areas of Hollister and San Juan Bautista expand.

The monitoring station at Hollister indicated that the Federal PM_{10} standards have not been exceeded in the past 12 years and State standards have not been exceeded since 1993. However, it must be recognized that some agricultural and industrial activities can cause local air quality degradation, including land clearing, controlled burning, gravel and mining operations, and use of non-paved roads.

San Benito County is particularly serious about maintaining good air quality to avoid human health impacts, reduction in agricultural production rates, and adverse impacts on biological resources.

B.4.2.1.4 Santa Clara Valley Water District

Climate in Santa Clara County is also characterized by westerly winds from the Pacific Ocean with rainfall from October through April. In the summer, subsidence inversions frequently occur to produce worst-case conditions for the formation of photochemical smog which causes extensive concentrations of ozone. During the winter, surface inversions occur and trap pollutants close to the ground.

The area is part of the Bay Area Air Quality Management District. The district operates five air quality monitoring stations in Santa Clara County. The county has been designated as an attainment area for nitrogen dioxide, sulfur dioxide, and carbon monoxide. The county has been designated as a non-attainment area for ozone and PM_{10}. The worst air quality problems occur in northern Santa Clara County where ozone concentrations have approached the first stage of Health Advisory Level. High PM_{10} have only occurred in downtown San Jose where vehicle traffic and demolition and construction activities have increased particulate matter.

Santa Clara County is working with the Metropolitan Transportation Commission to prepare a Transportation Improvement Plan to be conformance with the State Implementation Plan for non-attainment areas. The county also considers air quality issues when considering land use changes.

B.4.2.1.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.4.2.2.1 Biological Resources

The following description of the Fishery and Wildlife Resources includes a discussion of biological resources that could be affected in San Benito and Santa Clara counties by delivery of CVP water.

B.4.2.2.2 Affected Environment

The Affected Environment description summarizes overall biological resources in the counties that could be affected by users of CVP water. The operation of CVP facilities was addressed in the CVPIA PEIS and is not addressed in this section. Zone 6 of San Benito County Water District and Santa Clara Valley Water District utilize both streams and pipelines to convey CVP water throughout the service areas, as evaluated in the San Felipe Division Environmental Impact Statement and environmental documentation completed for the construction of the local facilities.

This section describes the land use and land cover types that exist in the both service areas of Zone 6 of San Benito County Water District and Santa Clara Valley Water District. Because many of these habitats occur in both districts in the San Felipe Division, this section is organized by habitat not by district.

Historically, the Zone 6 of San Benito County Water District and Santa Clara Valley Water District service areas supported a diversity of natural land cover types consisting of freshwater and saline emergent wetlands, riparian forest, grasslands, and adjacent higher elevation habitats. Urban and agricultural development resulted in the conversion of natural communities and reductions and fragmentation of natural communities. Urban and agricultural development has been focused in lowland areas. Riparian land cover in the lower watersheds has declined in quality and quantity as a result of vegetation removal for levee construction and bank protection, flow regulation, groundwater pumping, channel modification, encroachment of urban land uses, and spread of invasive species. The extent and characteristics of saline and freshwater emergent wetlands has been similarly altered by these activities. While natural land cover types in lowland areas have been reduced and continue to be affected by urban and agricultural activities, extensive natural community areas (oak woodlands, coastal scrub/chaparral and hardwood/conifer forest) remain in the foothills and in higher elevation areas.

As previously described, there is no current use of CVP water in the Pajaro Valley Water Management Agency service area therefore, habitat and special status species in that service area are not discussed in this subsection.

B.4.2.2.3 Land Use and Land Cover Types

The types, amounts, and distribution of land uses and land cover in the service areas were primarily derived from the California GAP land cover data. In the California GAP Analysis, land use and land cover is typed based on the California Wildlife Habitats Relationship System (CWHR). This project focused on mapping lands at a landscape scale and has a resolution of 274 acres for upland areas and 98.8 acres for wetland areas. As a result, this database identifies general land use and land cover types throughout the service areas but does not distinguish small land use and land cover patches, such as stringers of riparian areas or small wetlands, which can have high wildlife value.

B.4.2.2.4 Annual Grasslands

Annual grassland is a common land cover type in the San Felipe Division. Historically, grasslands were dominated by native perennial grasses such as needlegrass (*Nasella* sp.). Currently, most grassland in the area is dominated by introduced annual grasses of Mediterranean origin and a mixture of native and introduced forbs. Introduced annual grasses are the dominant plant species and include wild oats (*Arena* sp.), soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus rigidus*), red brome (*Bromus rubens*), barley (*Hordeum* sp.), and foxtail (*Hordeum murinum*). Annual native forbs also occur in annual grassland habitat and include filaree (*Erodium* sp.), California poppy (*Eschscholtzia californica*), owl's clover (*Orthocarpus purpurascens*), tarweed (*Holocarpha virgata*) and various lupines (*Lupinus* sp.). Yellow star-thistle (*Centaurea solstitialis*), a noxious weed, has invaded many annual grassland habitats and degraded forage quality for wildlife and livestock pasture. Annual grassland habitat merges with valley oak and blue oak woodlands, occurring where soil moisture is insufficient to support tree growth or is suppressed due to grazing.

Listed species potentially using annual grasslands are California red-legged frog, San Joaquin kit fox, and San Francisco garter snake.

B.4.2.2.5 Valley-foothill Riparian

Valley foothill riparian land cover develops in the flood plains of low-gradient rivers and streams. This land cover occurs adjacent to freshwater reaches of permanent and seasonal watercourses. Typically, riparian land cover occurs as narrow bands of vegetation immediately adjacent to watercourses. Dominant tree species of valley foothill riparian habitat are cottonwood (*Populus fremontii*), California sycamore (*Plantanus racemosa*), and valley oaks (*Quercus lobata*). Typical shrub species include willows (*Salix* sp.), elderberry (*Sambucus* sp.), and wild grape (*Vitis californica*).

Riparian land cover forms a transitional community between the aquatic, riverine environment and dry upland areas. The composition of riparian plant communities is shaped by the timing, intensity, and duration of flooding. Willows predominate in areas subject to regular inundation and quickly colonize newly deposited gravel bars or recently scoured areas. Cottonwoods occur farther from the river channel in areas subject to less frequent and intense flooding. Still, the persistence of cottonwoods is linked to the natural seasonal pattern of flows. Cottonwoods evolved to release seeds at the same time as high spring flows would deposit nutrient rich sediments where germination and seedling survival would be enhanced. Thus, the timing and intensity of flows is critical to the persistence of riparian vegetation. Flood control and water supply projects have resulted in hydrologic alterations that have changed the species composition, structure, and extent of riparian habitats. In addition, most rivers have been channelized and are confined by levees, which limit the area available to support riparian communities. As a result of these changes, the extent of riparian land cover has been substantially reduced.

Listed species potentially using valley-foothill riparian communities include California red-legged frog, least Bell's vireo, bald eagle, and San Joaquin kit fox.

B.4.2.2.6 Wetlands

The following three types of wetlands occur in the San Felipe Division:

- Freshwater emergent wetlands
- Saline emergent wetlands
- Vernal pools

Freshwater emergent wetlands occur in areas that are seasonally or perennially inundated. They form a transitional community between open water and upland communities and occur in backwater areas of rivers, streams and lakes, and in the flood plains of rivers and streams. Wetlands are characterized by erect rooted, herbaceous vegetation that emerges above the water surface. Water depths are shallow, to about 1 to 2 feet. Common plant species include cattails (*Typha* sp.), bulrushes (*Scirpus* sp.), and rushes (*Juncus* sp.).

Urban and agricultural developments as well as hydrologic changes from flood control and water supply development have substantially reduced the amount of wetland communities in California.

Listed species potentially using freshwater emergent wetlands are California red-legged frog and bald eagle.

Saline emergent wetlands encompass salt and brackish water marshes. They occur along the margins of bays, lagoons, and estuaries. These wetlands form above intertidal sand and mud flats and below upland communities not subject to tidal action. Plant species composition and structure varies with the salinity, substrate, and wave action. Characteristic plant species of more saline marshes are cordgrass (*Spartina foliosa*) and pickleweed (*Salicornia virginica*), while bulrushes and cattails occur in lower salinity marshes.

Only a small portion of the saline emergent wetlands existing in the San Francisco Bay area in the mid-1800s remain. Many of the wetlands were dredged or filled in association with urban development. Runoff and discharges from urban and industrial development also has reduced and degraded wetlands. The suitability of the remaining wetlands for many species has been further limited, and in some cases precluded, by their small size, fragmentation, and lack of other habitat features.

Saline emergent wetlands only occur at the northern edge of Santa Clara County. Much of the former saline emergent wetlands along Coyote Creek, Alviso Slough, and Guadalupe Slough have been converted to fresh and brackish water vegetation due to freshwater discharge from wastewater facilities, and is of lower quality for species such as California clapper rails. Some saline emergent wetland communities remain around the Coyote Creek Flood Control Bypass.

Listed species associated with saline emergent wetlands are salt marsh harvest mouse, California clapper rail, and California sea-blite.

Vernal pools are typically found in association with annual grassland communities but constitute a unique habitat type. Vernal pools form in shallow depressions that are underlain by hardpan or volcanic rock. The hardpan or volcanic rock impedes drainage such that, in winter, the depressions fill with water and retain moist soil into late spring. The pools are then dry during the summer and fall until rains commence the following winter. The soils and moist microhabitat of these pools provides a unique habitat within a general matrix of annual grassland communities. Plant species of vernal pools differ from those of the surrounding annual grassland and many animals associated with annual grasslands depend on the occurrence of vernal pools to persist in the annual grassland landscape. Common plant species found in vernal pools include popcorn flower (*Plagiobothrys stipitata*), navarretia (*Navarretia leucocephala*), toad rush (*Juncus bufonius*), goldfields (*Lathenia chrysostoma*), yellow carpet (*Blennosperma nanum*), coyote thistle (*Eryngium vaseyi*), tidy tips (*Layia* sp.), water buttercup (*Ranunculus* sp.), and hairgrass (*Deschampsia danthonioides*).

The number and distribution of vernal pools have been greatly reduced as a result of agricultural practices and conversion to urban land uses. It has been estimated that 5 to 30 percent of California's vernal pools are intact today. It is unknown whether any vernal pools remain in Santa Clara County. The occurrence and distribution of vernal pools in Zone 6 of San Benito County Water District is similarly uncertain.

Listed species associated with vernal pools in the action area are vernal pool fairy shrimp and Contra Costa goldfields.

B.4.2.2.7 Oak Woodland

Oak woodland in the action area encompasses four CWHR habitat types:

- Blue oak woodland
- Blue oak and foothill pine woodland
- Coastal oak woodland

Oak woodland is common in the action area, occurring between annual grasslands at lower elevations and coastal scrub and chaparral and hardwood and conifer forests at higher elevations. Typically oak woodlands are found at elevations of 3,000 to 4,000 feet.

Blue oak (*Quercus douglasii*) is the dominant overstory species of blue oak woodland and blue oak and foothill pine woodland. Gray pine (*Pinus sabiniana*) becomes an important overstory species at higher elevations. Where gray pine or other conifers comprise 25 to 49 percent of the overstory with blue oak comprising at least 50 percent of the overstory canopy, the CWHR classifies this habitat as Blue oak and Foothill Pine woodland. Frequent fire favors blue oak (a long-lived stump sprouter) over foothill pine. Stands vary from open savannas with grassy understories (usually at lower elevations) to fairly dense woodlands with shrubby understories. Typical shrub species in blue oak woodland are poison-oak (*Toxicodendron diversilobum*), coffeeberry (*Rhamnus californica*), redbud (*Cercis occidentalis*), ceanothus (*Ceanothus* sp.), and manzanita (*Arctostaphylos* sp.), with ground cover consisting of annuals such as bromegrass, wild oats, foxtail, and filaree.

Coastal oak woodland occurs in the Coast Range in the western portion of the San Felipe Division. In this woodland, coastal live oak (*Quercus agrifolia*) is the dominant overstory species and can be the only overstory species in some locations. In mesic areas, California bay (*Umbellularia californica*), Pacific madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflorus*), and canyon live oak (*Quercus chrysolepis*) contribute to the overstory. The understory typically consists of shade-tolerant shrubs such as California blackberry (*Rubus ursinus*), creeping snowberry (*Gaultheria hispidula*), and toyon (*Heteromeles arbutifolia*).

Listed species potentially occurring in oak woodlands are California red-legged frog, San Joaquin kit fox, and the bald eagle.

B.4.2.2.8 Hardwood/Conifer Forest

Hardwood and conifer forest occurs at the highest elevations in Santa Clara County. No hardwood and conifer forest occurs in Zone 6 of San Benito County Water District. Hardwood and conifer forest in the area consists of four CWHR community types:

- Montane hardwood
- Montane hardwood-conifer
- Redwood
- Ponderosa pine

Montane hardwood forest occurs in eastern portions of the action area at lower elevations than conifer forest habitat, although it can be interspersed with ponderosa pine (*Pinus pondersosa*). This forest type is dominated by hardwood tree species including coastal live oak, California black oak (*Quercus kelloggii*), tanoak, and Pacific madrone, but often includes some conifers, such as gray pine and ponderosa pine. Typical understory shrub species include manzanita, poison-oak, coffeeberry, currant (*Ribes* sp.), and ceanothus. Montane hardwood-conifer communities are similar to montane hardwood but include both conifers and hardwoods, often as a closed forest. Hardwood species are the same as in montane hardwood communities. Typical conifer species are Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine, and redwood (*Sequoia sempervirens*). The specific composition of this land cover type varies in response to soil type, exposure, and moisture, among other factors.

Ponderosa pine communities are dominated by pondersosa pines. It may occur in pure stands or in stands of mixed species where at least 50 percent of the canopy cover is created by ponderosa pine. Typically this forest type supports rather sparse understory and herbaceous cover.

Redwood communities are dominated by redwoods. Understory vegetation is usually dense, consisting of tall shrubs. Douglas-fir is a common associate.

Listed species potentially occurring in oak woodland are California red-legged frog and bald eagle.

B.4.2.2.9 Coastal Scrub and Chaparral

Coastal scrub and chaparral communities occur along the southern and eastern borders of Zone 6 of the San Benito County Water District and Santa Clara County. These communities consist of structurally homogenous brushland dominated by shrubs. Shrub height and crown cover vary considerably with fire frequency, precipitation, aspect, and soil type. Chaparral land cover in the area includes three types of communities distinguished by CWHR: Chemise-Redshank Chaparral, Mixed Chaparral, and Coastal Scrub. Chemise-Redshank Chaparral and Mixed Chaparral are very similar and their differentiation is somewhat subjective. In general, Chemise-Redshank Chaparral consists of at least 60 percent coverage by chemise (*Adenostoma fasciculatum*) and redshank (*Adenostoma sparsifolium*) combined. Mixed chaparral supports a greater diversity of plant species, including scrub oak (*Quercus berberidifolia*), ceanothus, manzanita, toyon, and yerba-santa (*Eriodictyon californicum*), in addition to chemise and redshank. The upper and lower elevational limits of chaparral land cover varies considerably with precipitation, aspect, and soil type, but typically occurs below 5,000 feet. Coastal scrub is typified by low to moderate-sized shrubs. Its growth form varies from patchy oceanside cover of nearly prostrate shrubs to dense, continuous areas of shrubs up to 7 feet tall. Coyotebush is the predominant overstory shrub, but other common species are ceanothus and coffeeberry. Understory species can include bracken fern (*Pteridium aquilinum*), swordfern (*Polystichum munitum*), yerba buena (*Satureja douglasii*), and Indian paintbrush (*Castilleja* sp.).

Listed species potentially using coastal scrub and chaparral are California red-legged frog.

B.4.2.2.10 Serpentine

Serpentine is distinguished by soil type rather than by dominant plant species. Serpentine soils are formed from weathered volcanic (ultramafic) rocks such as serpentinite, dunite, and peridotite. These soils provide a harsh environment for plant growth. Several factors contribute to the inhospitability of serpentine soils to plant growth including: 1) a low calcium-magnesium ratio; 2) lack of essential nutrients such as nitrogen, potassium, and phosphorous; and 3) high concentrations of heavy metals (mineral toxicity). As a result of these harsh conditions, serpentine soils support unique grassland communities consisting of fountain thistle (*Cirsium fontinale* ssp. *fontinale*), Santa Clara Valley dudleya (*Dudleya setchellii*), Marin dwarf-flax (*Hesperolinon congestum*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), uncommon jewelflower (*S. albidus* ssp. *peramoenus*), and coyote ceanothus (*Ceanothus ferrisae*).

Listed species associated with serpentine habitats are Santa Clara Valley dudleya, Metcalf Canyon jewelflower, coyote ceanothus, Tiburon indian paintbrush, and Bay checkerspot butterfly. Serpentine soils are patchily distributed in Santa Clara Valley Water District's service area but do not occur in Zone 6 of San Benito County Water District.

B.4.2.2.11 Barren

Barren areas are areas devoid of vegetation or supporting very sparse vegetation (< 2%). Barren areas can be natural or human-created. Natural barren areas include sand bars, rock outcrops, beaches and mudflats. Human-created barren habitats include areas such as quarries, roads and buildings. Small areas typed as Barren (< 1,000 acres total) occur in the service area of Santa Clara Valley Water District. No barren areas were demarcated in Zone 6 of San Benito County Water District.

Listed species associated with barren land cover include California least tern, which use beaches and mudflats.

B.4.2.2.12 Lacustrine

Lacustrine land types are inland depressions containing standing water. They vary in size and characteristics and include natural lakes, reservoirs, dammed river channels, and ponds. This aquatic land cover type can be associated with rivers and freshwater emergent wetlands. Shallow, temporary habitats may support rooted plants, whereas deep permanent water bodies are primarily open water. Permanent open waters can support emergent and aquatic plants in shallow areas along the margins of the waterbody. Large areas of lacustrine habitat is supported at San Justo Reservoir, Lexington Reservoir, Guadalupe Reservoir, Calero Reservoir, Uvas Reservoir, Chesbro Reservoirs, Coyote Lake, and Anderson Lake.

Listed species potentially using lacustrine habitat are bald eagle.

B.4.2.2.13 Other Surface Water

Riverine land cover types are aquatic habitats characterized by moving water. The nature and characteristics of riverine habitat can vary considerably. Depending on the size of the drainage basin and topography, riverine habitats can consist of large, slow-moving water to small, fast-moving water found in higher elevation drainages. Major watercourses in the area are Coyote Creek and the Guadalupe River.

Listed species associated with rivers and streams include coho salmon, steelhead, and California red-legged frog.

B.4.2.2.14 Agricultural

Agricultural land use is common in the San Felipe Division and consists of a variety of row crops and field crops. Crop types vary from year-to-year depending on market conditions and other factors. Agricultural fields have replaced native habitats consisting of grasslands, wetlands, and oak woodlands. Although some wildlife species are able to use agricultural fields, no listed species rely on this type of land use.

Orchard land use consists of cultivated fruit or nut-bearing trees. Typically, they are open, tree-dominated areas consisting of a single tree species. This type of land use is planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between orchard rows to reduce erosion. Walnuts and olives are the primary orchard crops. Wildlife use of orchards is typically limited. Ground squirrels and other small mammals can inhabit understory areas and birds such as scrub jays may be seasonally attracted to fruit orchards. No listed species rely on orchards or regularly use this type of land cover type.

B.4.2.2.15 Listed Species and Critical Habitat Accounts

The federally listed and proposed species and critical habitats that have the potential to occur in the two CVP service areas of the San Felipe Division are listed below. The occurrence within specific habitats was discussed previously. Those noted as T are listed as "threatened", those noted as E are listed as "endangered" and those listed as PT are “proposed for listing as threatened”. The species noted by a "1" are species that potentially occur only in Santa Clara Valley Water District’s service area. The species noted by a "2" are species not likely to occur in the San Felipe Division. Critical habitat has been designated for several of these species. The species noted by a "3" are species that potentially occur only in Zone 6 of San Benito County Water District’s service area.

Alameda whipsnake (*Masticophis lateralis euryxanthus*) T-1

Bald eagle (*Haliaeetus leucocephalus*) T

Bay checkerspot butterfly (*Euphydryas editha bayensis*) T-1

Blunt-nosed leopard lizard (*Gambelia* (=*Crotaphytus*) *sila*) E-1

California clapper rail (*Rallus longirostris obsoletus*)E-1

California least tern (*Sterna antillarum browni*)E-1

California red-legged frog (*Rana aurora draytonii*) T

California sea-blite (*Suaeda californica*) E-1

California tiger salamander (*Ambystoma californiense*) PT - Central California Distinct Population Segment

Chinook salmon (*Oncorhynchus tshawytscha*) - winter-run E-2

Chinook salmon (*Oncorhynchus tshawytscha*) – Central Valley spring-run T-2

Coho salmon (*Oncorhynchus kisutch*) T-1 – Central California Coast

Contra Costa goldfields (*Lasthenia conjugens*) E-1

Coyote ceanothus (*Ceanothus ferrisai*) E-1

Delta smelt (*Hypomesus transpacificus*) T-2

Giant garter snake (*Thamnophis gigas*) T-2

Least Bell’s vireo (*Vireo bellii pusillus*) E

Marbled murrelet (*Brachyramphus marmoratus*) T-1

Metcalf Canyon jewel-flower (*Streptanthus albidus* ssp. *albidus*) E-1

Riparian brush rabbit (*Sylvilagus bachmani riparius*) E-2

Riparian (San Joaquin Valley) woodrat (*Neotoma fuscipes riparia*) E-2

Robust spineflower (*Chorizanthe robusta var. robusta*) E-2

Salt marsh harvest mouse (*Reithrodontomys raviventris*) E-1

San Bruno elfin butterfly (*Incisalia mossii bayensis*) E-2

San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) E-1

San Joaquin kit fox (*Vulpes macrotis mutica*) E

San Mateo thornmint (*Acanthomintha duttonii*) E-2

Santa Clara Valley dudleya (*Dudleya setchellii*) E-1

Santa Cruz tarplant (*Holocarpha macradenia*) T-2

Showy Indian clover (*Trifolium amoenum*) E-2

Steelhead (*Oncorhynchus mykiss*) T-2 – Central Valley Evolutionarily Significant Unit

Steelhead (*Oncorhynchus mykiss*) T-1 – Central Valley, Central California Coast and South-Central California Evolutionarily Significant Units

Tiburon indian paintbrush (*Castilleja affinis* ssp. *neglecta*) E-1

Tidewater goby (*Eucyclogobius newberryi*) E-2

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) T-2

Vernal pool fairy shrimp (*Branchinecta lynchi*) T-1

Vernal pool tadpole shrimp (*Lepidurus packardi*) E-2

White-rayed pentachaeta (*Pentachaeta bellidiflora*) E-2

B.4.2.3.1 Soils and Geology

Soil conditions vary widely throughout San Felipe Division.

B.4.2.3.2 Affected Environment

The following description of the Affected Soil Resources is focused upon soils in areas served by the San Felipe Project. This information is primarily based upon environmental documentation completed for the San Benito County general plan, Santa Clara County general plan, and Pajaro Valley Water Management Agency.

B.4.2.3.3 Zone 6 of San Benito County Water District

Soils within Zone 6 of San Benito County Water District include some of the most productive soils in the county. These soils include the Sorrento-Yolo-Mocho Association and the Clear Lake-Pacheco-Willows Association. Other soils in the county include the Edenvale-Conejo Association and Panoche-Los Banos-Panhill Association, which are productive soils if irrigated. Orchards and row crops are located on Rincon-Antioch-Cropley

Association. These soils are characterized by erodible soils on slopes and irrigation water with high boron concentrations. Some of the Clear Lake-Pacheco-Willows Association and Rincon-Antioch-Cropley Association are shallow and cannot support deep rooted plants.

Erosion can occur on the steeper slopes of the Zone 6 of the San Benito County Water District; however, most of the land served by CVP water is very flat or gently rolling.

San Benito County is a highly active seismic area along the San Andreas Fault. The Hayward/Calaveras Fault also enters northern San Benito County near San Felipe Lake and extends to a point south of Hollister.

B.4.2.3.4 Santa Clara Valley Water District

Soils in Santa Clara Valley Water District vary widely. Overall Santa Clara County is formed by folded and faulted sedimentary and volcanic rock in the foothills and alluvial and bay deposits in the lower valleys. Soils include bay muds along the baylands; poorly drained alluvium under downtown San Jose and southeast of Gilroy; well drained alluvial plains and fans under most of the Santa Clara Valley; alluvial terraces and fans along the edges of the foothills; and bedrock of the Santa Cruz Mountains and Diablo Range, which are areas generally not served by CVP water.

Soils along the foothills are subject to erosion. The entire valley is subject to a high rate of seismic activity because the county is traversed by the San Andreas Fault, Sargent Berrocal Fault, and Hayward/Calaveras Fault.

B.4.2.3.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.4.2.4.1 Visual Resources

Visual resources vary widely throughout San Benito and Santa Clara counties.

B.4.2.4.2 Affected Environment

The following description of the Affected Visual Resources is focused upon areas served by the San Felipe Project. This information is primarily based upon environmental documentation completed for the San Benito County general plan, Santa Clara County general plan, and Pajaro Valley Water Management Agency.

B.4.2.4.3 Zone 6 of San Benito County Water District

The visual landscape of Zone 6 of San Benito County Water District include large open agricultural areas with scattered expanses of oak woodland. Wetlands, vernal pools, and riparian corridors added visual variety to the landscape. Recently, the urban areas of Hollister and San Juan Bautista have grown and replaced the agricultural areas. Reservoirs added visual variety, because large water bodies are widely perceived as features of high visual interest, but changed the visual character provided by free-flowing streams.

Scenic highways are roads designated as scenic by the State of California or local agencies and are recognized as having exceptional scenic qualities or affording panoramic vistas. Designated state scenic highways in San Benito County include portions of State Highway 129, U.S. Highway 101, Salinas Road, and State Highway 146.

B.4.2.4.4 Santa Clara Valley Water District

The visual landscape of Santa Clara County has changed considerably since before World War II. In the 1950s, the valley was largely open agricultural lands with riparian corridors. Wetlands, vernal pools, and riparian corridors added visual variety to the landscape. Urban areas were localized in San Jose and along the peninsula.

After the population influx following World War II, growth of communities changed the visual landscape substantially and relatively quickly. Much of the area was replaced by urban areas.

Reservoirs added visual variety, because large water bodies are widely perceived as features of high visual interest, but changed the visual character provided by free-flowing streams. Streams used to convey local surface waters and CVP water to recharge basins also added visual variety to the landscape by their form and water feature qualities.

The baylands landscape once consisted of a vast system of wetlands and river channels. The construction of levees dramatically changed the visual. The establishment of settlements in the baylands began in the mid-1800s. Continued urban growth has substantially altered the visual aspect of the baylands margins.

Scenic highways are roads designated as scenic by the State of California or local agencies and are recognized as having exceptional scenic qualities or affording panoramic vistas. Officially designated scenic highways in Santa Clara County include portions of State Highway 35, State Highway 9, State Highway 17, State Highway 152, State Highway 156, State Highway 280, and U.S. Highway 101.

B.4.2.4.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.4.3.0 SAN LUIS UNIT

B.4.3.1.1 Air Quality

This section briefly describes the air quality setting of the San Luis Unit.

B.4.3.1.2 Affected Environment

B.4.3.1.3 Climate and Weather

The primary factors affecting local air quality are the locations of air pollutant sources and the amounts of pollutants emitted. However, meteorological and topographical conditions are also important. Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants.

The San Luis Unit is located in the western San Joaquin Valley. Climatologically, the summer weather pattern for this area is dominated by a semipermanent, subtropical high pressure area that covers the eastern Pacific and the majority of California. Rainfall in the area averages 6 to 8 inches, with 90 percent of the amount falling between November and April.

B.4.3.1.4 Existing Air Quality

As noted above, topography and climate are intimately related to regional air pollution. The long and narrow San Joaquin Valley provides almost no escape for pollution. The valley setting, coupled with high temperatures and inversions that create additional natural barriers to pollution dispersion, causes the San Joaquin Valley to face a difficult battle in meeting State and Federal air quality standards. Additionally, rapid population growth, two major interstate highways, diverse urban and rural sources, geography, and climate also have a negative effect on the regional air quality. Despite these many challenges, emission levels have been decreasing over the past 15 years with the exception of particulate matter less than 10 microns in diameter (PM10) emissions. Based on information presented in California Air Resources Board's *2002 California Almanac of Emissions and Air Quality* (available at http:/www.arb.ca.gov/aqd/aqd.htm), it appears that the downward trend in emission levels is expected to continue. These decreases are predominately due to motor vehicle controls and reductions in evaporative and fugitive emissions.

B.4.3.1.5 Current Sources of Air Pollution

The air quality in the San Joaquin Valley is not dominated by emissions from one large urban area. Instead, a number of moderately sized urban areas are located throughout the valley. On-road vehicles are the largest contributor to carbon monoxide emissions, as well as a large contributor to nitrogen oxide. A large portion of the stationary source reactive organic carbon gas emissions is fugitive emissions from oil and gas production operations. PM10 emissions primarily result from paved and unpaved roads, agricultural operations, and waste burning.

B.4.3.1.6 Regulatory Standards

Both the State and Federal governments have established health-based Ambient Air Quality Standards for the following six air pollutants: ozone, particulate matter, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. The State of California has also established standards for hydrogen sulfide, sulfates, and visibility-reducing particles. These standards were established to assure an adequate margin of safety to protect the public health.

B.4.3.1.7 Attainment Status

The San Luis Unit contains three air quality districts. As such, the attainment status of the affected areas varies. Table B-5 provides the ozone and PM10 State and national attainment status of the various districts. With respect to all other ambient air quality standards (i.e., sulfur oxide, nitrogen oxide, carbon monoxide, etc.), the affected areas are considered to be unclassified or in attainment.

Table B-5 State and National Attainment Status Classifications

Air Basin	Air District	Alternative Affecting Air Quality	State Ozone Attainment Status (1-hour standard)	State PM_{10} Attainment Status	National Ozone Attainment Status (8-hour standard	National Ozone Attainment Status (1-hour standard)	National PM_{10} Attainment Status
San Joaquin Valley	San Joaquin Valley	All	Nonattainment	Nonattainment	Nonattainment	Nonattainment	Nonattainment
San Francisco Bay	San Francisco Bay Area	Delta	Nonattainment	Nonattainment	Nonattainment	Nonattainment	Unclassified
South Central Coast	San Luis Obispo	Ocean	Nonattainment	Nonattainment	Attainment	Unclassified / Attainment	Unclassified

Source: California Air Resources Board's *State and National Area Designation Maps of California* available at http://www.arb.ca.gov/desig/adm/adm.htm.

Current rulemaking in the San Joaquin Valley Air Pollution Control District (SJVAPCD) requires many owners and operators of agricultural operations in the San Joaquin Valley to develop and implement Conservation Management Practice (CMP) plans to reduce PM10 fugitive dust from on-farm sources such as unpaved roads and equipment yards, land preparation, and harvest activities, as well as other cultural practices (SJVAPCD 2004a). Examples of the CMP measures required under this program include activities that reduce or eliminate the need to move or disturb the soil (such as land fallowing), activities that protect the soil from wind erosion, equipment modifications, application of dust suppressants, speed reductions on unpaved roads, alternatives to burning brush and prunings, and activities that reduce chemical applications (SJVAPCD 2004b). Some operations and sites, including sites less than 11 acres in size, are exempt from these requirements.

B.4.3.2.1 Biological Resources

The San Luis Unit is located in the western San Joaquin Valley and includes portions of Merced, Fresno, and Kings Counties.

B.4.3.2.2 Affected Environment

Historically, the region surrounding the San Luis Unit contained a diverse and productive patchwork of aquatic, wetland, riparian forest, and surrounding terrestrial habitats that supported abundant populations of resident and migratory species of wildlife (Tetra Tech 2000). Huge herds of pronghorn, tule elk, and mule deer grazed the prairies, and large flocks of waterfowl occurred in the extensive wetlands. The major natural plant communities included grasslands, vernal pools, marshes, and riparian forests.

Today, land uses in the region, including agricultural, residential, and municipal and industrial uses, have converted land from native habitats to cultivated fields, grazing, residences, water impoundments, flood control structures, and other developments. The conversion of native terrestrial habitats to agricultural uses and urbanization has dramatically reduced populations of upland wildlife species. Draining once-extensive lakes, diversions, water storage projects, and interbasin transfers have drastically reduced instream flows in regional streams. Most of the species that occurred historically in the region remain in these same habitat areas, although at lower than historical numbers.

B.4.3.2.3 Fisheries

On the arid Westside of the San Joaquin River basin, relatively small intermittent streams drain the Coast Ranges but rarely reach the San Joaquin River. On the east side, numerous streams and three major rivers drain the western Sierra Nevada and provide flow to the San Joaquin River. The Stanislaus, Tuolumne, and Merced Rivers are located east of the San Luis Unit study area and provide habitat, spawning, and rearing for salmon. Impoundments on each of these rivers provide flood control, irrigation, and power generation.

The lower San Joaquin River is adjacent to the San Luis Unit along portions of the eastern boundary beginning at the Mendota Pool. Mud and Salt Sloughs are tributaries to the San Joaquin River that receive drainage (including tilewater and tailwater) from the northern districts, as well as other drainage from their watersheds.

The San Joaquin River in the vicinity of the San Luis Unit is characterized as a warm-water, Deep-Bodied Fishes Zone composed of a variety of habitats, ranging from slow-moving backwaters with emergent vegetation to the shallow tule beds and deep pools of slow-moving water in the main river (Moyle 1976). The environment is dominated by a warm-water habitat, but also supports anadromous, cold-water fish (chinook salmon) in the San Joaquin River. The natural habitat and water quality of the river and Mud and Salt Sloughs have been highly modified by the addition of canals, agricultural drainwater, and seasonal regulation of mainstem river flows.

As is characteristic of the modified or disturbed environments throughout the Sacramento-San Joaquin River system, the fish community in the area is dominated by introduced species and reduced populations of the remaining native warm-water species. Historically, the upper reaches of the San Joaquin River and its tributaries have provided habitat for chinook salmon and steelhead trout. Spring-run chinook historically used the upper reaches of the San Joaquin River, but was extirpated when Friant Dam was completed in 1949. Spring-run chinook was probably eliminated by 1930 from the Stanislaus, Tuolumne, and Merced Rivers as a result of the construction of water storage facilities. Both fall-run chinook salmon and steelhead trout continue to use these tributaries; their returns have been low for a number of years. The Merced River Fish Hatchery, operated by California Department of Fish and Game, produces fall-run chinook salmon. This facility is the only salmon production facility located within the San Joaquin River basin.

Little information exists about fishery resources in water bodies located within the San Luis Unit. The intermittent streams located within the area are not known to support anadromous fish and are unlikely to support populations of resident fish because of the hydrologic conditions. The numerous water conveyance facilities and water supply and drainage canals could support warm-water fish, such as bass, crappie, sunfish, catfish, and shad.

B.4.3.2.4 Vegetation and Wildlife

The following discussion describes the various communities and associated habitats, vegetation, and specific plant and animal species that potentially occur either in or near the San Luis Unit. While this section provides a discussion of potential habitat types in the area, not all habitat types are necessarily included within the service areas of the San Luis Unit CVP contractors.

The dominant community types associated with the San Luis Unit area include open water, wetland, grassland/unknown rangeland, shrub and brush/mixed rangeland, orchards and vineyards, cropland and pasture, confined feeding operations, deciduous forest, and evergreen forest. Natural habitats are restricted in their distribution and size and are largely fragmented. As a result, these habitats are extremely important to resident and migratory wildlife species.

Land uses in the region, which include agricultural, residential and M&I uses, have converted land from native habitats to cultivated fields, pastures, residences, water impoundments, flood control structures, and other developments. Agricultural land comprises the majority of the San Luis Unit and includes cropland, pastures, orchards, and vineyards. Almost half of the irrigated acreage in the San Joaquin River Region is planted with grains, hay, and pasture (USBR 1997e). Orchards are planted on about 30 percent of the irrigated acres; cotton and row crops are each planted on about 10 percent.

As a result of this large-scale conversion of native habitats, many species, including listed species, have been displaced or extirpated from the region. Most of the species that occurred historically are now restricted to habitat patches that are fragmented and isolated, making it difficult for viable populations to exist. Some species have adapted to portions of the new landscape and are able to maintain populations. However, as a result of the largely fragmented habitats, the potential for expansion or growth of these populations is greatly reduced. Because of the reduction in habitat available to these species, remnants of habitats such as wetlands and riparian forests are increasingly valuable.

B.4.3.2.5 Open Water

Open water in and near freshwater marshes and along rivers, oxbows, and quiet backwaters is dominated by floating and submerged aquatic plant species. These areas are generally unvegetated, except for occasional beds of aquatic plants. Common dominants include pondweeds, water milfoil, waterweeds, duckweeds, bladderworts, and water lily. The open water zones of lakes and large rivers provide resting and escape cover for many species of waterfowl. Gulls, terns, kingfishers, osprey, and bald eagle hunt over open water. Insectivorous birds and bats feed over open water. Common mammals in open water include muskrat, beaver, and river otter (Mayer and Laudenslayer 1988).

B.4.3.2.6 Wetlands

California supports a wide variety of wetland habitats, which are usually defined by the types of plants and animals they support. These vary, depending on the hydrologic regime, substrate, water source, and water quality of the site. Wetlands include deep and shallow freshwater marshes, wet meadows, seasonal wetlands, vernal pools, saturated freshwater flats, vegetated shallows, and riparian corridors.

Wetland
Source: Natural Resources Conservation Service

The largest wetlands in California occur in the Klamath Basin, the Sacramento and San Joaquin Valleys, the Delta, and the Imperial Valley-Salton Sea. Duck clubs in the San Joaquin Valley provide one of the largest areas of created wetlands in California, which provide habitat for migrating waterfowl. In the San Luis Unit, available wetland habitat includes both riparian corridors and the more classic wetland habitat with emergent vegetation associated with the San Joaquin River.

B.4.3.2.7 Freshwater Emergent Wetlands

In the 1940s, freshwater emergent wetlands occupied about 554,000 acres of the Central Valley (Frayer et al. 1989; Central Valley Habitat Joint Venture 1990). By 1990, only 86,704 acres remained (CDFG 1998), representing a reduction of 96 percent from the potential natural vegetation described in 1977. Regional reductions in freshwater emergent wetlands in the San Joaquin River basin were estimated at 96 percent.

Freshwater marsh wetlands are generally characterized by erect, rooted herbaceous hydrophytes. The upper margins of these wetlands support plant species such as big leaf sedge, rush, redroot, nutgrass, and saltgrass in moist soil. Wetter sites support species such as common cattail, tule bulrush, river bulrush, and arrowhead. This community is restricted to ponds, canals, sloughs, river backwaters, and similar sites. Wetlands are productive wildlife habitats providing food, cover, and water for numerous species.

Wetlands provide important habitat for waterfowl and a variety of other wildlife species, including Aleutian Canada geese, grebes, herons, egrets, bitterns, coots, shorebirds, rails, hawks, owls, muskrat, raccoon, opossum, and beaver. Many upland species such as ring-necked pheasant, California quail, black-tailed hare, and desert cottontail take cover and forage at the margins of wetland habitats. Reptiles and amphibians such as the common garter snake, aquatic garter snake, giant garter snake, Pacific treefrog, and bullfrog also breed and feed in freshwater marsh habitats of the region.

The hydrology of many of the remaining wetlands has been altered from seasonal to permanent inundation. This change has altered plant communities and facilitated the invasion of introduced aquatic predators such as bullfrogs, bass, and sunfish. These species compete with or prey upon several listed species, including California red-legged frogs and giant garter snakes.

Listed species associated with freshwater wetlands include Aleutian Canada goose, bald eagle, California red-legged frog, California tiger salamander, and giant garter snake. The bald eagle occurs widely throughout the study area. After severe declines resulting largely from pesticides, its numbers have been increasing following the enforcement of new pesticide regulations. Ecosystem degradation in the Central Valley may limit the extent of its recovery in the region.

B.4.3.2.8 Vernal Pools

Vernal pools are a special form of wetland found within grassland habitats throughout California. Vernal pools are shallow depressions filled with water from winter storms that subsequently dry up during spring or early summer. Vernal pools develop in shallow basins that form in flat to hummocky terrain. Soil durapans underlying the basins prevent water infiltration and the nearly level terrain inhibits surface water runoff. Vernal pools are important communities because of their current scarcity. Holland (1978) estimated that 5 to 30 percent of California's vernal pools are intact today; the Central Valley has about 5 percent of its vernal pools remaining.

Vernal pools support an ephemeral flora dominated by annual species, with perennial and aquatic species often contributing substantial cover. Vernal pool species flower throughout the spring, resulting in conspicuous zonation patterns formed by consecutively blooming species around drying pool margins. Characteristic dominant plants include popcorn-flower, low barley, downingia, coyote-thistle, goldfields, meadowfoam, owl's clover, pogogyne, woolly marbles, and navarretia.

Vernal Pool
Source: Natural Resources Conservation Service

Although vernal pools are an ephemeral aquatic habitat, they are utilized by plants, invertebrates, and amphibians adapted to seasonal wetting and drying. When standing water is available, the California tiger salamander, western spadefoot toad, and Pacific treefrog may use the pools for egglaying and for the development of young. Aquatic invertebrates such as cladocerans, copepods, branchipods, and crawling water beetles may also inhabit vernal pools. In winter and spring, waterbirds such as mallard, cinnamon teal, killdeer, California gull, green-backed heron, great blue heron, and great egret may use vernal pools for resting and foraging grounds. Western kingbird, black phoebe, and Say's phoebe feed on flying insects above vernal pools. Several federally listed branchipods, including longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp are found in vernal pools.

B.4.3.2.9 Riparian Habitat

Riparian forest habitats occur along creeks, canals, and rivers and are found throughout the San Luis Unit. This vegetation type has adapted to cope with wide yearly and seasonal fluctuation in flow volumes, abundant floodplain moisture, and a dynamic erosion-deposition cycle. Riparian forest habitats typically support a great diversity of wildlife species because they present a unique combination of surface and groundwater, fertile soils, high nutrient availability, and vegetation layering, all of which form microclimates (Warner 1979).

The vegetation of this habitat type typically consists of woodlands or forests of broad-leaved winter-deciduous hardwood trees as the overstory, with a variety of shrubs and vines composing the midstory, and a few grass and forb species in combination with vines composing the understory. Dominant species include cottonwood, California sycamore, and valley oak. Typical shrubs include California wild grape, wild rose, California blackberry, and blue elderberry. Willows, hoary nettle, poison hemlock, rushes, and grasses are commonly found in the herbaceous layer (USBR 1991). The endangered valley elderberry longhorn beetle lives in elderberry shrubs that grow in riparian areas. The riparian brush rabbit and riparian woodrat historically occupied the dense riparian forests along the lower San Joaquin River and its tributaries. Several fish species migrate from ocean or estuary habitats to spawn in sloughs, tributary streams, or inundated floodplains throughout the Central Valley.

B.4.3.2.10 Grassland and Unknown Rangeland

Grassland and unknown rangeland occurs throughout the Central Valley, mostly on level plains to gently rolling foothills. Most of the grasslands in California are dominated by naturalized annual grasses with perennial grasses existing in relict prairie communities or on sites with soil or water conditions unfavorable for annual grasses, such as on serpentine. Grassland vegetation occurs from sea level to about 3,900 feet in elevation. Grassland communities as a whole have relatively high species diversity when compared to other California plant communities.

Annual grasslands are composed primarily of annual grass and forb species. Perennial grasses, such as purple needlegrass and alkali sacaton, are typically found in moist, lightly grazed relict areas within the annual grassland habitat. Annual grasses found in grassland habitats include wild oats, soft chess, ripgut brome, medusa head, wild barley, red brome, and slender fescue. Perennial grasses found in grassland vegetation include purple needlegrass and alkali sacaton. Forbs commonly encountered include long-beaked filaree, redstem filaree, clover, Mariposa lily, popcornflower, and California poppy.

Grassland habitats are important foraging areas for white-tailed kite, red-tailed hawk, Swainson’s hawk, northern harrier, American kestrel, yellow-billed magpie, loggerhead shrike, savannah sparrow, American pipit, mourning dove, Brewer’s blackbird, red-winged blackbird, and a variety of swallows. Birds such as killdeer, ring-necked pheasant, western kingbird, western meadowlark, and horned lark nest in grassland habitats.

Blunt-nosed leopard lizards, San Joaquin kit foxes, and kangaroo rats occur in arid grasslands in the San Joaquin and Tulare River basins. California jewelflower, Hoover’s eriastrum, and San Joaquin woolly-threads occur in isolated populations within grasslands in these same basins.

The grassland community provides important foraging habitat for coyote and badger because this habitat supports large populations of small prey species, such as the deer mouse, California vole, pocket gopher, and California ground squirrel. Common reptiles and amphibians of grassland habitats include the western fence lizard, common kingsnake, western rattlesnake, gopher snake, common garter snake, western toad, and western spadefoot toad.

B.4.3.2.11 Shrub and Brush and Mixed Rangeland

Most of the rangelands in the United States are west of an irregular north-south line that runs from the Dakotas through Oklahoma and Texas. Rangelands are classified into three basic types. The shrub and brush rangeland is dominated by woody vegetation and is typically found in arid and semiarid regions. Mixed rangelands are ecosystems where more than one-third of the land supports a mixture of herbaceous species and shrub or brush rangeland species. Herbaceous rangelands are dominated by naturally occurring grasses and forbs as well as some areas that have been modified to include grasses and forbs as their principal cover. Rangelands are, by definition, areas where a variety of commercial livestock are actively maintained. Within the rangeland community, a number of herbivorous animals such as grasshoppers, jackrabbits, and kangaroo rats compete with livestock for forage.

B.4.3.2.12 Agricultural Habitat

Although natural communities provide the highest value for wildlife, many of these historical natural habitats have been largely replaced by agricultural habitats with varying degrees of benefits to wildlife. Two agricultural types occur in the San Luis Unit: (1) cropland and pasture and (2) orchards and vineyards. The intensive management of agricultural lands, including soil preparation activities, crop rotation, grazing, and the use of chemicals, effectively reduces the value of these habitats for wildlife. However, many wildlife species have adapted to some degree to particular crop types and now use them for foraging and nesting. Orchards, vineyards, and cotton crops generally provide relatively low-quality wildlife habitat because the frequent disturbance results in limited foraging opportunities and a general lack of cover. Pasture and row crops provide a moderate-quality habitat with some limited cover and foraging opportunities.

B.4.3.2.13 Cropland and Pasture

Pasture habitat can consist of both irrigated and unirrigated lands dominated by perennial grasses and various legumes. The composition and height of the vegetation, which varies with management practices, also affects the wildlife species composition and relative abundance. In southern California, Bermuda grass is the dominant plant species seeded in pastures, while in northern California, ryegrasses, fescues, clovers, and trefoils are preferred.

Irrigated pastures may offer some species habitats that are similar to those of both seasonal wetlands and unirrigated pastures. The frequent harvesting required, which reduces the overall habitat quality for ground-nesting wildlife, effectively reduces the value of the habitat. Irrigated pastures provide both foraging and roosting opportunities for many shorebirds and wading birds, including black-bellied plover, killdeer, long-billed curlew, and white-faced ibis. Unirrigated pastures, if lightly grazed, can provide forage for seed-eating birds and small mammals. Ground-nesting birds, such as ring-necked pheasant, waterfowl, and western meadowlark, can nest in pastures if adequate vegetation is present. Small mammals occupying pasture habitat include California voles, Botta's pocket gophers, and California ground squirrels. Raptors including red-tailed hawks, white-tailed kites, and prairie falcons prey upon the available rodents. In areas where alfalfa or wild oats have been recently harvested, the large rodent populations can provide high-quality foraging habitat for raptors.

The habitat value in cropland is essentially regulated by the crop production cycle. Most crops in California are annual species and are managed with a crop rotation system. During the year, several different crops may be produced on a given parcel of land. Many species of rodents and birds have adapted to croplands, which often requires that the species be controlled to prevent extensive crop losses. This may require intensive management and often the use of various pesticides. Rodent species that are known to forage in row crops include the California vole, deer mouse, and the California ground squirrel. These rodent populations are preyed upon by Swainson's hawks, red-tailed hawks, and black-shouldered kites.

B.4.3.2.14 Row Crops

Row crops include tomatoes, sugar beets, and melons, among many others. Intensive management and pesticide use limit the use of row crops by wildlife. Rodent species that forage in row crops include the California vole, deer mouse, and California ground squirrel. These rodent populations are preyed upon by Swainson's hawks, red-tailed hawks, and white-tailed kites.

B.4.3.2.15 Grain Crops

Grain crops include barley, wheat, corn, and oats. Many grain crops are planted in fall and harvested in spring. They are intensively managed, and chemicals are often used to control pests and diseases. This management strategy reduces the value of these crops to wildlife. However, the young green shoots of these crops provide important foraging opportunities for such species as greater white-fronted geese, tundra swans, wild pigs, and tule elk. Other species, including red-winged blackbirds, Brewer's blackbirds, ring-necked pheasants, waterfowl, and western harvest mice, feed on the seeds produced by these crops.

B.4.3.2.16 Rice

Cultivated rice in the Central Valley has some of the attributes found in seasonal wetlands. However, the intensive management of this habitat reduces many of the benefits found in natural wetlands. Flooded rice fields provide nesting and foraging habitat for waterfowl and shorebirds. Rice provides important forage for many wildlife species. After harvest, waterfowl (e.g., mallards and Canada geese), sandhill cranes, California voles, and deer mice feed upon the waste grain. Raptors, including northern harrier, white-tailed kite, and ferruginous hawk, feed upon rodents in this habitat. Irrigation ditches used to flood rice fields often contain dense cattail vegetation and provide habitat for wildlife species, such as the Virginia rail, American bittern, snowy egret, marsh wren, common yellowthroat, and song sparrow.

Rice Harvesting
Source: Natural Resources Conservation Service

B.4.3.2.17 Cotton

Cotton is of limited value to wildlife because of the intensive management of this crop and the use of chemicals to control pests and disease. Mourning doves and house mice are found in this crop type. During irrigation, when vegetation is short and sparse, additional wildlife, including killdeer, American pipit, and horned lark, may be attracted.

B.4.3.2.18 Orchards and Vineyards

Orchard-vineyard habitat consists of cultivated fruit or nut-bearing trees or grapevines. Orchards are typically open, single-species, tree-dominated habitats. This habitat is planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between rows to reduce erosion. In vineyards, the rows under the vines are often sprayed with herbicides to prevent the growth of herbaceous plants.

Wildlife species associated with vineyards include the deer mouse, mourning dove, and black-tailed hare. Nut crops provide food for American crows, scrub jay, northern flicker, Lewis' woodpecker, and California ground squirrel. Fruit crops provide additional food supplies for yellow-billed magpies, American robin, northern mockingbird, black-headed grosbeak, California quail, gray squirrel, raccoon, and mule deer. Loss of fruit to grazers often results in species management programs designed to force these species away from the orchards and reduce fruit loss.

B.4.3.2.19 Deciduous Forest

Deciduous forests are composed of trees that lose their leaves in the winter. These include species such as the various California oaks and California buckeye; the interior live oak, which is not deciduous, is also found in deciduous forests. Valley oak woodlands are found in the Sacramento and San Joaquin Valleys and usually occur below elevations of 2,000 feet. The deciduous forest plant species often provide a substantial amount of food to associated animals. The forest itself also provides a large amount of three-dimensional habitat. Wildlife associated with deciduous forests includes a wide variety of birds, small rodents, deer, raccoons, various insects, foxes, bobcats, black bears, or even wolves.

B.4.3.2.20 Areas Affected by Use of CVP Water

Three of the four Water Authority San Luis Division member agencies (excluding Pleasant Valley) and several Significant Natural Areas use CVP water. The following sections describe several of the larger Significant Natural Areas affected by CVP water.

B.4.3.2.21 Significant Natural Areas

The 77 Significant Natural Areas in the San Joaquin Valley are scattered throughout the region, but are concentrated in the grasslands of the San Joaquin Valley in freshwater marsh, valley sink scrub, and grassland vernal pool habitats. These areas are important to waterfowl and shorebirds that winter and nest in the San Joaquin Valley and to several listed species, including the giant garter snake, Swainson's hawk, tricolored blackbird, San Joaquin woolly-threads, and California jewelflower. In the southwestern portion of the valley, several Significant Natural Areas support listed species (e.g., the giant kangaroo rat, blunt-nosed leopard lizard, Swainson's hawk, and San Joaquin antelope squirrel) and habitats (e.g., valley needlegrass grassland and northern vernal pool habitats).

Historically, the San Joaquin River basin was a large floodplain of the San Joaquin River that supported vast expanses of permanent and seasonal marshes, lakes, and riparian areas. Almost 70 percent of the basin has been converted to irrigated agriculture, with wetland acreage reduced to 120,300 acres. In combination with the adjacent uplands, the wetland complex is referred to as "the Grasslands" and consists of 160,000 acres of private and public lands. Approximately 53,300 acres of the Grasslands are permanently protected in state or federal wildlife refuges or in federal conservation easements.

Several Significant Natural Areas are present in the area or are located nearby. They include the Los Banos, Little Panoche, North Grasslands, and Volta Wildlife Management Areas and the Merced, San Joaquin River, and San Luis National Wildlife Refuges.

B.4.3.2.22 Los Banos Wildlife Management Area

The Los Banos Wildlife Management Area, the first waterfowl refuge established in California (USBR 1997b), encompasses approximately 5,586 acres of the San Joaquin River. It maintains approximately 3,200 acres of seasonal and permanent wetlands and 213 acres of alkali sink habitat. The refuge provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, wading birds, and cranes. Pintail ducks and lesser snow geese are the most common waterfowl on the refuge. Swainson's hawks are known to nest near the refuge and to use it for foraging. Other listed species known to occur on the refuge include the giant garter snake and delta button celery.

B.4.3.2.23 North Grasslands Wildlife Management Area

The North Grasslands Wildlife Management Area, purchased by the State of California in April 1990 and managed by the CDFG (USBR 1997d), includes three separate units. The China Island and Salt Slough units contain 5,556 acres of primarily agricultural land and pasture, but also have extensive river and slough channels with riparian edges. These two units receive water directly from the CVP (Wilbur 2000); however, the Salt Slough unit does not have a firm historical water supply. The North Grasslands Wildlife Management Area provides habitat for a variety of wildlife species. Ducks are the most common waterbirds using the refuge, but sandhill cranes, shorebirds, and geese, including the Aleutian Canada goose, are also common. Agricultural crops irrigated with water from the SLC feed wintering migratory birds.

B.4.3.2.24 Volta Wildlife Management Area

The 3,000-acre Volta Wildlife Management Area maintains more than 1,800 acres of wetlands, including 1,400 acres of moist soil plants, and 720 acres of alkali sink habitat are preserved on the refuge as a rare ecological community (USBR 1997d). The Volta Wildlife Management Area provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, and wading birds. Black-necked stilts, sandpipers, dunlins, and dowitchers dominate shorebird species.

B.4.3.2.25 Merced National Wildlife Refuge

The Merced National Wildlife Refuge was established in 1951 to alleviate crop depredation and provide waterfowl habitat (USBR 1997d). The 2,562-acre refuge is one of the most important wintering areas in California, supporting snow and Ross' geese, sandhill cranes, and variety of shorebirds. The refuge maintains approximately 1,232 acres of wetlands, of which approximately 730 acres are in moist soil plant management. A total of 550 acres is in cereal grain production, primarily alfalfa and corn.

B.4.3.2.26 San Joaquin River National Wildlife Refuge

The San Joaquin River National Wildlife Refuge is located approximately 10 miles west of Modesto on Highway 132 and the San Joaquin River. No public access currently exists. The refuge consists of approximately 800 acres of San Joaquin River riparian habitat. Primary wildlife at the refuge includes the endangered Aleutian Canada goose, as well as ducks, sandhill cranes, migratory nongame songbirds, and colonial nesting birds.

B.4.3.2.27 San Luis National Wildlife Refuge

The 7,340-acre San Luis National Wildlife Refuge is a complex of wetland, upland, and riparian habitat, with approximately 2,700 acres of wetlands managed for moist soil plant production (USBR 1997d). Of the 3,940 acres of grasslands, 145 acres of native grassland are preserved as a rare ecological community. The San Luis National Wildlife Refuge buys water from the CVP to irrigate seasonal wetlands and cereal crops (Chouinard 2000). The refuge provides habitat for waterfowl, including ducks, geese, and shorebirds, as well as tule elk and other endangered species.

B.4.3.2.28 Areas Not Affected by Use of CVP Water

One of the four Water Authority San Luis Division member agencies (Pleasant Valley) and four natural areas in the vicinity of the San Luis Unit that are managed as uplands do not receive CVP water. These areas include the Little Panoche, Lower Cottonwood Creek, O'Neill Forebay, and Upper Cottonwood Creek Wildlife Management Areas. The Upper and Lower Cottonwood Creek Wildlife Management Areas are located adjacent to San Luis Reservoir. O'Neill Forebay Wildlife Management Area is located adjacent to its namesake. The Little Panoche Wildlife Management Area is located on Little Panoche Creek in the hills.

B.4.3.3.1 Soils and Geology

This section describes the existing soils and geology conditions found within the San Luis Unit.

B.4.3.3.2 Soils

The soils of the San Joaquin Valley are divided into four physiographic groups: valley land soils, valley basin land soils, terrace soils, and upland soils. Valley land and valley basin land soils occupy most of the San Joaquin Valley floor. In the vicinity of the San Luis Unit, valley land soils consist of deep alluvial and aeolian soils that make up some of the best agricultural land in California. Valley basin land soils consist of organic soils of the Delta, poorly drained soils, and saline and alkali soils in the valley trough and on the basin rims (University of California 1980). Areas above the San Joaquin Valley floor consist of terrace and upland soils, which are not as productive as the valley land and valley basin land soils.

B.4.3.3.3 Valley Land Soils

Valley land soils are well-drained, agricultural soils, which are generally found on flat to gently sloping surfaces such as on alluvial fans. These soils are composed of alluvial- and aeolian-deposited soils.

Alluvial-deposited valley land soils include the calcic brown, noncalcic brown, and gray desert soils. Calcic brown and noncalcic brown alluvial soils are found on deep alluvial fans and floodplains of intermediate rainfall (10 to 20 inches annually). These two soils tend to be brown to light brown with a loam texture that forms soft clods. Calcic brown soil is calcareous; noncalcic soil is usually neutral or slightly acid. These soils are highly valued for irrigated crops.

Gray desert alluvial soil, a light-colored calcareous soil low in organic matter, is found on alluvial fan and floodplains of low rainfall (4 to 7 inches annually). These soils are too dry to produce crops without irrigation.

B.4.3.3.4 Valley Basin Land Soils

Valley basin land soils occupy the lowest parts of the San Joaquin Valley. The two general groups found in the San Luis Unit area are imperfectly drained soils and saline and alkaline soils.

Imperfectly drained soils, found in the troughs of the San Joaquin Valley, generally contain dark clays and have a high water table or are subject to overflow. These soils tend to be gray to dark gray with a high clay content that forms clods and may be neutral to slightly calcareous.

Saline and alkali soils are characterized by excess salts, excess sodium, or both. Saline soils often form a white crust on the surface while soils with excess sodium appear black. Many of these soils are irrigated with CVP or SWP surface waters or with slight to moderately saline groundwater. In addition, salts are added through application of fertilizers or other additives needed for cropping. Saline soils form a crust on top of other soils, change the chemical characteristics of the soils in the root zone, and reduce the capability of the soil to transfer applied moisture to the roots. To minimize salinity problems, irrigators apply water to the soil before seeding or planting to leach salts from the root zone. Poor drainage, low permeability, and high sodium content complicate leaching. Leaching increases salinity in the groundwater aquifers, which further exacerbates the salinity problem as the more saline groundwater is used for irrigation. Because of the increase in groundwater salinity, the areas with soil salinity problems have increased. Increased leaching also increases the salinity in flows from subsurface drains, which affects the quality of surface waters that receive the return flows or the water and sediments in evaporation ponds.

B.4.3.3.5 Wind Erosion

Soil erodibility, local wind erosion, climate, soil surface roughness, width of field, and quantity of vegetative cover affect wind erosion of soils. The climatic factor incorporates the moisture of the surface soil. The more moisture in the soil, the less susceptible the soil is to wind erosion. Aeolian-deposited soils are more susceptible to wind erosion than alluvial soils. Soils taken out of irrigation and allowed to remain barren with no cover vegetation are also more susceptible to wind erosion than those same soils under crop production with irrigation.

There are several concerns about wind-eroded soils. Wind erosion makes the soil shallower and can remove organic matter and needed plant nutrients. In addition, blowing soil particles can damage plants, particularly young plants. Blowing soils can also cause off-site problems such as reduced visibility and increased allergic reaction to dust. Some of the soils on the west side of the San Joaquin Valley have naturally occurring asbestos. If these soil particles become airborne, the local population and any nearby water bodies could be affected. Soils prone to wind erosion require a vegetation cover to reduce or eliminate the impacts of blowing soils.

Wind erosion from cultivated and uncultivated soils may result in fine particles remaining airborne for a considerable time. Particulate matter of 10 microns or less in diameter (PM_{10}) can be inhaled and lodge in the lungs with resultant health effects. Wind erosion of agricultural lands creates significant airborne dust.

B.4.3.3.6 Water Erosion

In order of increasing erodibility, the several types of water-based soil erosion are sheet, splash, and rill and gully erosion. Soils factors that influence the erodibility of soils include land slope, surface texture and structure, infiltration rate, permeability, particle size, and the presence of organic or other cementing materials. Level land erodes less than sloped land because flow velocities are lower. Based on this factor alone, soils on the valley floor are less susceptible to water erosion than terrace and upland soils.

Six factors predict the severity of erosion from farm fields: long-term average rainfall-runoff erosivity, soil erodibility index, slope length, slope gradient, soil cover, and erosion control practices. The detailed nature of these factors prevents extrapolation to a regional level.

B.4.3.3.7 Soil Salinity

Soil salinity problems occur primarily in the western and southern portions of the San Joaquin Valley. Most soils in this region contain salts and potentially toxic trace elements such as arsenic, boron, molybdenum, and selenium. Soil salinity problems are intensified by poor soil drainage, insufficient water supply for adequate leaching, poor quality (high salinity) irrigation water, high water table, and an arid environment.

Soil salinity was first recognized as a problem in the San Joaquin Valley in the 1880s. Drainage and soil salinity problems have persisted in the San Joaquin Valley. Soil salinity occurs when salts concentrated in the high groundwater table are left behind as water evaporates from the soil surface. Backlund and Hoppes (1984) estimated that about 2.4 million of the 7.5 million acres of irrigated cropland in the Central Valley were salt-affected. These saline soils generally exist in the valley trough and along the western side of the San Joaquin Valley. The San Joaquin Valley Drainage Program Management Plan projected that by the year 2000, up to 918,000 acres of San Joaquin Valley farmland would be affected by a water table existing less than five feet from the ground surface (San Joaquin Valley Drainage Program 1990). In addition, the San Luis Unit Drainage Program Draft EIS projected losses of between 5,000 to 10,000 acres to increased salinity by the year 2007 if current irrigation, farming, and drainage practices were to continue (USBR 1991).

B.4.3.3.8 Soil Selenium

Soil selenium is primarily a concern on the Westside of the San Joaquin Valley. When the soils in this area are irrigated, selenium and other salts and trace elements dissolve and leach into the groundwater (Gilliom et al. 1989). Over the past 30 to 40 years of irrigation, most soluble selenium has been leached from the soils into the shallow groundwater (San Joaquin Valley Drainage Program 1990). Selenium is drained from those soils when growers try to protect crop roots from salts and the high water table.

In areas with high selenium concentrations, selenium leached from the soils enters irrigation return flows and subsurface drainage flows. Irrigation of these soils further mobilizes selenium, facilitating its movement into shallow groundwater that is retained in poorly drained soils or mechanically drained soils. In the absence of adequate drainage facilities, leaching cannot fully remove the salts from these soils because water cannot percolate beyond one or more confining clay layers under the shallow groundwater aquifer. To maintain agricultural production, drainage from these soils must be removed from the area.

B.4.3.3.9 Geology

The San Joaquin Valley is part of a large, northwest-to-southeast-trending asymmetric trough of the Central Valley, which has been filled with up to six vertical miles of sediment. This sediment includes both marine and continental deposits ranging in age from Jurassic to Holocene. The San Joaquin Valley lies between the Coast Range Mountains on the west and the Sierra Nevadas on the east and extends northwestward from the San Emigdo and Tehachapi Mountains to the Sacramento-San Joaquin Delta near the city of Stockton. The San Joaquin Valley is 250 miles long and 50 to 60 miles wide. The relatively flat alluvial floor is interrupted occasionally by low hills.

The San Luis Unit, which lies within the San Joaquin Valley, is bounded on the west by the Coast Range Mountains and on the east by the San Joaquin Valley trough. The foothills adjacent to the study area on the west are composed of folded and faulted beds of mainly marine shale in the north and sandstone and shale in the south (Prokopovich 1989). The valley deposits consist of marine and continental deposits that are as much as 6 miles thick (Page 1986).

The San Joaquin Valley floor is divided into several geomorphic land types including dissected uplands, low alluvial fans and plains, river floodplains and channels, and overflow lands and lake bottoms. The alluvial plains cover most of the valley floor and comprise some of the most intensely developed agricultural lands in the San Joaquin Valley. In general, alluvial sediments of the western and southern parts of the San Joaquin Valley tend to have lower permeability than east side deposits.

Near the valley trough, fluvial deposits of the east and west sides grade into fine-grained deposits. The San Joaquin Valley has several thick lakebed deposits. The largest of these are found beneath the Tulare Lake bed where up to 3,600 feet of lacustrine and marsh deposits form the Tulare Formation. This formation is composed of widespread clay layers, the most extensive being the Corcoran clay member, which is found in the western and southern portion of the San Joaquin Valley. This deposit notably affects the groundwater and its confinement. This clay bed separates the upper semi-confined to unconfined aquifer from the lower confined aquifer (Page 1986). The clay bed covers approximately 5,000 square miles and is up to 160 feet thick beneath the present bed of Tulare Lake. The lower confined zone consists of poorly consolidated floodplain, deltaic, alluvial, and lacustrine deposits.

B.4.3.3.10 Land Subsidence

Land subsidence in the western San Joaquin Valley results from reduced groundwater elevations and the related compaction of the soil interstitial spaces that had previously been filled with groundwater. Land subsidence has caused substantial reductions in ground elevations.

B.4.3.4.1 Visual Resources

This section briefly describes the visual resources found within the San Luis Unit.

B.4.3.4.1 Affected Environment

The San Joaquin River Region is lowland with predominantly flat and gently sloping terrain bordered by hills and low mountains. The valley is semi-arid to arid, and few natural lakes or perennial streams are present. The San Joaquin River is the principal water feature. A number of wetlands used as wildlife refuges are located in the region. The valley area is developed predominantly for agriculture. It is sparsely to moderately populated, having one large urban area (metropolitan Fresno) and scattered small communities. The northern area of the region near the city of Tracy is developing rapidly.

CVP facilities in the vicinity of the San Luis Unit include the San Luis, Los Banos, and Little Panoche Reservoirs, the O'Neill Forebay, and the Delta-Mendota, San Luis, and Coalinga Canals. The CVP also supplies water to several wildlife refuges. Most of the landscape surrounding the San Luis Unit is considered to be of common scenic or minimal scenic quality. O'Neill Forebay and the San Luis, Los Banos, and Little Panoche Reservoirs are considered to be of common scenic quality. The service area of the CVP, including the area of the DMC and the SLC, is considered to have minimal scenic quality with some areas of common scenic quality (USFS 1976).

Panoramic views are found within some areas of Interstate 5, some segments of which are designated scenic highways. Views from Interstate 5 of the DMC and California Aqueduct are the basis for this designation. Similarly, views of the San Luis Reservoir are an important part of the designation of SR 152 as a scenic highway.

Wildlife refuges in the region near the San Luis Unit are considered to have landscape variety that ranges from common scenic to distinctive scenic quality (USFS 1976). These areas provide visual contrast to the surrounding agricultural lands primarily because of their vegetation and water. The scenic quality is enhanced seasonally by the large numbers and variety of waterfowl and seasonal wildflower displays, which attract substantial numbers of visitors, thereby increasing the viewer sensitivity of the area.

B.5.0 SOCIAL AND CULTURAL CHARACTERISTICS

B.5.1.0 DELTA DIVISION

B.5.1.1.1 Cultural Resources

This section discusses the cultural resources found in the Delta Division.

B.5.1.1.2 Affected Environment

Consideration of cultural resources consists within the service areas of the 20 Delta Division Member Agencies. The district service areas incorporate extensive areas along the western portion of the San Joaquin Valley and the interface between the valley and the lower reaches (eastern margin) of the Diablo Range. The remainder of this section details cultural resources that are considered eligible or potentially eligible for inclusion on the National Register of Historic Places (NRHP) and that are located or may be present within the area.

B.5.1.1.3 Information Sources and Background Data for Affected Environment

This section provides a brief overview of environmental, prehistoric, ethnographic, and historic contexts for the area encompassed by the Delta Division. Much of this background information has been derived from anthropological, archaeological, and historical studies conducted over the past several decades on both public and private lands within the service areas of the 20 Member Agencies. Also discussed are the types of cultural resources known or suspected of being present within these service areas.

In order to secure information concerning the types and general distribution of known archaeological and historical sites and to estimate whether additional sites may remain undiscovered within individual district lands, the following sources were consulted:

A search of archaeological survey, site, and other records and documents maintained by the California Historical Resources Information System, Central California Information Center (CSU-Stanislaus), and the Southern San Joaquin Valley Information Center (CSU-Bakersfield).

A review of selected published and unpublished archaeological, ethnographic, and historical reports and documents available for the overall project area.

- A review of the NRHP.
- The California Register of Historical Resources.
- The California Inventory of Historic Resources (1976).
- The California Historical Landmarks (1996).
- The California Points of Historical Interest listing (May 1992 and updates).
- The Historic Property Data File (Office of Historic Preservation current list).
- The CALTRANS Local Bridge Survey (1989).
- The Survey of Surveys (1989).

The background research and records searches were undertaken in September 2000, with specific results summarized below under Natural Environmental Context, Cultural Environmental Context, and Current Inventory of Cultural Resources.

B.5.1.1.4 Natural Environmental Context

The service areas of the Delta Division contractors include primarily valley and lower foothill lands located within the central and southern San Joaquin Valley, along the western margin of the valley at the interface of the valley and the lower reaches of the Diablo Range.

This area contains a variety, but a limited number of water sources and resource zones. Prehistoric use and occupation focused on these features, particularly around the confluences of streams and within the ecotones created at the interface of foothill and valley lands. Drainages and associated natural levees and benches were moderately to intensively utilized, while uplands were visited for oak and other resources on a more seasonal basis.

Much of this area has been affected by ranching for over 100 years and by agriculture during the past 50 to 100 years. The most recent impacts derive primarily from the construction of water distribution facilities, major transportation routes (Interstate 5 in particular), and agricultural equipment and storage buildings.

B.5.1.1.5 Prehistoric Context

The CVP service area, inclusive of the Delta Division, has a long and complex cultural history with distinct regional patterns that extend back more than 11,000 years. The first generally agreed-upon evidence for the presence of prehistoric peoples in the CVP is represented by the distinctive fluted spear points, termed Clovis points, found on the margins of extinct lakes in the San Joaquin Valley. The Clovis points are found on the same surface with the bones of extinct animals such as mammoths, sloths, and camels. Based on evidence from elsewhere, the ancient hunters who used these spear points existed during a narrow time range of 10,900 BP to 11,200 BP.

The next cultural period represented, the Western Pluvial Lakes Tradition, thought by most to be after the Clovis period, is another widespread complex that is characterized by stemmed spear points. This poorly defined early cultural tradition is regionally known from a small number of sites in the Central Coast Range, San Joaquin Valley lake margins, and Sierra Nevada foothills. The cultural tradition is dated to between 8,000 and 10,000 years ago and its practitioners may be the precursors to the subsequent cultural pattern.

About 8,000 years ago, many California cultures shifted the main focus of their subsistence strategies from hunting to seed gathering, as evidenced by the increase in food-grinding implements found in archeological sites dating to this period. This cultural pattern is best known for southern California, where it has been termed the Milling Stone Horizon (Wallace 1954, 1978), but recent studies suggest that the horizon may be more widespread than originally described and is found throughout the area. Radiocarbon dates associated with this period vary between 8,000 and 2,000 BP, although most cluster in the 6,000 to 4,000 BP range (Basgall and True 1985).

Cultural patterns as reflected in the archeological record, particularly specialized subsistence practices, became codified within the last 3,000 years. The archeological record becomes more complex, as specialized adaptations to locally available resources were developed and populations expanded. Many sites dating to this time period contain mortars and pestles and are associated with bedrock mortars, implying the intense exploitation of the acorn. The range of subsistence resources utilized and exchange systems expanded significantly from the previous period. Along the coast and in the Central Valley, archeological evidence of social stratification and craft specialization is indicated by well-made artifacts such as charmstones and beads, often found as mortuary items. Ethnographic lifeways serve as good analogs for this period.

B.5.1.1.6 Ethnographic Context

As noted above, the service areas of the Delta Division contractors are nearly coterminous with lands claimed by the Penutian-speaking Northern Valley Yokuts at the time of their initial contact with European-American populations, circa AD 1850 (Kroeber 1925; Wallace 1978). These Yokuts occupied an area extending from the crest of the Coast Diablo Range easterly into the foothills of the Sierra Nevada, north to the American River, and south to the upper San Joaquin River.

The basic social unit for the Yokuts was the family, although the village may also be considered a social, as well as a political and economic unit. Often located on flats adjoining streams, villages were inhabited mainly in the winter because it was necessary to go out into the hills and higher elevation zones to establish temporary camps during food-gathering seasons (i.e., spring, summer, and fall). Villages typically consisted of a scattering of small structures, numbering from four or five to several dozen in larger villages, each house containing a single family of from three to seven people. Larger villages, with from 12 to 15 or more houses, might also contain an earth lodge.

As with most California Indian groups, economic life for the Yokuts revolved around hunting, fishing, and collecting plants, with deer, acorns, and avian and aquatic resources representing primary staples. The Yokuts used a wide variety of wooden, bone, and stone artifacts to collect and process their food. The Yokuts were very knowledgeable of the uses of local animals and plants and the availability of raw materials that could be used to manufacture an immense array of primary and secondary tools and implements. However, only fragmentary evidence of their material culture remains, due in part to perishability and in part to the impacts to archaeological sites resulting from later land uses.

B.5.1.1.7 Resource Considerations, Native American Sites

The discussion of regional prehistory and ethnography provides insight into the types of Native American sites already known or likely to be present within the service areas of the Delta Division Member Agencies, with the most frequently occurring types including the following:

- Large village sites located along the margins of all permanent streams, particularly at confluences, and other natural surface water sources (springs, marshes, and other wetlands). Additional large village sites have been documented along smaller stream courses, especially where streams merge, and particularly at the interface between major ecotones.
- Surface scatters of lithic artifacts without buried cultural deposits, resulting from short-term occupation and/or specialized economic activities.

- Petroglyphs, often in the form of cupped boulders, at or close to village sites or encampments.
- Bedrock food-processing (milling) stations, including mortar holes and metate slicks.
- Trails, often associated with migratory game animals.
- Mortuary sites, often but not exclusively associated with large village complexes.
- Isolated finds of aboriginal artifacts and flakes.

B.5.1.1.8 Historic Context

Interior California was initially visited by Anglo-American fur trappers, Russian scientists, and Spanish-Mexican expeditions during the early part of the nineteenth century. These early explorations were followed by a rapid escalation of European-American activities, which culminated in the massive influx fostered by the discovery of gold at Coloma in 1848. The influx of miners and others during the Gold Rush set in motion a series of major changes to the natural and cultural landscape of California that would never be reversed.

Early Spanish expeditions arrived from Bay Area missions as early as 1804, penetrating the northwestern San Joaquin Valley (Cook 1976). By the mid-1820s, hundreds of fur trappers were annually traversing the valley on behalf of the Hudson's Bay Company (Maloney 1945). By the late 1830s and early 1840s, several small permanent European-American settlements had emerged in the Central Valley and adjacent foothill lands, including ranchos in the interior Coast Range.

With the discovery of gold in the Sierra Nevada, large numbers of European-Americans, Hispanics, and Chinese arrived in and traveled through the general area. The mining communities' demand for hard commodities led quickly to the expansion of ranching and agriculture throughout the valley and logging within the foothill and higher elevation zones of the Sierra Nevada. Stable, larger populations arose and permanent communities slowly emerged in the Central Valley at this time, particularly along major transportation corridors. Of particular importance was the transformation brought about by construction of railroad lines.

The Southern Pacific and Central Pacific Railroads and a host of smaller interurban lines to the north around the City of Stockton began intensive projects in the late 1860s. By the turn of the century, nearly 3,000 miles of lines connected the cities of Modesto and Stockton with points south and north. Many of the valley's larger cities, including many in San Joaquin County and adjacent counties, were laid out as isolated railroad towns in the 1870s and 1880s by the Southern Pacific, which not only built and settled, but continued to nurture the infant cities until settlement was successful. The Southern Pacific main line proceeds through or adjacent to the entire area.

Intensive agricultural development soon followed, since railroads provided the means for product to be transported to a much larger market. Agricultural land conversion began long before the development of water supply projects. By the end of the twentieth century, a substantial portion of the valley was being intensively cultivated, with increasing mechanization through all of the twentieth century and substantial expansion of cultivated acreage with the arrival of water from the CVP.

B.5.1.1.9 Resource Considerations, Historic Resources

Historic overviews for the region generally document the presence of a wide range of historic site and feature types and complexes, with types known or most likely to be present with the project area including the following:

- Historic railroad alignments.
- Two-track historic trails and wagon roads and now paved historic road corridors.
- Water distribution systems, including levees and small and large ditch, canal, and channel systems.
- Occupation sites or homesteads and associated features such as refuse disposal sites, privy pits, barns, and sheds.
- Commercial undertakings.
- Refuse disposal site(s) associated with early communities.
- Ranch features, including standing structures, structural remnants, stock ponds, and corrals.

B.5.1.1.10 Current Inventory of Cultural Resources

A total of 89 archaeological and historic sites are currently documented within the service areas of the Delta Division. These include sites that contain exclusively prehistoric material, sites with only historic material, and sites with mixed prehistoric and historic components and structures.

Prehistoric sites are represented by large habitation areas (village sites) in which both habitation and special-use activity areas are represented; mortuary sites, usually associated with habitation sites; specialized food-procurement and food-processing sites including milling areas; and other site types representing a variety of specialized activities.

Historic sites are represented by a range of types, including buildings and structures dating to the nineteenth century; historic transportation features; water distribution systems; occupation sites and homesteads with associated features such as refuse disposal sites, privy pits, barns, and sheds; historic disposal sites associated with historic communities; and ranch complexes.

Some of these prehistoric and historic sites have been determined eligible for inclusion on the NRHP through consultation between a federal agency and the State Historic Preservation Office. Others remain unevaluated in relation to NRHP eligibility criteria.

In addition to formally recorded sites, it is clear that a large number of both prehistoric and historic sites remain undiscovered within the overall project area simply because for many areas, especially undeveloped ranch and farm lands, a formal archaeological inventory survey has never been undertaken.

Table B-5 summarizes the current cultural resources inventory by Delta Division CVP contractor. The table also provides information concerning the cultural resource inventory within each district, as follows:

- The number of documented archaeological and historic sites that have been assigned State Trinomials, Primary Record, or State Landmark designations.
- An estimate of the land area within the district that has been surveyed for cultural resources.
- A conclusion as to whether district lands are known to contain or, if subjected to formal archaeological survey, would be likely to be discovered to contain important prehistoric or historic sites or other cultural features. This conclusion or assessment is based on (a) the results of the formal records search, (b) previous consultation with Native American groups and historic societies as summarized in existing documents, (c) the results of prior surveys in the general or immediate vicinity, and (d) an assessment of archaeological sensitivity based on stream courses and other critical variables present within unsurveyed district lands.

Table B-5 Summary of Previous Studies and Cultural Properties

Entity Name	Recorded Sites and Landmarks	Percentage Surveyed to Date	Are Undocumented Sites Likely To Be Present in District?
The West Side Irrigation District	7	30%	Yes
Byron Bethany Irrigation District	6	60%	Yes
(CVP)	15	20%	Yes
City of Tracy	5	10%	Yes
Banta-Carbona Irrigation District	3	1%	Yes
West Stanislaus Irrigation District			
Patterson Water District	3	5%	Yes
Del Puerto Water District	22	35%	Yes
Centinella Water District	0	20%	Yes
Laguna Water District	0	0%	Yes
Eagle Field Water District	0	0%	Yes
Oro Loma Water District	0	0%	Yes
Mercy Springs Water District	0	0%	Yes
Widren Water District	0	1%	Yes
Broadview Water District	0	0%	Yes
Coelho Family Trust*	1	1%	Yes
Reclamation District #1606*	1	1%	Yes
Fresno Slough Water District	0	0%	Yes
Tranquillity Irrigation District*	1	2%	Yes
Tranquillity Public Utilities District	25	3%	Yes
James Irrigation District	0	25%	Yes
Total	89		
*District contains no sites with State Trinomial or number designations, but contains one State Historic Landmark herein counted as a “site."			

B.5.1.2.1 Land Use and Demographics

This section discusses the land uses within the Delta Division. Information in this section was summarized primarily from the final CVPIA PEIS (USBR and Service 1999), county general planning documents, CVP contractor water conservation plans, U.S. Bureau of the Census data on population, and information obtained in interviews with individual Delta Division CVP contractors.

B.5.1.2.2 Affected Environment

Land use can be defined as the human use of land resources for various purposes including economic production, natural resources protection, recreation, or institutional uses. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine allowable uses. Agricultural development and the conversion of natural habitat to agricultural uses began in the early to mid-1800s and intensified in the later 1800s as the railroads provided the means to transport agricultural produce to much larger markets. This section discusses lands in the project area at the county level and for the geographic service areas of the 20 CVP contractors in the Delta Division. A discussion of areas of Important Farmland is also included.

B.5.1.2.3 County Land Uses

As discussed previously, the Delta Division contractors are located in the San Joaquin River Region. Land uses could be affected in portions of San Joaquin, Stanislaus, Merced, and Fresno Counties. The following discussion generally addresses lands located within these counties.

B.5.1.2.4 San Joaquin County

San Joaquin County encompasses approximately 1,440 square miles and includes the seven incorporated cities of Stockton, Tracy, Manteca, Escalon, Ripon, Lodi, and Lathrop. Stockton and Tracy are the largest cities in the county. The City of Tracy is the only CVP contractor in the Delta Division that is a municipality and uses its CVP supply solely for M&I use.

B.5.1.2.5 San Joaquin County Demographics

In 1990, it was estimated that more than 77 percent of the county's population resided within the seven incorporated cities, with the additional 23 percent residing within urban and rural unincorporated areas (San Joaquin County 1992a, 1992b, 1992c). The population in San Joaquin County is expected to increase from about 465,000 in 1990 to about 750,000 by the year 2010 or to increase on average by about 14,000 persons per year (San Joaquin County 1992a, 1992b, 1992c). Year 2000 Census data reports a population of 563,598 persons in San Joaquin County (U.S. Bureau of Census 2000a). In 2004, the population of San Joaquin County was estimated to be 613,500 (California State Association of Counties 2004).

B.5.1.2.6 San Joaquin County Land Use

According to the county's most recent General Plan, approximately 86 percent of the county's total acreage in 1990 was used for agriculture. The land uses in San Joaquin County are shown in Table B-6.

Table B-6 San Joaquin County Land Uses

	Acres	Percentage of County
Agriculture	788,896	86.47
Urban*	63,760	6.99
Other Land	49,332	5.41
Water	10,341	1.13
Total	912,329	100.00

Source: San Joaquin County General Plan (San Joaquin County 1992a, 1992b, 1992c)
* Includes residential, commercial and industrial

San Joaquin County contains large areas of highly productive soils. Agriculture and related activities have historically constituted a major portion of the county's economic base, and agriculture has been a mainstay of the county's economy. According to the 1997 Agricultural Census for San Joaquin County, there were 808,838 acres in farms; this represents an increase from 783,715 acres in 1992, but a decrease from the 823,729 acres in 1987. It is estimated that with projected population growth and continued urbanization in the county that the amount of agricultural land lost could increase from the 10 percent loss over the last 50 years to a 33 percent loss by the year 2040 (San Joaquin County 1992a).

B.5.1.2.7 Stanislaus County

Stanislaus County encompasses an area of approximately 1,500 square miles and includes the nine incorporated cities of Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford. Modesto and Turlock are the largest cities in the county.

B.5.1.2.8 Stanislaus County Demographics

In 1990, an estimated 74 percent of the population lived in incorporated areas, an increase from 65 percent in 1980 (Stanislaus County 1994). Based on U.S. Bureau of the Census data, the population in Stanislaus County increased by 39 percent in the 1980s, from 265,900 to 370,522. This compared to the average increase statewide of 26 percent. Between 1980 and 1990, the population in Stanislaus County increased by 59 percent in incorporated cities, while the unincorporated areas saw an increase of only 3 percent. Since 1990, the county's population has continued to grow at an average annual rate of 3.5 percent, reaching a total population of 412,676 in 1994 (Stanislaus County 1994). Year 2000 Census data reports a population of 446,997 persons in Stanislaus County (U.S. Bureau of Census 2000b). In 2004, the population of Stanislaus County was estimated to be 481,600 (California State Association of Counties 2004).

B.5.1.2.9 Stanislaus County Land Use

Stanislaus County has adopted a number of community plans for most of the unincorporated towns in the county. Community plans outline land uses and future growth patterns of the towns in the county and are used in conjunction with county general planning documents. For unincorporated areas not included in a community plan, land use designations generally include residential, commercial, industrial, agricultural, urban transition, and industrial transition. Over 95 percent of the area in the unincorporated county is zoned for agricultural use.

The incorporated cities in the county have adopted city general plans. Specific land use information is available from community and city general plans. General countywide land use information is not readily available in the Stanislaus County General Plan. However, the plan does state that urban development has spread over 48,000 acres, much of which was originally prime farmland in agricultural production. According to the 1997 Agricultural Census for Stanislaus County, there were 732,736 acres in farms; this represents a decrease from 759,649 acres in 1992 and a further decrease from 819,845 acres in 1987.

B.5.1.2.10 Merced County

Merced County encompasses approximately 2,020 square miles and includes the six incorporated cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced and 18 unincorporated communities. Merced is the largest incorporated city in the county.

B.5.1.2.11 Merced County Demographics

From 1980 to 1990, the population in Merced County grew by over 33 percent from 134,560 to 178,403. This is compared to the average increase statewide of 26 percent. The incorporated cities grew by approximately 41 percent and the unincorporated areas by 19 percent. Year 2000 Census data reports a population of 210,554 persons in Merced County (U.S. Bureau of Census 2000c). In 2004, the population of Merced County was estimated to be 225,100 (California State Association of Counties 2004).

B.5.1.2.12 Merced County Land Use

Merced County uses the "Urban Centered Concept" as a basic land use principle. This concept directs urban development in identified centers. Increased growth often results in a loss of the most productive agricultural soils. Under this concept, however, urban development will only occur within cities, unincorporated communities, and other urban centers. The Urban Centered Concept was revised in 1990 to include the development of unincorporated communities in the foothills on both sides of the county. This revision has fostered the planned development of subdivisions that will presumably become the urban centers for new communities in the foothills of the county.[3] In Merced County, besides the

3 Pursuant to the Merced County General Plan, full environmental review is required for community specific plans for any such development that may, to the extent they are within the CVP permitted place of use, eventually rely on the CVP allocation to the agricultural water districts after the environmental review has been completed.

urban areas discussed above, rural areas of the county, which are typically used for cropping or pasturing activities, are subject to their own land use designations. When the general plan was developed in 1990, it was estimated that 80 percent of the population lived in the urban centers, the remaining 20 percent lived in rural areas, and 95 percent of the land in the county was considered rural.

According to the 1997 Agricultural Census for Merced County, there were 881,696 acres in farms, a decrease from 1,049,302 acres ten years earlier.

B.5.1.2.13 Fresno County

Fresno County encompasses nearly 6,000 square miles and includes the 15 incorporated cities of Coalinga, Clovis, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, San Joaquin, Sanger, and Selma. Over 60 percent of the population resides in the county's two largest cities, Fresno and Clovis.

B.5.1.2.14 Fresno County Demographics

According to Department of Finance population estimates, the population in Fresno County grew between 1980 and 1990 by approximately 29 percent, from 514,621 to 661,400. This is compared to the average statewide increase of 26 percent. The combined populations of Fresno and neighboring Clovis comprise 61 percent of the total county population and 82 percent of the population of the other incorporated cities combined (County of Fresno 2000a). Year 2000 Census data reports a population of 799,407 persons in Fresno County (U.S. Bureau of Census 2000d). In 2004, the population of Fresno County was estimated to be 841,400 (California State Association of Counties 2004).

B.5.1.2.15 Fresno County Land Use

In 1997, approximately 50 percent of the county's total acreage was used for agriculture. The current land uses in Fresno County are shown on Table B-7.

Table B-7 Fresno County Land Uses (1997)

Land Use	Square Miles
Residential	152
Commercial	7
Industrial	11
Agricultural	2,911
Resource Conservation 1	2,691
Unclassified 2	11
Incorporated Cities	154
Total	5,937

Source: Fresno County General Plan (County of Fresno 2000a, 2000b)
1 Including national forests, parks and timber preserves
2 Includes streets, highways and rivers

Farming and agriculture-related businesses comprise a major component of the local economy. Factors that contribute to its success include excellent soil and climatic growing conditions and workforce and transportation availability. According to the 1997 Agricultural Census for Fresno County, there were 1,881,418 acres in farms; this represents a decrease from 1,975,373 acres in 1987.

B.5.1.2.16 Farmland Categories

Table B-8 contains a description of farmland categories as defined by the U.S. Department of Agriculture, Natural Resources Conservation Service. Some of these farmland categories are found within San Joaquin, Stanislaus, Merced, and Fresno Counties.

Table B-8: Important Farmland Map Categories

Category	Description
Prime Farmland	Land that has the best combination of physical and chemical characteristics for producing food, seed, forage, fiber, and oilseed crops and is also available for use. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods.
Farmland of Statewide Importance	Land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production. The land must have been used for production of irrigated crops within the last three years and also meet specific criteria including soil temperature and range.
Unique Farmland	Land that does not meet the criteria for either Prime Farmland or Farmland of Statewide Importance, but that is used for the production of specific high economic value crops. It is land that has a special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality of high yield of specific crops.
Farmland of Local Importance	Land that may be important to the local economy because of its productivity.
Source: County of Fresno 2000b.	

Prime farmland continues to decline across the counties encompassing the contract service areas. Table B-9 summarizes important farmland trends for Fresno, Merced, San Joaquin, and Stanislaus Counties.

Table B9: Important Farmland Changes from 2000 to 2002

Type of Farmland	Fresno County		Merced County		San Joaquin County		Stanislaus County	
	2000	2002	2000	2002	2000	2002	2000	2002
Prime Farmland	734,052	731,149	287,160	286,054	419,227	415,527	264,121	260,730
Farmland of Statewide Importance	491,569	490,353	157,936	158,405	93,739	92,521	30,715	30,069
Unique Farmland	104,223	102,946	96,355	100,749	59,118	61,849	59,850	61,205
Farmland of Local Importance	70,691	74,347	47,621	41,772	58,906	56,507	31,848	29,519
Important Farmland Subtotal	1,400,535	1,398795	589,072	586,980	630,990	626,404	386,534	381,523

Source: California Department of Conservation 2004; Division of Land Resource Protection, Farmland Mapping and Monitoring Program 2004.

B.5.1.2.17 Williamson Act

The California Land Conservation Act of 1965 (more commonly known as the Williamson Act) established a voluntary tax incentive program for preserving both agricultural and open space lands. The Act reduces property taxes in return for the guarantee that the property will remain in agriculture for not less than 10 years, thereby slowing down the conversion of agricultural land. Under the Act, property owners enter into 10-year contracts with their respective counties. The county then places restrictions on the land in exchange for tax savings. The property is then taxed according to the income it is capable of generating from agriculture and other compatible uses, rather than being taxed on its full market value. The contract is automatically renewed annually after the first 10 years, unless a written request, called a Notice of Non-Renewal, is prepared.

The California Department of Conservation, Division of Land Resources Protection maintains information by county on acres of land currently enrolled in the Williamson Act. Table B-10 summarizes acreage of farmland enrolled in the Williamson Act for Fresno, Merced, San Joaquin, and Stanislaus Counties.

Table B-10 Williamson Act: Total Reported Enrollment in 2000 and 2001

Type of Farmland	Fresno County		Merced County		San Joaquin County		Stanislaus County	
	2000	2001	2000	2001	2000	2001	2000	2001
Prime	1,084,968	1,080,671	--*	215,249	343,153	338,757	281,910	284,764
Nonprime	487,012	487,075	--*	122,907	151,703	148,213	405,484	404,869

Source: California Department of Conservation 2004
*Merced County began its participation in the Williamson Act in 2000; therefore, the number of acres in 2000 was unavailable.

B.5.1.3.1 Recreation

This section discusses the recreational resources within the Delta Division. Information in this section is summarized from the Draft CVPIA PEIS, Recreation, Technical Appendix, Volume 4 (USBR 1997c).

B.5.1.3.2 Affected Environment

Recreation sites in or near the Delta Division include San Luis Reservoir, the O'Neill Forebay, Pacheco State Park, the San Joaquin River, and various wildlife refuges. The DMC itself also provides limited recreational opportunities.

B.5.1.3.3 Reservoirs

San Luis Reservoir and the adjacent O'Neill Forebay provide reservoir related recreational resources in the vicinity of the service areas of the Delta Division CVP contractors. The reservoirs are located west of Interstate 5 near State Route 152. They are within the San Luis Reservoir State Recreation Area, operated by the California Department of Parks and Recreation (CDPR). Visitor attendance to the San Luis Reservoir State Recreation Area in fiscal year 2001 and 2002 was 514,096 (California Department of Parks and Recreation 2004). This included 469,478 day-users and 44,618 campers.

B.5.1.3.4 San Luis Reservoir

When it is full, San Luis Reservoir covers approximately 12,700 surface acres. Recreational activities include boating, water-skiing, fishing, picnicking, camping, hunting, and hiking. Reservoir facilities consist of one campground and two concrete boat ramps and boarding docks. The reservoir has no designated swimming or lakeside beach areas. Boat and shore fishing occur throughout San Luis Reservoir. Migratory waterfowl hunting is permitted on most of the reservoir. Hunting for deer and wild pig is also allowed on the northwest shoreline of the San Luis Reservoir State Recreation Area.

Water enhanced activities account for the largest portion of reservoir use. Relaxing and camping are the most popular of the water related activities. Seventy-seven percent of annual use occurs between April and September. Recreation at the reservoir is optimized at a pool elevation 544 feet above mean sea level. Use of the two boat ramps becomes impaired between 340 and 360 feet above mean sea level. Swimming activities are unaffected by reservoir surface water fluctuations because the reservoir has no designated swimming facilities.

B.5.1.3.5 O'Neill Forebay

The O'Neill Forebay is located immediately east of San Luis Reservoir and 2.5 miles downstream of the San Luis Dam. The O'Neill Forebay covers about 2,250 acres of surface area and 14 miles of shoreline and was developed in part to accommodate recreational use that may be lost when San Luis Reservoir is drawn down. Recreational facilities consist of two boat ramps, two picnic areas, a campground, and a swimming area. O'Neill Forebay recreational features also include the Medeiros recreation area, which provides picnicking, camping, and boat ramp access, and the San Luis Creek day use area, which provides picnicking, swimming, and boat ramp access. Facilities accommodate boating, fishing, swimming, wading, camping, and sightseeing. In addition, the O'Neill Forebay is nationally known for windsurfing.

The recreational facilities at O'Neill Forebay provide more diverse recreational opportunities than those at San Luis Reservoir. The most popular activities are swimming, wading, and relaxing. The majority of visits occur between April and September. Visitor origins include San Luis Reservoir, including coastal and bay counties to the west, and valley and foothill counties to the east.

Recreational use at O'Neill Forebay is generally unaffected by water level fluctuations because pool elevations are usually maintained at constant levels. However, minor drops in surface elevation may affect beach use because a relatively large amount of the shoreline would be exposed.

B.5.1.3.6 Pacheco State Park

Pacheco State Park is adjacent to the San Luis Reservoir to the west. Because Paula Fatjo, a direct descendant of Francisco Pacheco for whom Pacheco Pass is named, wanted her ranch, El Rancho San Luis Gonzaga, to be kept intact for the enjoyment of people who shared her love of horses and the beauty of the unspoiled land itself, she donated the parklands to the State of California. Pacheco State Park has beautiful displays of spring wildflowers, scenic vistas, and excellent hiking, mountain biking, and horse trails. The 28 miles of designated trails offers several loop options to give visitors the choice of a hike or ride from one to 20 miles or more. Visitors on the park's trails can enjoy beautiful views of the San Luis Reservoir and the San Joaquin Valley and, in the spring, blossoming wildflowers. Pacheco

State Park is home to tule elk, deer, bobcat, coyote, fox, hawks, eagles, and a variety of smaller animals. Among the historic features of the park are an old line shack used by Henry Miller's cattle company in the late 1800s and part of the old Butterfield stage line route.

Only the western 2,600 acres are currently open for public use. The eastern portion of the park that adjoins San Luis Reservoir remains closed to the public until additional trail systems have been developed and the safety concerns associated with a wind turbine farm can be addressed.

B.5.1.3.7 San Joaquin River

The San Joaquin River is approximately 100 miles long and extends from Millerton Lake to the Delta. Table B-11 lists some of the recreational facilities and activities located on the San Joaquin River in proximity of the Delta Division.

Table B-11 San Joaquin River Recreational Facilities and Activities near the DMC

San Joaquin River Locations	Facilities and Activities
Millerton Lake to Merced County line near State Route 152	No major public recreation features; public access at several road and state highway crossings
Merced County	San Luis National Wildlife Refuge Fremont Ford State Recreation Area
Stanislaus County	Las Palmas fishing access site Laird County Park Numerous public access points
San Joaquin County	Durham Ferry State Recreation Area Mossdale Landing County Park Dos Reis County Park Numerous public road crossings

Recreational use estimates for the 100 miles of the lower San Joaquin River are not available. However, based on information provided by recreation sites on the river, boating and fishing activities are estimated to total about 157,000 six-hour recreation visitor-days (California Department of Parks and Recreation 1990). Most of the San Joaquin River visitors are assumed to originate from nearby counties.

Recreational use on the San Joaquin River has been substantially affected by operation of Millerton Lake and diversions from the Merced and Chowchilla Canals east of the Mendota Pool. The San Joaquin River flow is somewhat intermittent downstream of the Mendota Pool to the Merced River confluence, with flows fed mainly by irrigation return flows.

B.5.1.3.8 Delta-Mendota Canal

Fishing access to the DMC is provided at DMC Site 2A in Stanislaus County and DMC Site 5 in Fresno County. Both sites provide parking areas and restrooms (USBR 1992). Fishing access to the DMC is limited to the developed access points (USBR 1993). Fishing is the only recreational activity allowed at both access sites.

Fishing use at the two sites has been estimated at 23,000 visitor-days (USBR 1997c). Canal Site 5 accounted for approximately 99 percent of this total in 1991. An estimated 85 percent of the visitors to the fishing sites originate in the local area (USBR 1981). Because no water contact activities are allowed on the canal, fluctuations in the water level or flow do not directly affect recreational opportunities.

B.5.1.3.9 Wildlife Refuges

Wildlife refuges in the vicinity of the DMC service area include the San Luis and Kesterson National Wildlife Refuges; the Mendota, Merced, San Luis National, San Joaquin National, Volta, Los Banos, and North Grasslands (Salt Slough and China Island) Wildlife Management Areas; Upper and Lower Cottonwood Wildlife Areas; Action Plan Lands (Freitis and West Bear Creek); and the Grassland Resource Conservation District.

B.5.1.3.10 Private Hunting Clubs

The 176 private waterfowl hunting clubs in the San Joaquin River Region cover about 96,800 acres. About 33,900 acres are flooded annually. Waterfowl hunting activity was estimated at 241,000 hunter-days in 1992.

B.5.1.4.1 Sociological Resources

This section discusses the socioeconomic resources of the Delta Division. Methods of analysis are described below.

B.5.1.4.2 Affected Environment

Socioeconomic analyses are composed of two primary types of analyses. Regional economics looks at changes to the income and employment levels of the project area. Social analyses look at changes to the demographic or social makeup and well-being of the project area.

Water supply in the area affects the following economic and social resources:

- Regional income
- Regional employment
- Regional population
- Area demographics

The project area includes the geographic service areas of the 20 CVP water contractors within the Delta Division. The contractor service areas all run roughly along the Interstate 5 – SLC corridor from the City of Tracy in San Joaquin County in the north, through parts of Stanislaus and Merced Counties, to the northern portion of Fresno County, just south of Highway 180 to the south.

When the economic modeling for this analysis was conducted, income and employment information by county was available from the U.S. Department of Commerce, Bureau of Economic Analysis website by industry for 1998. In terms of both earnings (as measured by wages and proprietor earnings) and employment, the largest industries in San Joaquin, Stanislaus, Merced, and Fresno Counties were retail trade, manufacturing, and government. Total earnings by major industry for each of the four counties are shown in Table B-12. Total employment by major industry for each of the four counties is shown in Table B-13.

Table B-12: 1998 Total Earnings by Industry by County1
(thousands of dollars)

Industry	County			
	San Joaquin	Stanislaus	Merced	Fresno
Farm Income2	$327,146	$351,101	$317,439	$554,061
Ag. Services, Forestry & Fishing	143,300	–3	90,821	581,149
Mining	12,578	–3	888	14,431
Construction	482,184	382,571	95,963	668,436
Manufacturing	975,178	1,099,685	383,958	1,006,513
Transportation & Public Utilities	655,342	341,005	134,501	651,665
Wholesale Trade	389,369	272,639	71,671	616,834
Retail Trade	757,576	625,731	227,704	1,067,575
Finance, Insurance & Real Estate	473,146	239,403	79,922	702,235
Services	1,556,828	1,313,887	357,590	2,578,764
Government	1,393,704	950,288	418,045	2,203,822
Total	$7,166,351	$5,715,861	$2,178,502	$10,645,485

Source: U.S. Department of Commerce 1998a.
1Includes wages, other labor income, and proprietor income.
2Farm income consists of proprietors' income; the cash wages, pay-in-kind, and other labor income of hired farm workers; and the salaries of officers of corporate farms.
3Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Table B-13: 1998 Total Employment by Industry by County1

Industry	County				
	San Joaquin	Stanislaus	Merced	Fresno	
Farm Employment		17,097	14,591	12,086	34,620
Ag. Services, Forestry & Fishing		9,019	–2	4,798	41,266
Mining		231	–2	52	456
Construction		12,457	11,482	3,074	19,202
Manufacturing		24,259	27,870	13,012	28,847
Transportation & Public Utilities		14,399	7,150	3,597	15,633
Wholesale Trade		10,124	7,400	2,162	16,654
Retail Trade		40,824	36,143	13,439	60,941
Finance, Insurance & Real Estate		16,800	10,748	4,161	25,906
Services		63,495	51,209	15,353	98,520
Government		34,714	24,152	12,506	56,770
Total		243,689	201,613	84,240	398,815

Source: U.S. Department of Commerce 1998b.
1Includes full-time labor, part-time labor, and proprietor employment.
2Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Agriculture is also a very important industry. If taken together, the farm and agricultural service sectors are particularly important to Fresno and Merced Counties. Agriculture takes on additional significance because it is generally considered a “primary” industry (along with mining and manufacturing). A reasonably large portion of activity in non-primary industries can be attributed to support for primary industry activity in an area. Changes in primary industry activity, therefore, usually precipitate additional changes in non-primary, or support, industries.

Population data can be most closely related to the project area by aggregating individual census tract information. Population and ethnicity breakdowns were available by census tract for 1990, the most recent reported census supporting economic modeling. The California Department of Finance develops population and ethnicity estimates and projections at the county level. Implied growth rates from the California Department of Finance’s county estimates were applied to the 1990 tract information to generate estimates and projections from 1990 through 2026 for the aggregated tracts. The following census tracts were used to simulate the Delta Division’s service area.

- Fresno County: Tracts 39, 82, 84.01, 84.02
- Merced County: Tracts 20, 21.98
- Stanislaus County: Tracts 32, 33.98, 34.98, 35

- San Joaquin County: Tracts 52.02, 52.03, 52.04, 52.05,53.02, 53.03, 53.05, 53.06, 54.02, 55

Table B-14 shows the estimated and projected population and ethnicity in the Delta Division service area. As shown in Table B-14, the Hispanic community makes up a large proportion of the regional population. It is estimated that over 40 percent of the regional population is identified as Hispanic in 2001 and that the percentage will rise to over 50 percent by 2026.

Table B-14: Population and Ethnicity–Delta Division Project Area1

Year	Population				
	White	Black	Other	Hispanic2	Total3
1990	69,542	2,257	21,885	35,995	93,684
1995	72,173	2,504	28,136	42,177	102,777
2000	75,774	2,802	33,601	48,500	112,883
2005	80,395	3,142	41,109	56,592	125,813
2010	85,226	3,531	47,514	65,062	139,339
2015	89,462	3,992	53,488	73,896	152,634
2020	93,940	4,417	60,688	85,069	167,985
2026	97,300	4,863	68,221	97,246	184,078

Source: U.S. Census Bureau 1990.
1Estimated and extrapolated from aggregated census tract data.
2Hispanic population is also counted as White, Black, or Other.
3Equals the sum of White, Black, and Other.

In addition to the information provided above, regional income, employment, and population can be impacted by changes to the availability, cost, or profitability of agricultural resources, recreational resources, power resources, and M&I water resources. Agricultural and recreational resources are discussed in their own sections within this chapter and the reader is referred to those sections for a review of the affected environment of those resources.

B.5.2.0 SAN FELIPE DIVISION

B.5.2.1.1 Cultural Resources

Cultural resources in the San Felipe Division are discussed in this subsection.

B.5.2.1.2 Affected Environment

The following description of the Affected Cultural Resources is focused upon cultural resources located in areas served by the San Felipe Division. This information is primarily based upon environmental documentation completed for the San Benito County general plan, Santa Clara County general plan, and Pajaro Valley Water Management Agency.

B.5.2.1.3 Zone 6 of San Benito County Water District

San Benito County was settled by a group of Hokan-speaking Native Americans over 10,000 years ago. The Hokans were replaced by the Ohlone, which lived in over 50 small tribal groups along the San Francisco and Monterey bay areas and foothills. The Ohlones were hunter and gatherers and lived within about six tribal groups in San Benito County. The tribes included the Mutsun tribe in the San Juan Canyon area, Pagsin tribe near Hollister, the Ausaima tribe in San Juan Valley and near Hollister, the Tamarron in the Diablo Range, the Chalon tribe in the south central part of the county, and the Salinan tribe in the southern part of the county. The area near Pajaro Gap in northwestern San Benito County was a crossroads of several Native American trading routes. Within the county, trade routes extended along San Benito River and Pacheco Pass. There are an estimated 300 descendants of the Coastanona (Ohlone) tribes in the Santa Clara and San Benito counties near Mission San Jose, Mission San Juan Bautista, and Watsonville.

Over five Spanish expeditions traversed San Benito County. One of the largest was completed by Juan Bautista de Anza in 1775. This party included 30 families, 12 soldiers, and 1,000 livestock animals. A National Historic Trail has been proposed for this expedition that attempted to find a route from Mexico to San Francisco. A portion of this trail may be along Salinas Grade Road and another trail may be located along Old Stage Road. The trail includes the City of San Juan Bautista. A large portion of the trail has not been specifically identified in the county because the corridor extends across private agricultural lands. The Dante and Sal expedition in 1795 explored San Benito Valley and identified the Mission San Juan Bautista site. This mission was founded in 1797.

The City of Hollister was a center for sheep ranching in the mid-1800s. The San Justo Homestead Association was formed in 1868 and purchased 21,000 acres from Colonel William Hollister in the eastern part of Rancho San Justo. Hollister was located on 100 acres of this purchase. Hollister began to grow and become larger than San Juan Bautista when the railroad was constructed only near Hollister. Initially, following California statehood, this area was part of Monterey County. In 1874, the area to the east of the Gabilan Mountains became San Benito County. In addition to the two large communities of Hollister and San Juan Bautista, several small agricultural communities were formed including Tres Pinos which served as the southern terminus for Southern Pacific Railroad in the county; Paicines; Panoche, which was a stagecoach and ore wagon stop; New Idria Quicksilver Mine, which was one of the largest quicksilver mines in the world; and Bear Valley.

B.5.2.1.4 Santa Clara Valley Water District

The Ohlones also inhabited the area currently in Santa Clara County. Extensive archaeological sites exist, including midden sites, burial sites, and sacred sites. Ohlone villages have been identified near Gilroy and Los Altos Hills. Shell mound sites are located in Mountain View and Milpitas.

Santa Clara Valley was discovered by the Spanish expedition led by Moncado. Missions and Mexican families established communities in the early 1800s. European and American settlers arrived in the mid 1800s, including the Bidwell Party and the Stevens-Murply-Townsend Party. Following statehood, many Americans purchased land from the Mexican-owned ranchos. Martin Murphy, Sr. owned most of the property in the area that stretches today from Sunnyvale to Gilroy. The Central Railroad was completed between San Francisco and San Jose in 1864, which led to the growth of fruit orchards, vineyards, and other agricultural farms. Agricultural growth continued until after World War II when the electronic industry and other industries expanded in the area resulting in associated residential growth.

Archaeological districts in Santa Clara County include Isabel Valley, Santa Teresa, Circles within Circles near Morgan Hill, Uvas Creek-Little Arthur Creek, Upper and Lower Bodfish Creek, Leavesley Road-Alamias Creek, and Pacheco Pass Creek. Coyote Creek Archaeological District and Poverty Flat Site in Henry Coe State Park are listed on the National Register of Historic Places.

Historic sites are located near Los Gatos, Coyote area near Metcalf Road, the settlement of Old Gilroy, Madrone area, New Almaden historic district, Stanford University, Mt. Hamilton Road, and areas from Gilroy to San Martin. The sites include residences, windmills, tankhouse, and historic buildings. Historic districts have been established for Alviso (Embarcadero de Santa Clara), Downtown San Jose, St. James Square, Hensley, and New Almaden.

B.5.2.1.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.5.2.2.1 Indian Trust Assets

Indian trust assets are legal interests in assets held in trust by the federal government for Indian tribes or individuals. The trust relationship usually stems from a treaty, executive order, or act of Congress. Assets are anything that holds monetary value. Assets can be real property, physical assets, or intangible property rights. Examples of trust assets are lands, minerals, hunting and fishing rights, and water rights. In addition, such assets include the right to access certain traditional areas and perform traditional ceremonies.

The federal government maintains a responsibility to protect Indian Trust Assets and to avoid adverse impacts where possible. Appropriate mitigation or compensation is required in consultation with affected Indian tribes when impacts cannot be avoided. Secretarial Order No. 3175, issued November 1993, clarifies the responsibility of the federal government in developing procedures for identifying, protecting, and maintaining Indian Trust Assets.

B.5.2.2.2 Affected Environment

There are Native American resources and sites within the San Felipe Division. However, these tribes are not federally recognized. Therefore, there are no Indian Trust Assets recognized by the Bureau of Indian Affairs in the San Felipe Division.

B.5.2.3.1 Land Use and Demographics

The San Felipe Division provides water to the northern portion of San Benito County and all of Santa Clara County.

B.5.2.3.2 Affected Environment

The following description of the Affected Land Use and Demographics is primarily based upon environmental documentation completed for the San Benito County general plan, Santa Clara County general plan, and Pajaro Valley Water Management Agency.

B.5.2.3.3 Zone 6 of San Benito County Water District

Zone 6 of San Benito County Water District provides water supplies to northern San Benito County, including the communities of Hollister and San Juan Bautista. It should be noted that Zone 6 of San Benito County Water District has no responsibility or ability to influence land use changes, zoning changes, or land use decisions. These policies are solely determined by San Benito County and individual cities. Zone 6 of San Benito County Water District also has no ability to determine "willingness to serve" any urban customers because Zone 6 does not directly serve urban customers, but provides water supplies to retailers.

The Land Use Element of San Benito County General Plan identifies three major categories of land uses: urban, rural, and agricultural. The urban land is exclusively located in the cities of Hollister and San Juan Bautista. The rural land includes areas with low density development in areas such as lands surrounding Hollister and San Juan Bautista where lot sizes can range from 1/2 acre to about 5 acres. Agricultural land includes very low density development and makes up over 87 percent of the total land in San Benito County.

Santa Benito County has a total area of about 893,440 acres. Agricultural land uses currently cover about 715,800 acres. In 1992, the total estimated production value of agricultural crops in San Benito County was $132 million/year. In Zone 6 of San Benito County Water District, the majority of land is agricultural and supports row crops, fruit and nut orchards, cattle, and field crops. The county has established policies to protect agriculture as an important industry in San Benito County. The San Benito County General Plan identifies land to be converted to municipal uses to be located adjacent to urban areas and encourages the use of infilling development methods rather than conversion of agricultural land.

The population of San Benito County has increased from 18,226 in 1970 to 51,800 in 2000. This represents an average annual growth rate over the past 30 years of 3.5 percent. Approximately 52 percent of these people lived in Hollister and San Juan Bautista in 1990. The Department of Finance projects a population of 82,300 in 2020 and 97,900 in 2030 for San Benito County, including Hollister and San Juan Bautista, as summarized in Table B-15.

For this purpose, it is assumed that the growth projections are linear between 2020 and 2030, and therefore the projected 2025 population would be 89,900 for San Benito County.

The San Benito County General Plan evaluated the land use changes that will be required to accommodate this projected growth. It is anticipated that 16,700 to 18,500 dwelling units will be required for the 2025 projected population. The General Plan and associated environmental impact report evaluated lands uses that support 20,030 to 36,830 dwelling units. Therefore, the General Plan environmental documentation fully evaluated the land uses that would be required to support the projected population in 2026, most of which will be served directly or indirectly by the San Felipe Project.

B.5.2.3.4 Santa Clara Valley Water District

The Santa Clara Valley Water District provides water supplies to all of Santa Clara County through treated water and groundwater recharge. It should be noted that Santa Clara Valley Water District has no responsibility or ability to influence land use changes, zoning changes, or land use decisions. These policies are solely determined by Santa Clara County and individual cities. Santa Clara Valley Water District also has no ability to determine "willingness to serve" any urban customers because the water district does not directly serve urban customers, but provides water supplies to retailers.

The Land Use Element of Santa Clara County General Plan identifies six major categories of land uses: rural unincorporated, cities (or urban incorporated), urban unincorporated, resource conservation, areas with special land use policies, and other land uses. The rural unincorporated areas are located throughout the county and represent 67 percent of the total county area. There are 15 cities which are primarily located in the northern portion of the county. The urban unincorporated areas are primarily located adjacent to the cities and within the Urban Services Areas.

Santa Clara County has a total area of about 835,400 acres. Agricultural land uses currently cover about 457,000 acres. In 1991, the total estimated production value of agricultural crops in Santa Clara County was $150 million/year. There are over 30 different food crops plus cattle, nursery crops, and cut flowers. Approximately 41 percent of the county is under Williamson Act protection. The county and several cities have considered establishment of agricultural preserves. The Santa Clara County General Plan acknowledges that some agricultural lands could be converted to residential uses, but this would be minimized through the use of mitigation measures included in the county general plan.

The population of Santa Clara County has increased from 1,065,300 in 1970 to 1,763,000 in 2000. This represents an average annual growth rate over the past 30 years of 1.7 percent. The Department of Finance projects a population for Santa Clara County of 2,196,750 in 2020 and 2,400,600 in 2030, including the incorporated areas, as summarized in Table B-15. For this purpose, it is assumed that the growth projections are linear between 2020 and 2030, and therefore the projected 2025 population would be 2,299,500 for Santa Clara County.

TABLE B-15

POPULATION PROJECTIONS

Years	San Benito County	Santa Clara County
2000	51,800	1,763,300
2005	60,300	1,909,500
2010	68,000	2,021,400
2015	74,900	2,096,400
2020	82,300	2,196,750
2025	89,900	2,299,500
2030	97,900	2,400,600

Source: California Department of Finance

B.5.2.3.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.5.2.4.1 Recreation

Recreational opportunities in the San Felipe Division include local and regional parks, golf courses, and recreational opportunities at water supply reservoirs.

B.5.2.4.2 Affected Environment

The following description of the Affected Recreation is focused upon recreation at reservoirs that store CVP water. This information is primarily based upon environmental documentation completed for the San Benito County general plan, Santa Clara County general plan, Santa Clara Valley Water District, and Pajaro Valley Water Management Agency.

B.5.2.4.3 Zone 6 of San Benito County Water District

Regional recreational facilities in or near Zone 6 of San Benito County Water District include Fremont State Park, Bolado State Park, State Offroad Recreational Vehicle State Park near Hollister, San Benito County Historical and Recreation Park, Veterans Memorial Park, and San Justo Reservoir. Of these facilities, only San Justo Reservoir is directly affected by the San Felipe Project. San Justo Reservoir provides picnicing opportunities However, the opportunities are limited to periods when the reservoir is full. The reservoir is operated as a water storage facility and frequently the water level is extremely low in the late summer and fall.

B.5.2.4.4 Santa Clara Valley Water District

Santa Clara County recreational opportunities are provided at 31 regional parks operated by Santa Clara County Parks Department, open space areas owned by Mid Peninsula Regional Open Space District, Henry Coe Memorial State Park, San Francisco Bay National Wildlife Refuge, many lands owned by the Bureau of Land Management, and extensive holdings by cities, water districts, universities, and private organizations. In addition, the Santa Clara County Open Space Authority was established to acquire additional lands for multiple purposes, including recreation. Of these areas, several recreational areas are directly affected by the San Felipe Project, including Anderson Lake County Park, Calero Reservoir Park, Almaden Quicksilver County Park, Coyote Creek Park, and Los Gatos Creek Park. CVP water stored in reservoirs and conveyed to recharge sites in creeks provides water features for picnicking, boating, and general recreational opportunities. In dry years when water supplies are reduced, water levels in these areas are also reduced, thereby reducing the recreational opportunities and values.

B.5.2.4.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.5.2.5.1 Sociological Resource

Sociological resources include consideration of housing, employment, education, and income.

B.5.2.5.2 Affected Environment

The following description of the Affected Sociological Resources is focused upon areas served by the San Felipe Division. This information is primarily based upon environmental documentation completed for the San Benito County general plan, Santa Clara County general plan, and the Pajaro Valley Water Management Agency.

B.5.2.5.3 Zone 6 of San Benito County Water District

Growth in the San Benito County has been stimulated in the past 50 years by such factors as the baby boom following World War II, expanded job opportunities in electronics and defense-related sectors in the adjoining San Francisco Bay Area, climate, and other quality of life considerations in Central California. Population increases in San Benito County have primarily occurred in the past 20 years, as shown in Table B-15. This growth has primarily occurred in Hollister and San Juan Bautista. Residents of San Benito County represent many ethnic groups, as shown in Table B-16.

Most of the population growth has been due to individuals that moved into the county. The average age of the population is 30 years old. Seniors represent about 10 percent of the population. Approximately 75 percent of households are family households with an average size of 3.5 individuals per household. Female heads of families is about 15 percent, less than the statewide average. The majority of housing units are single family dwellings. The majority of the new residents are first-time home buyers. A large percentage of the housing units are less than 10 years of age, and therefore, are assumed to be of good structural soundness.

Employment in San Benito County is approximately 25 percent agriculture, 25 percent industrial, 20 percent government services, and 30 percent retail trade and services. It is anticipated that services and government employment will increase at a higher rate than the rest of the sectors. Due to the relatively large agricultural sector, unemployment rises during the winter months. Other sectors, including construction workers and landscape contractors, also are affected by the seasons. If drought occurs, agricultural and landscape contractors also may be affected if alternative water supplies are not available.

B.5.2.5.4 Santa Clara Valley Water District

Growth in Santa Clara County also has been stimulated in the past 50 years by such factors as the baby boom following World War II, expanded job opportunities in electronics and defense-related sectors in the adjoining San Francisco Bay Area, climate, and other quality of life considerations in Central California. Population increases in Santa Clara County have occurred consistently over the past 50 years, as shown in Table B-15. This growth has extended throughout most of the area served with CVP water by the Santa Clara Valley Water District.

Almost half of the housing units in Santa Clara County are located in San Jose. The need for housing exceeds the supply in Santa Clara County. A large portion of the available housing is unaffordable for most employees of the county. Therefore, many employees commute to other counties with affordable housing, such as Merced County in the Delta Division.

Residents of Santa Clara County represent many ethnic groups, as shown in Table B-16.

Employment in Santa Clara County is approximately 25 percent industrial, 10 percent government services, and 65 percent retail trade and services. It is anticipated that services and industrial employment will increase at a higher rate than the rest of the sectors.

TABLE B-16
ETHNIC DIVERSITY IN SAN FELIPE DIVISION

San Benito County						
Year	**White**	**Hispanic**	**Asian & Pacific Islander**	**Black**	**American Indian**	**Total**
1990	19,039	16,891	658	169	213	36,970
2000	28,139	22,111	1,127	209	267	51,853
2010	37,360	28,256	1,736	325	363	68,040
2020	44,087	35,067	2,269	398	455	82,276
2030	50,390	43,678	2,858	489	526	97,941
Santa Clara County						
Year	**White**	**Hispanic**	**Asian & Pacific Islander**	**Black**	**American Indian**	**Total**
1990	872,210	317,288	255,357	52,860	6,687	1,504,402
2000	842,673	425,918	426,883	62,625	5,153	1,763,252
2010	776,820	542,731	626,725	69,761	5,380	2,021,417
2020	665,849	666,330	783,993	75,168	5,410	2,196,750
2030	538,831	817,832	961,010	77,654	5,237	2,400,564

Source: California Department of Finance

B.5.2.5.5 Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency is currently not served by the San Felipe Project, thus no description is provided.

B.5.3.0 SAN LUIS UNIT

B.5.3.1.1 Cultural Resources

B.5.3.1.2 Affected Environment

The cultural resources, considered here cover the service areas of the San Luis Unit CVP contractors. Their service areas incorporate extensive areas along the western portion of the San Joaquin Valley and the interface between the valley and the lower reaches (eastern margin) of the Diablo Range and the northernmost portion of the Temblor Range of the Central Coast Ranges.

The remainder of this section describes cultural resources that are considered eligible or potentially eligible for inclusion on the National Register of Historic Places (NRHP) and that are located or may be present within the San Luis Unit.

B.5.3.1.3 Information Sources and Background Data for Affected Environment

This section provides a brief overview of the environmental, prehistoric, ethnographic and historic contexts for the area encompassed by the San Luis Unit. Much of this background information has been derived from anthropological, archaeological, and historic studies conducted over the past several decades on both public and private lands within the area. Also discussed are the types of cultural resources known or suspected of being present within the San Luis Unit.

In order to secure information concerning the types and general distribution of known archaeological and historic sites and to estimate whether additional such sites may remain undiscovered within an individual contractor's lands, the following sources were consulted:

- Archaeological surveys and site and other records and documents maintained by the California Historical Resources Information System, Central California Information Center and Southern San Joaquin Valley Information Center.
- Selected published and unpublished archaeological, ethnographic and historic reports and documents available for the overall study area.
- The NRHP.
- The California Register of Historical Resources (State of California 1998).
- The California Inventory of Historic Resources (State of California 1976).
- The California Historical Landmarks (State of California 1990).
- The California Points of Historical Interest listing (State of California 1992 and updates).
- The Historic Property Data File (Office of Historic Preservation 2001).
- The CALTRANS Local Bridge Survey (California Department of Transporation 1989).
- The Survey of Surveys (1989).

The background research and records searches were undertaken in July and August 2001, with general archaeological findings summarized below in the discussions of the environmental, prehistoric, ethnographic, and historic contexts.

B.5.3.1.4 Natural Environmental Context

The service area of the San Luis Unit includes primarily valley and lower foothill lands located within the central and southern San Joaquin Valley, along the western margin of the valley and including lands at the interface of the valley and the lower reaches of the Diablo and Temblor Ranges of the Central Coast Ranges.

This area contains a variety, but a limited number of water sources and resource zones. Prehistoric use and occupation focused on these features, particularly around the confluences of streams and within the ecotones created at the interface of foothill and valley lands. Drainages and associated natural levees and benches were moderately to intensively used, while uplands were visited for oak and other resources on a more seasonal basis.

Much of this area has been affected by ranching for over 100 years and by intensive agriculture during the past 50 to 100 years. The most recent impacts derive primarily from the construction of water distribution facilities, major transportation routes (Interstate 5 for example), expansion of mechanized agriculture, and construction of associated agricultural equipment and storage buildings.

B.5.3.1.5 Prehistoric Context

The CVP project area, inclusive of the San Luis Unit, has a long and complex cultural history with distinct regional patterns that extend back more than 11,000 years. The first generally agreed-upon evidence for the presence of prehistoric peoples in the CVP area is represented by the distinctive fluted spear points, termed Clovis points, found on the margins of extinct lakes in the San Joaquin Valley. The Clovis points are found on the same surface with the bones of extinct animals such as mammoths, sloths, and camels. Based on evidence from elsewhere, the ancient hunters who used these spear points existed during a narrow time range of 10,900 BP to 11,200 BP.

The next cultural period, the Western Pluvial Lakes Tradition, is thought by most to be subsequent to the Clovis period. It is another widespread complex characterized by stemmed spear points. This poorly defined, early cultural tradition is regionally known from a small number of sites in the Central Coast Range, San Joaquin Valley lake margins, and Sierra Nevada foothills. The cultural tradition has been dated to between 8,000 BP and 10,000 BP and its practitioners may be the precursors to the subsequent cultural pattern.

About 8,000 years ago, many California cultures shifted the main focus of their subsistence strategies from hunting to seed gathering as evidenced by the increase in food-grinding implements found in archeological sites dating to this period. This cultural pattern is best known in southern California, where it has been termed the Milling Stone Horizon (Wallace 1954, 1978c), but recent studies suggest that the horizon may be more widespread than originally described and was likely present throughout the CVP area. Radiocarbon dates associated with this period vary between 8,000 BP and 2,000 BP, although most cluster in the 6,000 BP to 4,000 BP range (Moratto 1984).

Cultural patterns as reflected in the archeological record, particularly specialized subsistence practices, became codified within the last 3,000 years. The archeological record becomes more complex, as specialized adaptations to locally available resources were developed and populations expanded. Many sites dated to this time period contain mortars and pestles and are associated with bedrock mortars, implying increasingly intense exploitation of acorns. The range of subsistence resources utilized, along with Native American exchange systems, expanded significantly from the previous period. Along the coast and in the Central Valley, archeological evidence of social stratification and craft specialization is indicated by well made artifacts such as charmstones and beads, which are often found as mortuary items.

B.5.3.1.6 Ethnographic Context

As noted above, the San Luis Unit is nearly coterminous with lands claimed by the Penutian-speaking Northern Valley Yokuts (Wallace 1978a) and the Southern Valley Yokuts (Wallace 1978b; Kroeber 1925) at the time of initial contact with European-American populations circa AD 1850. These peoples occupied an area extending from the crest of the Coast Diablo and Temblor Ranges easterly into the foothills of the Sierra Nevada, north to the American River in the case of the Northern Valley Yokuts, and south to Buena Vista and Kern Lakes at the southernmost end of the Great Central Valley in the case of the Southern Valley Yokuts.

The basic social unit for the Yokuts was the family, although the village may also be considered both a social and a political and economic unit. Often located on flats adjoining streams, villages were inhabited mainly in the winter because it was necessary to go into the hills and higher elevation zones to establish temporary camps during food-gathering seasons (i.e., spring, summer, and fall). Villages typically consisted of a scattering of small structures, each containing a single family of three to seven people. Larger villages that were maintainable seasonally might also contain an earth lodge.

As with most California Indian groups, economic life for the Yokuts revolved around hunting, fishing, and collecting plants, with deer, acorns, and avian and aquatic resources representing primary staples. The Yokuts used a wide variety of wooden, bone, and stone artifacts to collect and process their food. The Yokuts were very knowledgeable in the uses of local animals and plants and the availability of raw materials that could be used to manufacture an immense array of primary and secondary tools and implements. However, only fragmentary evidence of their material culture remains, in part because of their perishability and the impacts to archaeological sites resulting from later (historic) land uses.

B.5.3.1.7 Resource Considerations, Native American Sites

The discussion of regional prehistory and ethnography provides insight into the types of Native American sites already known or likely to be present within the San Luis Unit. The most frequently occurring types include the following:

- Large village sites located along the margins of all permanent streams, particularly at confluences, and other natural surface water sources (springs, marshes and other wetlands). Additional large village sites have been documented along smaller stream courses, especially where streams merge, and particularly at the interface between major ecotones.
- Surface scatters of lithic artifacts without buried cultural deposits, resulting from short-term occupation and/or specialized economic activities.
- Petroglyphs, often in the form of cupped boulders, frequently but not always located close to village sites or encampments.
- Bedrock food-processing (milling) stations, including mortar holes and metate slicks.
- Trails, often associated with migratory game animals.
- Mortuary sites, often but not exclusively associated with large village complexes.
- Isolated finds of aboriginal artifacts and flakes.

B.5.3.1.8 Historic Context

Interior California was initially visited by Anglo-American fur trappers, Russian scientists, and Spanish-Mexican expeditions during the early part of the nineteenth century. These early explorations were followed by a rapid escalation of European-American activities, which culminated in the massive influx fostered by the discovery of gold at Coloma in 1848. The influx of miners and others during the gold rush set in motion a series of major changes to California's natural and cultural landscape that would never be reversed.

Early Spanish expeditions arrived from Bay Area missions as early as 1804, penetrating the northwestern San Joaquin Valley (Cook 1976). By the mid-1820s, hundreds of fur trappers were annually traversing the valley on behalf of the Hudson's Bay Company (Maloney 1945). By the late 1830s and early 1840s, several small permanent European-American settlements had emerged in the Central Valley and adjacent foothill lands, including ranchos in the interior Coast Range.

With the discovery of gold in the Sierra Nevada, large numbers of European-Americans, Hispanics, and Chinese arrived in and traveled through the Central Valley. The mining communities' demand for hard commodities led quickly to the expansion of ranching and agriculture throughout the Central Valley and logging within the foothill and higher elevation zones of the Sierra Nevada. Stable, larger populations arose and permanent communities slowly emerged in the Central Valley, particularly along major transportation corridors. Of particular importance was the transformation brought about by the construction of railroad lines.

The Southern Pacific and Central Pacific Railroads and a host of smaller interurban lines to the north around the cities of Stockton and Sacramento began intensive projects in the late 1860s. By the turn of the century, nearly 3,000 miles of rail lines connected the cities of

Modesto and Stockton with points south and north. Many cities in the Central Valley were laid out as isolated railroad towns in the 1870s and 1880s by the Southern Pacific Railroad, which not only built and settled, but continued to nurture the infant cities until settlement was successful. The Southern Pacific Railroad main line traverses the Central Valley a short distance east of the San Luis Unit.

Intensive agricultural development soon followed, since railroads provided the means for product to be transported to a much larger market. By the end of the twentieth century, a substantial portion of the valley was being intensively cultivated, with increasing mechanization through all of the twentieth century and substantial expansion of cultivated acreage with the arrival of water from the CVP.

B.5.3.1.9 Resource Considerations, Historic Resources

Historical overviews for the region generally document the presence of a wide range of historic sites, feature types and complexes. The types known or most likely to be present within the study area include the following:

- Historical railroad alignments.
- Two-track historic trails and wagon roads and now-paved historical road corridors.
- Water distribution systems, including levees and small and large ditch, canal, and channel systems.
- Occupation sites or homesteads and associated features such as refuse disposal sites, privy pits, barns, and sheds.
- Commercial undertakings with associated buildings and irrigation systems.
- Refuse disposal site(s) associated with early communities.
- Ranch features, including standing structures, structural remnants, stock ponds, and corrals.

B.5.3.1.10 Current Inventory of Cultural Resources

A total of 67 archaeological and historic sites are currently documented within the San Luis Unit service area. These include sites that contain exclusively prehistoric material, sites with only historic material, sites with mixed prehistoric and historic components, and structures.

Prehistoric sites are represented by habitation areas (village sites) in which both habitation and special-use activity areas are represented; mortuary sites; specialized food-procurement and food-processing sites; and other site types representing a variety of specialized activities.

Historic sites are represented by a range of types, including buildings and structures dating to the nineteenth and early through mid-twentieth centuries; historic transportation features;

water distribution systems; occupation sites and homesteads with associated features such as refuse disposal areas, privy pits, barns, and sheds; historic disposal sites associated with historic communities; and ranch complexes.

Some of these prehistoric and historic sites have been determined eligible for inclusion on the NRHP through consultation between a federal agency and the State Historic Preservation Office (SHPO). Others remain unevaluated.

In addition to formally recorded sites, it is probable that both prehistoric and historic sites remain undiscovered within the area simply because for many areas, especially on undeveloped ranch and farm lands, formal archaeological inventory surveys have not been undertaken.

Table B-17 summarizes the current cultural resources inventory in the region. The table also provides a conclusion as to whether the area is known or, if subjected to formal archaeological survey, would be likely to be discovered to contain important prehistoric or historic sites or other cultural features. This conclusion or assessment is based on (a) the results of the formal records search, (b) previous consultation with Native American groups and historical societies as summarized in existing archaeological reports and other documents, (c) the results of prior surveys in the general or immediate vicinity, and (d) an assessment of archaeological sensitivity based on stream courses and other critical variables present within unsurveyed contractor service areas.

Table B-17
Summary of Previous Studies and Cultural Properties

San Luis Unit Contractor	Recorded Sites or Landmarks	Percentage Surveyed to Date	Are Undocumented Sites Likely To Be Present in Service Area?
City of Avenal	25	9%	Yes
City of Coalinga	0	1%	Yes
City of Huron	0	0%	Yes
Pacheco Water District	12	5%	Yes
Panoche Water District	0	12%	Yes
San Luis Water District	28	5%	Yes
Westlands Water District	2	2%	Yes
Total	67		

B.5.3.2.1 Land Use and Demographics

This section describes land use and demographics for the seven federal San Luis Unit contractors.

B.5.3.2.2 Affected Environment

Land use can be defined as the human use of land resources for various purposes including economic production, natural resources protection, recreation, or institutional uses. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine allowable uses. This section discusses lands in the area at the county level and for the geographic service areas of the seven federal contractors in the San Luis Unit. A discussion of areas of Important Farmland is also included.

B.5.3.2.3 County Land Uses

The San Luis Unit contractors are located in the San Joaquin River Region of the CVP. Land uses could be affected in Merced, Fresno, and Kings Counties. The following discussion generally addresses lands located within these counties.

B.5.3.2.4 Merced County

Merced County encompasses approximately 2,020 square miles and includes 18 unincorporated communities and the six incorporated cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced. Merced is the largest incorporated city in the county.

B.5.3.2.5 Merced County Demographics

From 1980 to 1990, the population in Merced County grew by over 33 percent from 134,560 to 178,403, exceeding the average statewide increase of 26 percent. The incorporated cities grew by approximately 41 percent and the unincorporated areas by 19 percent. According to the U.S. Bureau of the Census (1998b), the population in Merced County in 1996 was 194,407.

B.5.3.2.6 Merced County Land Use

Merced County uses the “Urban Centered Concept” as a basic land use principle. The Urban Centered Concept, which directs urban development in identified centers, was revised in 1990 to include the development of unincorporated communities in the foothills on both sides of the county. This revision has fostered the planned development of subdivisions that will presumably become the urban centers for new communities in the foothills of the county.[4]

Rural areas in Merced County, which are typically used for cropping or pasturing activities, are subject to their own land use designations. When Merced County’s general plan (Merced County 1990) was developed in 1990, it was estimated that 80 percent of the population lived in the urban centers; the remaining 20 percent lived in the 95 percent of the land in the

4 Pursuant to the Merced County General Plan (Merced County 1990), full environmental review is required for a community’s specific plans for any such development that may, to the extent they are within the CVP permitted place of use, eventually rely on the CVP allocation to the agricultural water districts after the environmental review has been completed.

county that was considered rural. General countywide land use information is not readily available in the Merced County General Plan.

According to the 1997 Census of Agriculture for Merced County (National Agricultural Statistics Services 1999), there were 881,696 acres in farms, a decrease from 1,049,302 acres ten years earlier.

B.5.3.2.7 Fresno County

Fresno County encompasses nearly 6,000 square miles and includes the 15 incorporated cities of Coalinga, Clovis, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, San Joaquin, Sanger, and Selma. Over 60 percent of the population resides in the county's two largest cities, Fresno and Clovis.

B.5.3.2.8 Fresno County Demographics

According to California Department of Finance population estimates (1999), between 1980 and 1990, the population in Fresno County grew by approximately 29 percent, from 514,621 to 661,400, exceeding the average increase statewide of 26 percent. According to the U.S. Bureau of the Census (1998a), the population in Fresno County in 1997 was 754,396. The combined populations of Fresno and neighboring Clovis comprise 61 percent of the total county population and 82 percent of the population of the other incorporated cities combined (County of Fresno 2000a).

B.5.3.2.9 Fresno County Land Use

In 1997, approximately 50 percent of the county's total acreage was used for agriculture. The existing land uses in Fresno County are shown on Table B-18.

Farming and agricultural related businesses comprise a major component of the local economy. Factors that contribute to the success of agriculture include excellent soil and climatic growing conditions and the availability of a workforce and transportation. According to the 1997 Census of Agriculture for Fresno County (National Agricultural Statistics Service 1999), there were 1,881,418 acres in farms, a decrease from 1,975,373 acres in 1987.

Table B-18
Fresno County Land Uses in 1997

Land Use	Square Miles
Residential	152
Commercial	7
Industrial	11
Agricultural	2,911
Resource Conservation[1]	2,691
Unclassified[2]	11
Incorporated Cities	154
Total	5,937

Source: County of Fresno 1998

[1]Including national forests, parks, and timber preserves

[2]Includes streets, highways, and rivers

B.5.3.2.10 Kings County

Located in the southern half of the Central Valley, Kings County encompasses approximately 1,435 square miles. The county includes the four incorporated cities of Hanford, Lemoore, Corcoran, and Avenal. Approximately 67 percent of the county's population lives in the incorporated cities.

B.5.3.2.11 Kings County Demographics

According to the Kings County General Plan (Kings County Planning Department 1993), the population in the county in 1993 was approximately 111,212. This figure includes approximately 5,430 inmates at the Avenal State Prison and 5,521 inmates at the Corcoran State Prison; therefore, prison inmates made up almost 10 percent of the county's population in 1993. According to the California Department of Finance population estimates (1999), the population of the county grew to 156,000 in 2000, increasing by approximately 29 percent between 1993 and 2000.

B.5.3.2.12 Kings County Land Use

Approximately 95 percent of the land in the county is privately owned and approximately 88 percent (or 1,265 square miles) of the land was devoted to agriculture and grazing (Kings County Planning Department 1993). This includes an estimated 550,000 acres of irrigated agricultural land (Collins & Associates 1993). The county's economy has been dominated by agriculture and related industries since the county's formation in 1893. Kings County has consistently ranked among the top counties in the nation in the production of cotton, barley, and alfalfa seed. The county also produces 39 crops or products, including milk, cattle, and turkeys. According to the 1997 Census of Agriculture for Kings County (National Agricultural Statistics Services 1999), there were 656,968 acres in farms, a decrease from 775,829 acres in 1992.

General countywide land use information is not readily available in the Kings County General Plan (Kings County Planning Department 1993). There is, however, information on land available for urban development as shown in Table B-19.

Table B-19
Land Available in Kings County
for Urban Development in 1993

Land Use	Acres
Residential	1,696
Commercial	634
Industrial	1,003
Total	3,333

Source: Collins & Associates 1999

B.5.3.2.13 Farmland Categories

Table B-20 contains a description of farmland categories as defined by the U.S. Department of Agriculture, Natural Resources Conservation Service. Some of these farmland categories are found within Merced, Kings, and Fresno Counties.

Table B-20
Important Farmland Map Categories

Category	Description
Prime Farmland	Land that has the best combination of physical and chemical characteristics for producing food, seed, forage, fiber, and oilseed crops and is also available for use. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods.
Farmland of Statewide Importance	Land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production. The land must have been used for production of irrigated crops within the last three years and also meet specific criteria including soil temperature and range.
Unique Farmland	Land that does not meet the criteria for either Prime Farmland or Farmland of Statewide Importance, but that is used for the production of specific high economic value crops. It is land that has a special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality or high yields of specific crops.
Farmland of Local Importance	Land that may be important to the local economy because of its productivity.

Source: County of Fresno 2000b.

The soils in Merced County have been classified and mapped by the California Department of Conservation's Farmland Mapping and Monitoring Program. Some farmland in Merced County meets the criteria of Important Farmland as specified in Table B-20. Although the Merced County general plan (Merced County 1990) includes a map of soils meeting the above criteria, specific acreages were not included.

The soils in Kings County have also been classified and the county general plan (Kings County Planning Department 1993) includes a map of soil types. Some farmland in Kings County also meets the criteria of Important Farmland as specified in Table B-20; however, specific acreages were not included. The Kings County General Plan anticipates that 709 acres of productive farmland (or 0.09 percent of the agricultural and grazing land in the county) will be converted from agricultural production to urban uses. It is expected that some of this land would also meet the criteria of Important Farmland specified in Table B-20.

According to the California Department of Conservation and as provided in the county's general plan (County of Fresno 2000a), Fresno County has approximately 374,567 acres of Prime Farmland, 144,243 acres of Farmland of Statewide Importance, 96,724 acres of Unique Farmland, and 29,663 acres of Farmland of Local Importance.

B.5.3.2.14 Williamson Act

The California Land Conservation Act of 1965 (more commonly known as the Williamson Act) established a voluntary tax incentive program for preserving both agricultural and open space lands. The act reduces property taxes in return for the guarantee that the property will remain in agriculture for not less than 10 years, thereby slowing down the conversion of agricultural land. Under the act, property owners enter into 10-year contracts with their respective counties. The county then places restrictions on the land in exchange for tax savings. The property is then taxed according to the income it is capable of generating from agriculture and other compatible uses, rather than being taxed on its full market value. The contract is automatically renewed annually after the first 10 years, unless a written request, called a Notice of Non-Renewal, is prepared.

In Fresno County, 1,494,454 acres of farmland are within Williamson Act agricultural preserves that are located predominantly in unincorporated areas of the county (County of Fresno 2000a). Merced County also has land in Williamson Act contracts, but the specific number of acres is unknown. Merced County first opted to participate in the Williamson Act in 2000; therefore, the number of acres subject to the act is only beginning to increase. It can be assumed that in the future, Merced County will have proportionally as much participation in the Williamson Act as nearby counties. Kings County also has land in Williamson Act contracts, but the specific number of acres is unknown.

B.5.3.3.1 Recreation

This section describes recreational opportunities in and around the San Luis Unit.

B.5.3.3.2 Affected Environment

Recreation sites in an around the San Luis Unit include San Luis Reservoir, Los Banos Reservoir, Little Panoche Reservoir, the O'Neill Forebay, SLC, the San Joaquin River, and the wildlife refuges located near the San Luis Unit.

B.5.3.3.3 Reservoirs

San Luis Reservoir, the adjacent O'Neill Forebay, and Los Banos and Little Panoche Reservoirs provide reservoir-related recreational resources in or near the study area. San Luis Reservoir and the O'Neill Forebay are located west of Interstate 5 near State Route 152. Los Banos Reservoir is located southwest of the town of Los Banos and Little Panoche Reservoir is located south of Los Banos.

B.5.3.3.4 San Luis Reservoir

When full, San Luis Reservoir covers approximately 12,700 surface acres. Recreational activities include boating, water-skiing, fishing, picnicking, camping, hunting, and hiking. Reservoir facilities consist of one campground and two concrete boat ramps and boarding docks. The reservoir has no designated swimming or lakeside beach areas. Boat and shore fishing occur throughout San Luis Reservoir. Migratory waterfowl hunting is permitted on most of the reservoir. Hunting for deer and wild pig is also allowed on the northwest shoreline of the San Luis Reservoir State Recreation Area.

An estimated 210,000 twelve-hour recreation visitor-days were reported in 1992 for the San Luis Reservoir. Water-enhanced activities account for the largest portion of reservoir use. Relaxing and camping are the most popular of the water-related activities. Seventy-seven percent of annual use occurs between April and September. The majority of visitors are from the Bay-Delta (38 percent) or San Joaquin Valley areas (27 percent) (DWR 1987).

San Luis Reservoir
Source: USBR

Recreation at the reservoir is optimized at a pool elevation 544 feet above mean sea level. Use of the two boat ramps becomes impaired between 340 and 360 feet above mean sea level. Swimming activities are unaffected by reservoir surface water fluctuations because the reservoir has no designated swimming facilities.

B.5.3.3.5 Los Banos Reservoir

The Los Banos Reservoir has a capacity of 34,600 acre-feet and protects the City of Los Banos and adjacent areas from damaging floods. Los Banos Reservoir provides recreation facilities for picnicking, camping, swimming, fishing and boating. In 1989-1990, it had an estimated 24,200 non-hunting recreation visitor-days and an estimated 4,900 hunting recreation visitor-days.

B.5.3.3.6 Little Panoche Reservoir

The Little Panoche Reservoir has a capacity of 5,580 acre-feet and detains floodwater collected over 81.3 square miles of mountainous drainage area. Its limited recreational facilities are considered undeveloped, but allow camping and hunting. In 1989-1990, Little Panoche Reservoir had an estimated 3,600 non-hunting recreation visitor-days and an estimated 840 hunting recreation visitor-days.

B.5.3.3.7 O'Neill Forebay

The O'Neill Forebay, immediately east of San Luis Reservoir, covers about 2,700 surface acres when full and was developed in part to accommodate recreational use that may be lost when San Luis Reservoir is drawn down. The O'Neill Forebay received approximately twice the recreation visitor-days (417,000) as San Luis Reservoir in 1992. Recreational facilities at O'Neill Forebay provide more diverse recreational opportunities than those at San Luis Reservoir. The most popular activities are swimming, wading, and relaxing. The majority of visits occur between April and September. Visitor origins include San Luis Reservoir, coastal and bay counties to the west, and valley and foothill counties to the east.

Recreational facilities consist of two boat ramps, two picnic areas, a campground, and a swimming area. Forebay recreational features also include the Medeiros recreation area, which provides picnicking, camping, and boat ramp access, and the San Luis Creek day-use area, which provides picnicking, swimming, and boat ramp access. Facilities accommodate boating, fishing, swimming, wading, camping, and sightseeing. In addition, the O'Neill Forebay is nationally known for windsurfing.

Recreational use at O'Neill Forebay is generally unaffected by water level fluctuations because pool elevations are usually maintained at constant levels. However, minor drops in surface elevation may affect beach use because a relatively large amount of the shoreline would be exposed.

B.5.3.3.8 San Luis Canal

Fishing access is provided along 343 miles of the 444 mile long SLC. Most of the 279 mile portion of the SLC that passes through the San Joaquin River Region is accessible for fishing. In this area, 12 fishing access sites provide parking areas and toilet facilities.

San Luis Canal
Source: California Department of Water Resources

An estimated 61,000 visitor-days were reported at the SLC for fishing in 1991. The majority of the fishing occurs along the access roads running alongside the canal, away from designated fishing sites. No water-dependent uses other than fishing are allowed.

B.5.3.3.9 San Joaquin River

The San Joaquin River is approximately 100 miles long and extends from Millerton Lake to the Delta. While there are no major recreation features associated with the San Joaquin River in the vicinity of the San Luis Unit, public access exists at several road and state highway crossings.

Recreational use estimates for the 100 miles of the lower San Joaquin River are not available. However, based on information provided for recreation sites on the river, boating and fishing activities are estimated to total about 157,000 six-hour recreation visitor-days (California

Department of Parks and Recreation 1990). Most of the San Joaquin River visitors are assumed to originate from nearby counties.

Recreational use on the San Joaquin River has been substantially affected by operation of Millerton Lake and diversions from the Merced and Chowchilla Canals east of the Mendota Pool. The San Joaquin River flow is somewhat intermittent downstream of the Mendota Pool to the Merced River confluence, with flows fed mainly by irrigation return flows.

B.5.3.3.10 Salt Slough

Within the San Luis National Wildlife Refuge, fishing in Salt Slough is permitted during daylight hours. Fishing is by rod and reel only and the taking of frog, crayfish, turtles, snakes, and all other wildlife is prohibited. Outside the refuge, people fish near the Lander Avenue Bridge. Fish species include bass and catfish.

B.5.3.3.11 Mud Slough

Fishing is not officially permitted at Mud Slough. “No Fishing” signs have been posted at Mud Slough to protect people from ingesting high levels of selenium. Catfish is the primary fish caught at Mud Slough.

B.5.3.3.12 Wildlife Refuges

Recreational activities at national wildlife refuges and wildlife management areas can be affected by water supply. Wildlife refuges in the vicinity of the San Luis Unit include the San Luis and Merced National Wildlife Refuges, which are owned and operated by the USFWS, and the Volta and Los Banos Wildlife Management Areas, which are owned and operated by the California Department of Fish and Game.

Recreation facilities in the national wildlife refuges and wildlife management areas are primarily designed to enhance wildlife observation. Recreational facilities are limited at the San Luis and Merced National Wildlife Refuges. Camping is permitted at staging areas on the national wildlife refuges during hunting season only. Camping at the Volta or Los Banos Wildlife Management Areas is not allowed.

Most recreational activities on the refuges are wildlife-dependent. They include non-consumptive uses (e.g., wildlife observation) or consumptive uses (e.g., hunting). About 15 percent of the visitors originate from the local area. Recreational activities at the refuges are associated with the presence of wildlife, primarily waterfowl, and accordingly, visitation peaks in winter when waterfowl are present. Waterfowl hunting is permitted at the wildlife management areas and the national wildlife refuges. Fishing is permitted at the San Luis National Wildlife Refuge. Management regulations designed to minimize wildlife disturbance at the refuges include limiting public access to certain time periods and not providing facilities that would extend recreation beyond existing boundaries and limits for observation.

B.5.3.3.13 Private Hunting Clubs

The 176 private waterfowl hunting clubs in the San Joaquin River Region cover about 96,800 acres. About 33,900 acres are flooded annually. Waterfowl hunting was estimated at 241,000 hunter-days in 1992.

B.5.3.4.1 Sociological Resources

This section summarizes the socio-economic make up of the San Luis Unit.

B.5.3.4.2 Affected Environment

The study area includes the geographic service areas of the CVP water contractors within the San Luis Unit. The service area runs roughly along the Interstate 5 and SLC corridor from the San Luis Reservoir in Merced County in the north, through part of Fresno County, to the city of Avenal in Kings County to the south.

Income and employment information from the U.S. Department of Commerce, Bureau of Economic Analysis was available by industry for 1998. In terms of both earnings (as measured by wages and proprietor earnings) and employment, the largest industries in Merced, Fresno, and Kings Counties were services, retail trade, manufacturing, and government.

Total earnings by major industry for each of the three counties are shown in Table B-21.

Table B-21
1998 Total Earnings by Industry by County[1]
(thousands of dollars)

Industry	County		
	Merced	Fresno	Kings
Farm Income[2]	$317,439	$554,061	$97,808
Agricultural Services, Forestry & Fishing	90,821	581,149	57,701
Mining	888	14,431	B[3]
Construction	95,963	668,436	49,679
Manufacturing	383,958	1,006,513	126,619
Transportation & Public Utilities	134,501	651,665	43,537
Wholesale Trade	71,671	616,834	40,898
Retail Trade	227,704	1,067,575	121,678
Finance, Insurance & Real Estate	79,922	702,235	B[3]
Services	357,590	2,578,764	190,284
Government	418,045	2,203,822	576,299
Total	$2,178,502	$10,645,485	$1,330,634

Source: U.S. Department of Commerce 1998a
[1]Includes wages, other labor income, and proprietor income.
[2]Farm income consists of proprietors' income; the cash wages, pay-in-kind, and other labor income of hired farm workers; and the salaries of officers of corporate farms.
[3]Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Total employment by major industry for each county is shown in Table B-22.

Table B-22
1998 Total Employment by Industry by County[1]
(number of jobs)

Industry	County		
	Merced	Fresno	Kings
Farm Employment	12,086	34,620	6,604
Agricultural Services, Forestry & Fishing	4,798	41,266	4,322
Mining	52	456	B[2]
Construction	3,074	19,202	1,444
Manufacturing	13,012	28,847	3,410
Transportation & Public Utilities	3,597	15,633	1,152
Wholesale Trade	2,162	16,654	1,126
Retail Trade	13,439	60,941	7,050
Finance, Insurance & Real Estate	4,161	25,906	B[2]
Services	15,353	98,520	8,248
Government	12,506	56,770	14,199
Total	84,240	398,815	49,250

Source: U.S. Department of Commerce 1998b
[1]Includes full-time labor, part-time labor, and proprietor employment.
[2]Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Agriculture is also a very important industry. If taken together, the farm and agricultural services sectors are important to all three counties. Agriculture takes on additional significance because it is generally considered a primary industry (along with mining and manufacturing). A reasonably large portion of activity in non-primary industries can be attributed to support for primary industry activity in an area. Changes in primary industry activity, therefore, usually precipitate additional changes in non-primary or support industries.

Population data could be most closely related to the study area by aggregating individual census tract information. Population and ethnicity breakdowns were available by census tract for 1990. The California Department of Finance develops population and ethnicity estimates and projections at the county level. Implied growth rates from the California Department of Finance's county estimates were applied to the 1990 tract information to generate estimates and projections from 1990 through 2026 for the aggregated tracts. The following census tracts were used to simulate the San Luis Unit's service area.

- Fresno County: Tracts 78, 79.98, 80, 82, 83, 84.02.
- Merced County: Tract 21.98.

- Kings County: Tracts 3, 16, 17.

Table B-22 shows the estimated and projected population and ethnicity in the San Luis Unit service area. As shown in Table B-22, the Hispanic community makes up a large proportion of the regional population. It is estimated that over 63 percent of the regional population was identified as Hispanic in 2000 and that the percentage will rise to over 76 percent by 2025.

Table B-22
Population and Ethnicity-San Luis Unit Study Area[1]

Year	Population				
	White	Black	Other	Hispanic[2]	Total[3]
1990	27,275	4,842	27,908	34,453	60,025
1995	28,754	5,551	35,983	40,754	67,253
2000	29,639	6,498	41,628	46,428	73,174
2005	30,862	7,241	48,940	52,923	80,257
2010	32,003	8,079	56,382	60,010	87,702
2015	33,015	9,054	63,309	67,309	95,193
2020	34,080	9,930	71,950	76,697	104,231
2026	35,078	10,809	80,993	86,896	113,820

Source: U.S. Census Bureau 1990
[1]Estimated and extrapolated from aggregated census tract data.
[2]Hispanic population is also counted as White, Black, or Other.
[3]Equals the sum of White, Black, and Other.

In addition to the information provided above, regional income, employment, and population can be affected by changes to the availability, cost, or profitability of agricultural resources, recreational resources, power resources, and M&I water resources.

B.6.0 REGIONAL ECONOMIC CONDITIONS AND TRENDS

B.6.1 Economic Characteristics of the Westside Region

The Westside analysis region includes two distinct economies and each is affected by CVP water supply differently. The South Bay and Central Coast portion of the Westside Region includes the most southern part of the San Francisco Bay urban area and some less urban areas in San Benito and Santa Clara counties. Most CVP water use in this region is for M&I purposes and the CVP water supply is a small but important share of all water use in the region.

The west San Joaquin Valley is a highly agricultural region. There are no large cities or industries in the region to provide an alternative economic base. The economy of this region is predominately agricultural production and therefore, the availability of CVP agricultural water is an essential element to the economic health of the region. Smaller amounts of CVP water are used for M&I purposes and refuge water supply. Most water use is for agriculture and the CVP provides a large share of all water used in the region. The total amount of CVP water used in the San Joaquin Valley is roughly ten times the amount of use in the South Bay and Central Coast. The amount of CVP refuge water use alone is more than all CVP water use in the South Bay and Central Coast.

B.6.2 West San Joaquin Valley

The west San Joaquin Valley includes parts of Fresno, Kings, Merced, San Joaquin and Stanislaus counties. Depending on water supply conditions, about 800,000 acres are partially or solely irrigated with CVP water. Other economic base industries include travel on the Interstate-5 corridor, some petroleum extraction and tourism. Wetlands benefit the local economies by attracting hunters, naturalists, and bird-watchers.

M&I water use, which is a small share of total water use in the region, occurs in about a dozen locations. M&I water use is described in more detail in Section 3. The largest M&I use areas based on January 2002 populations are the cities of Tracy (65,643), Avenal (14,827), Coalinga (14,827), and Huron (6,919). Tracy has recently grown at a rapid pace, becoming a suburb for commuters to the Bay Area. Total population of the Westside Central Valley region in 2000, based on population data by census tract, was about 209,000 persons as shown in Table B-24. The 2002 population data from California Department of Finance suggests that the regional population could now be close to 250,000 persons.

The other towns within or adjacent to the Westside have economies greatly related to agricultural production. These towns include San Joaquin, Tranquility, Mendota, Firebaugh, Dos Palos, Los Banos, Santa Nella, Newman, Gustine, Crows Landing, and Patterson. All of these communities are strongly affected by the reliability of CVP agricultural water. Some of them are dependent upon agricultural water from the CVP for M&I use and most are experiencing dramatic rates of growth and urbanization. The municipal use of CVP agricultural water is forecasted to increase from approximately 6,200 AF to 12,700 AF by 2025.

TABLE B-24
2000 Population of West San Joaquin Valley

County	Population
Fresno	53,197
Kings	14,751
Merced	45,584
San Joaquin	69,802
Stanislaus	25,769
Total	**209,103**

Source: USDC, Bureau of the Census, 2001. 2000 Census of Population.

B.6.3 Disadvantaged Communities Within the West San Joaquin Valley

The Westside of the San Joaquin Valley supports a high percentage of disadvantaged individuals and families. Overall, three of the five counties that contain the West San Joaquin Valley region have median household incomes that are less than 80% of the statewide average of $49,493 in 2000.

Twelve of the twenty-three census tracts which make up the West San Joaquin area are below 80% of the state median household income ($37,994) as shown in Table B-25. Even within those areas nearer to the statewide median there remain significant numbers of economically disadvantaged persons. Recent suburban developments in Westside cities proximate to the South Bay Area have brought in a more affluent resident whose employment is generally out of the county and the Westside region. This tends to skew average numbers and masks the number of low-income households.

Table B-25
Median Household Income and Hispanic/Latino Population Percentage
West San Joaquin Valley

County/Census Tract	Median Household Income	Percent Hispanic or Latino Population
San Joaquin		
40.01	$ 30,000	44.9%
39	$ 40,804	71.0%
52.02	$ 52,500	24.2%
55	$ 43,813	23.3%
Stanislaus		
33	$ 36,250	58.3%
32.02	$ 50,531	51.0%
32.01	$ 47,219	63.9%
34	$ 32,266	51.2%
35	$ 40,598	50.1%
Merced		
20	$ 39,426	36.3%
21	$ 33,491	53.9%
22.02	$ 48,944	53.2%
23.01	$ 54,858	26.2%
23.02	$ 48,300	49.7%
Fresno		
84.02	$ 27,147	64.3%
84.01	$ 30,817	87.5%
83.02	$ 25,241	93.6%
82	$ 27,164	85.4%
79	$ 34,979	74.0%
80	$ 38,298	41.3%
78	$ 27,127	75.7%
Kings		
17.01	$ 29,375	65.9%
16.01	$ 28,310	72.2%

The area is also home to a high Hispanic or Latino population, which is greatly dependent upon agricultural production as a source of employment. Where countywide, the percentage of Hispanic population to the total runs from a low of 30.5% in San Joaquin County to 45.3% in Merced County, Hispanic populations in the Westside of the Valley are usually the majority in a given area and run as high as nearly 94% of the population.

Improving the water supply reliability and otherwise enhancing the conditions for production agriculture in this region will expand source of employment opportunities for these disadvantaged populations.

B.6.4 South Bay and Central Coast

The portion of the Regional analysis not within the Central Valley includes Santa Clara County and San Benito County. M&I water use is a large share of all water use in this area of the Region. Santa Clara Valley Water District serves most of the urbanized land in the region. M&I water use is described in detail in Section 3. Santa Clara Valley is world-renowned as the home of "Silicon Valley." Major cities in Santa Clara and San Benito counties and their 2002 populations are San Jose (917,971), Sunnyvale (132,825), Santa Clara (104,306), Palo Alto (60,487), Milpitas (63,768), Cupertino (52,235), and Saratoga (30,444). Regional population in 2002, including San Benito County, was 1.78 million (California Department of Finance, 2002).

In 2000, median household income in Santa Clara County was among the highest in the nation at $74,335 or 156% of the statewide average. The cost of living in the region is also among the highest in the nation. A significant portion of the workers in Santa Clara County commute from locations as far north as San Francisco, as far south as Monterey and as far east as Los Banos. The south portion of Santa Clara County and San Benito County are more agricultural. CVP agricultural water is directly or indirectly used for irrigation of about 50,000 acres. Important towns in San Benito County include Hollister (36,338), Morgan Hill, and Gilroy.

SECTION C: PLAN OBJECTIVES

C.1.1 REGIONAL OBJECTIVES

The 2005 Westside Integrated Water Resources Management Plan is a Regional blueprint that guides resource management in the context of environmental and socioeconomic factors. The Plan identifies alternatives to reduce the imbalance between water demand and supply while improving environmental and socio-economic status through a series of drainage, flood control, groundwater management, land use, water conservation, water quality, water supply, water use efficiency proposals. The overarching goal of the Plan is to minimize Regional conflict by addressing the most problematic sources of tension affecting our agricultural, municipal, and environmental water use, namely water supply reliability, drainage, and water quality.

The Plan's evolution over the last several years has been iterative and driven by stakeholder interest in minimizing Regional conflict while maximizing resource efficiency and effectiveness. The Plan is reactive to the ever changing regulatory climate, such as implementation of the CVPIA, water quality regulations in the San Francisco Bay/Sacramento-San Joaquin Delta (the Delta or Bay-Delta), and ESA provisions, all of which have significantly reduced CVP water supply reliability in the region, while remaining responsive to the progressive needs and imaginations of the local stakeholders.

In attempting to alleviate the chronic water shortages faced by the region, the Water Authority recognizes the importance of employing a variety of water management strategies. Given the Water Authority's diverse membership, it becomes imperative to Regionally address multiple opportunities and needs simultaneously. For example, ameliorating water shortages requires pursuing supply augmentation, conveyance expansion, groundwater management, storm water management, conservation, recycling, conjunctive use, water importation, surface storage, and transfers concertedly, as no single solution can sufficiently close the water supply gap. In addition, as opportunities are realized, consideration must be given to how best balance a project's benefits so as to attend to the diverse obligations of our membership to provide water supply reliability, habitat protection, recreation, water quality improvement, and wetlands enhancement. In this regard, each project becomes an equation carefully calculated to match the opportunities created by some stakeholders with the needs of others.

The State has developed a series of water management strategies and desired outcomes that are closely aligned with the objectives of the Region. Many of the items on that list are actions we have already undertaken and intend to further advance through continued implementation of the Plan. To illustrate the similarities this Plan examines the parallel between the State's goals and our Regional objectives.

C.1.2 Ecosystem Restoration

Objective #1: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation.

Examples from the Plan include: The San Joaquin River – DMC Pipeline Connection will provide operational flexibility essential in minimizing Delta conflict associated with fishery restoration efforts. The Westside Regional Drainage Plan eliminates agricultural discharge to the San Joaquin River thereby improving water quality in the affected ecosystem. The San Luis Reservoir Low-Point Improvement Project, though currently only in the appraisal phase, has scoped new ecosystem restoration potential.

C.1.3 Environmental and Habitat Protection and Improvement

Objective #2: Develop Regional solutions that protect environmental and habitat concerns and provide potential for improvement.

Examples from the Plan include: The Level 2 & Level 4 Refuge Water Supply Diversification Program will develop new and predictable water supplies through well development to provide water critical for wildlife habitat cultivation within the Region's refuges. The Pleasant Valley Groundwater Banking could provide storage for surplus supplies held by federal or state wildlife agencies for later extraction. The Westside Regional Drainage Plan will eliminate agricultural discharge to the San Joaquin River improving the quality of habitat along its course.

C.1.4 Water Supply Reliability

Objective #3: Improve south-of-Delta water supply reliability by an average of 25%.

Examples from the Plan include: The Westside Regional Drainage Plan furthers conservation through source control and water use efficiency, water recycling through recirculation and blending of drain water for primary irrigation purposes, and supply development through water treatment. The San Luis Reservoir Low-Point Improvement Project maximizes the operational flexibility of the existing facility by eliminating non-structural constraints. The Westside Surface Storage Reservoir Project provides an essential buffer against dry year shortages by preserving the utility of wet year supplies.

C.1.5 Flood Management

Objective #4: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially.

Examples from the Plan include: The West Stanislaus Flood Control Project studies the use of multi-purpose detention basins to reduce flood damage in Newman, Patterson and surrounding agricultural lands. The Arroyo Pasajero Flood Control Project considers a mix of existing features modification and construction of new facilities to better control periodically inundating flows that jeopardize the SLC, Interstate 5, and thousands of acres of highly productive farmland.

C.1.6 Groundwater Management

Objective #5: Maximize utility of Regional aquifers while reducing potential for overdraft.

Examples from the Plan include: The San Joaquin River – DMC Pipeline Connection provides operational flexibility that could alleviate reliance on groundwater. The Pleasant Valley Groundwater Banking project maximizes potential of a confined aquifer. The Westside Regional Drainage Plan strategically extracts groundwater in order to minimize the hydraulic pressure affecting tile drains.

C.1.7 Recreation

Objective #6: Consider recreational potential in project development.

Examples from the Plan include: The Level 2 & Level 4 Refuge Water Supply Diversification Program provides water critical for wildlife habitat cultivation, which can be enjoyed by naturalists, bird watchers, and hunters alike. The West Stanislaus Flood Control Project contemplates a recreational benefit through the development of multi-purpose detention basins.

C.1.8 Storm Water Management

Objective #7: Capture storm water for higher beneficial use whenever practicable.

Examples from the Plan include: The Westside Regional Drainage Plan could diminish the discharge of storm flow by directing it through its reuse areas. The San Joaquin River – DMC Pipeline Connection could capture excessive San Joaquin River flows whenever feasible. The Pleasant Valley Groundwater Banking project could provide important storage of captured storm flow for use at more advantageous times.

C.1.9 Water Conservation

Objective #8: Always promote and enhance water conservation.

Examples from the Plan include: The Southwest Stanislaus County Regional Drainage Management intends on conserving water by developing a system to recover operational spills and tail water. In addition to reuse and recirculation, the Westside Regional Drainage Plan implements source control projects that will replace furrow irrigation with micro-irrigation technology and line earthen delivery canals. The West Stanislaus Flood Control Project will explore the potential of storing uncontrollable storm flow for later beneficial use.

C.1.10 Water Quality Improvement

Objective #9: Develop Regional solutions that provide opportunity for water quality improvement.

Examples from the Plan include: The Westside Regional Drainage Plan eliminates the discharge of agricultural drainage from the solution area thereby providing ecosystem and water quality benefits in the San Joaquin River and Delta. The Southwest Stanislaus County Regional Drainage Management project could capture for reuse approximately 20,000 AF of agricultural drainage annually. The San Joaquin River – DMC Pipeline Connection could improve Regional water quality by introducing high quality Central Sierra Nevada water into the system.

C.1.11 Water Recycling

Objective #10: Always promote and enhance water recycling.

Examples from the Plan include: The Southwest Stanislaus County Regional Drainage Management project's desilting and tail water recovery reservoir allows water to be recycled back through the system. The Westside Regional Drainage Plan incorporates water treatment strategies to develop high quality water that can once again be applied to primary irrigation lands.

C.1.12 Wetlands Enhancement

Objective #11: When possible, align projects to complement existing wetlands.

Examples from the Plan include: The Westside Surface Storage Reservoir project is located near the Mendota Wildlife Area and could provide habitat for migratory birds

C.1.13 Conclusion of Objectives Comparison

In all respects, the Westside Integrated Water Resources Plan corresponds well with the State's desired outcomes. In addition, the Plan complements federal goals and other water related objectives articulated in such documents as the CALFED Programmatic Record of Decision, CVPIA, California Water Security and Environmental Enhancement Act, and the Delta Improvements Package.

C.2.1 PLAN DEVELOPMENT

All of the projects incorporated in the Plan began locally and, through the open participation forums sponsored by the Water Authority and other organizations, local projects often evolve into Regional solutions. For example, the Westside Regional Drainage Plan was conceived by a group of individual landowners that began talking among themselves about their particular problems. As they began discussing potential solutions, local agencies' staffs were drawn in to the dialogue along with outside consultants. Ultimately the Water Authority was approached to facilitate the process and a definitive, comprehensive solution was developed. This approach to problem solving is typical within our Region.

Regional objectives have been developed in much the same way. Often, while Water Authority working groups or committees are considering a matter at hand, divisional representatives share local experiences and ideas. In hearing local perspectives, other divisional representatives may begin contemplating how a project in San Joaquin County may alleviate a problem in Kings County; and so a solution is born. As a project evolves, the dialog passes from the informal committees to the formal Committees and ultimately the Board. If an action is adopted, then the discourse expands to other Regional and non-regional entities as appropriate. The inverse is also true, wherein the flow of ideas may emanate from outside the Water Authority through various conduits of communication, which may result in the adoption of projects or objectives of external genesis. In this fashion, Regional objectives are assessed frequently and iteratively, which fosters robust projects capable of adjusting as Regional priorities change. As a result, the Plan reflects a diverse knit of mutually beneficial solutions.

Indicative of the process, the Plan examines a broad array of issues, including water conservation potential, changes in land use, and measures to ameliorate drainage problems while improving ecosystem and drinking water quality affecting the lower San Joaquin River and Delta. The Plan illustrates the economic effect related to Regional utilization of the CVP water supply and generally contemplates the effect on local communities and the environment via implementation of water management options. The Plan also documents the potential use of water, existing supplies, which have significantly diminished over the last fifteen years, as well as existing and future water demands. Documenting potential water supply is a necessary step toward maximizing integration in that measuring the problems provides the greatest opportunity to develop comprehensive solutions.

SECTION D: WATER MANAGEMENT STRATEGIES

D.1.0 PROJECT SELECTION & COMPLEMENT

The Plan is a collection of projects intended to support progress toward achieving the objectives of the Region. The breadth of Regional objectives is such that they cannot be accomplished through implementation of a single project. The Plan therefore establishes a menu of complementary projects. While individually worthy, the integration of projects otherwise pursued independently allows for the maximization of a project's benefit, while providing the best opportunities available to realize the objectives of the Region.

The Plan identifies alternatives to reduce the imbalance between water demand and supply while improving environmental and socio-economic status through a series of drainage, flood control, groundwater management, land use, water conservation, water quality, water supply, water use efficiency proposals. The overarching goal of the Plan is to minimize Regional conflict by addressing the most problematic sources of tension affecting our agricultural, municipal, and environmental water use, namely water supply reliability, drainage, and water quality. The Plan is flexible and responsive to changing circumstances. The projects are not intended to be interdependent from the standpoint of implementation so as to avoid the potential failing of a project from disrupting progress toward the Plan's objectives. The Plan's progress is therefore measured by the implementation of its projects, which are selected on the basis of their perceived ability to add Regional value through incremental progress toward the Regional objectives. To illustrate, the Arroyo Pasajero Flood Control Project provides a needed flood control solution but offers no wetlands enhancement, a benefit derive through implementation of the Level 2 & Level 4 Refuge Water Supply Diversification Program, which offers no progress toward water quality improvement; that can be found in the Westside Regional Drainage Plan.

The projects incorporate various strategies, the complexity and interdependency of which are relative to the projects' desired outcomes, as defined by its stakeholders, and level of development. Stakeholder participation and project development is discussed in greater detail in other sections of this Plan. For the following projects, the strategies understood at this time are generally described. For some projects, such as the San Luis Reservoir Low-Point Improvement Project, the strategies are still being developed. For others, such as the Westside Regional Drainage Plan, the strategies are well defined and interdependent technically, financially, and politically.

D.2.0 ARROYO PASAJERO FLOOD CONTROL PROJECT

D.2.1 Project Need

The Arroyo Pasajero River inundates the Huron area during flood events and causes severe damage to Highway 269, to thousands of irrigable acres within Westlands and of most concern, to the California Aqueduct - a main source of irrigation and drinking water for southern California. In 1995, a major flood event washed out a bridge on Interstate 5 resulting in the loss of life and significant damage to the Aqueduct.

D.2.2 U.S. Army Corps of Engineers Alternative

In 1999, the U.S. Army Corps of Engineers (Corps) released a flood study on the Arroyo Pasajero that proposed the construction of the Gap Dam. The project would resolve the flood threat and provide up to 50,000 AF of storage. Unfortunately, several agencies opposed the project due to concerns over potential wildlife corridor impacts. In addition to the Gap Dam proposal, the Corps included an alternative that proposed the following:

a) Enlargement of the Westside Retention Basin located west of the California Aqueduct;

b) Modification of structures to allow Arroyo Pasajero floodwaters into the California Aqueduct;

c) Construction of a turnout structure near Kettleman City to divert water out of the California aqueduct and finally;

d) Construction of a surface water detention basin on lands within the Tulare lakebed.

Ultimately, the Corps decided the project’s cost-to-benefit ratio was not high enough to support Federal funding or further design. DWR has assumed the Corps’ role is continuing to develop the project as outlined above. Although this project will protect the aqueduct from major flood events, it fails to address the following: (i) inundation of irrigable lands west of the aqueduct, (ii) shallow groundwater problems resulting from water being stored and percolated west of the aqueduct and (iii) most importantly, still allows flood flows which carry silt, asbestos and other constituents into the aqueduct.

D.2.3 Westlands Water District Alternative

Since the DWR and Corps proposals fails to address all of the major issues involved in the problem, Westlands has developed its own alternative that could prove to be less expensive and more efficient. . Westlands proposal consists of the following project features:

a) Enlargement of the Westside Retention Basin similar to the DWR/Corps proposal;

b) Construction of a siphon under or a flume across the California Aqueduct to prevent flows from entering the aqueduct;

c) Construction of diversion channel to convey water from the California Aqueduct to a detention basin;

d) Construction of an Eastside detention basin on lands that Westlands has acquired or will acquire in the future.

D.2.4 Preliminary Project Design

Both the DWR and Corps proposal and Westlands alternative recommend expansion of the Westside Detention Basin. Westlands' proposal then consists of construction of a siphon under or a flume over the California Aqueduct near the Gale Avenue inlet structure. The inlet structure will remain and only be used for those events that exceed the 100-year design event. The siphon or flume will convey water across the aqueduct and to a flood diversion channel originating on the Westside of the aqueduct. The seven mile long channel will be earth lined and vegetated for erosion control since the channel will have approximately 100 feet of elevation fall. The channel will be designed to carry the 100 year flood event assuming a constant flow rate from the Westside Detention basin and will be designed so all flows are sub-critical to avoid channel erosion. The channel will terminate at the Eastside Detention basin located on approximately 12 sections, 7,680 acres. The basin will be constructed using material on site to minimize construction costs. The levees will be constructed along the 210 feet through 240 feet land elevation contours and have a total storage of approximately 45,000 acre-feet. The basin will likely fill from the northeast section and back-fill southwesterly.

D.2.5 Preliminary Project Operations

The project design will allow flood operations to be flexible based on the size of a given flood event. During small flood events, water can be detained in the Westside Detention basin where it will cause no damage. The water can be stored or diverted to the Eastside Detention basin where it can be stored for evaporation or be used to provide water supply to adjacent lands. During large storm events, stream flows will be diverted into the Westside Detention basin where the large peak events will be attenuated. During these events, water will be discharged at a constant rate under/across the aqueduct, into the diversion channel and then to the Eastside detention basin. In addition to the storage that the Eastside Basin will provide, a connection can be made to the Tulare Lake Basin Water Storage District Lateral "A" canal to allow the basin to be drained to the canal where the floodwater can be beneficially used for irrigation. In addition, Westlands could pump the supply from the basin into its distribution system where the water could be beneficially used as well.

D.2.6 Cost Comparison

Westlands expects its proposal to be less expensive than the DWR/Corps proposal. Most importantly, the lands where the proposed Eastside Detention basins would be sited have been acquired by Westlands, thereby minimizing acquisition costs. The costs necessary for the Detention basin would be the construction of levees and outlet structures. In addition, the diversion channel has a significant gradient which will result in a reduced cross section thereby reducing the easements and rights-of-ways to be acquired. Additionally, the channel can be earthen lined and vegetated to reduce the channel cost compared to concrete lining.

The only remaining cost is the construction of a siphon under or flume over the California Aqueduct. Until the operation is finalized, the size of the siphon or flume cannot be determined.

The cost that has not been developed between the two proposals is the additional cost for the DWR proposal for desilting the aqueduct and delivery reductions after major flood events. With the Westlands proposal, the aqueduct will remain in service and not be affected by flood flows. However, the DWR proposal will still result in flood flows entering the aqueduct that will require downstream deliveries to be suspended and after a flood event, the aqueduct will have to be cleaned of silt, debris and other constituents.

D.3.0 ARROYO PASAJERO GROUNDWATER BANKING PROJECT

D.3.1 General Summary

There is some potential for groundwater storage in the upslope areas or western portion of the Westside region. Westlands, with assistance from DWR, has investigated groundwater storage potential in the Arroyo Pasajero fan, in the Cantua Creek area and other locations within the boundaries of the water district. Westlands was granted $72,000 from AB303 funds to investigate conjunctive use potential. The District has completed a Proposition 13 grant application for $9.5 Million to construct a groundwater conjunctive use project on the Arroyo Pasajero fan that has an estimated 50,000 acre-foot annual capacity.

D.4.0 LEVEL 2 & LEVEL 4 REFUGE WATER SUPPLY DIVERSIFICATION PROGRAM

D.4.1 Program Background and Purpose

The CVPIA, Subsection 3406(d) provides for specific “level 2” annual deliveries of water from the CVP for wildlife refuges. CVPIA directs the Secretary to “*endeavor to diversify sources of supply in order to minimize possible adverse effects*” of the delivery of this water upon CVP contractors. CVPIA also provides for specific “level 4” deliveries of water to supplement the level 2 supplies, which are to be “*acquired by the Secretary . . . through voluntary measures . . . which do not require involuntary reallocations of project yield.*” *“The Secretary is authorized and directed to construct or to acquire from non-Federal entities such water conveyance facilities, conveyance capacity, and wells as are necessary to implement the requirements of this subsection.”*

PL 108-361 (California Water Security and Environmental Enhancement Act) codifies the diversification directive by including “*actions to diversify sources of level 2 refuge supplies and modes of delivery to refuges”* in its “Description of Activities Under Applicable Law” section.

D.4.2 Well Development Program

The Level 2 & Level 4 Refuge Water Supply Diversification Program is a multi-agency cooperative program to scope out and develop wells for the dual benefit of diversifying Level 2 refuge supplies and providing for a long-term, affordable and reliable source of Level 4 refuge supplies. The diversification of level 2 refuge supplies frees up a like amount of CVP water for other CVP purposes. Areas within the Water Authority region have been identified as potential sites for well development for this purpose. Criteria for potential sites include sustainable groundwater availability, access to conveyance facilities, quality, quantity and price.

The Program will be implemented in phases. The initial phase is a pilot program that includes the development and monitoring of two wells. Depending on the results of the pilot program we anticipate development of 2-5 wells annually. The water that is produced through the Program will be split equally between level 2 diversification and level 4 supplies.

It is anticipated that the Program will be funded by CVP contractors. The facilities will be turned over to the USBR for ownership and integration with the CVP.

D.4.3 Status of the Program

Work has been initiated on a Pilot Program which would include the development and monitoring of two wells targeted to be operating by October 2006, to correspond with the fall refuge flood-up. Test holes have been drilled to test water quality and quantity at various depths. Environmental documentation has been initiated and applicable permits and agreements are being drafted. Participants in the development of the Project have included representatives from the USBR, Water Authority, Fish & Wildlife Service, Fish & Game, Grasslands Water District, Westlands Water District, and Ducks Unlimited.

A component of the Program is a monitoring program. The monitoring program is being developed for the Pilot Program and will include monitoring groundwater levels, water production, and water quality. It is anticipated that this monitoring program will be ongoing during the implementation of the project.

D.5.0 LOS BANOS CREEK CONJUNCTIVE USE PROJECT

D.5.1 General Summary

The Central California Irrigation District, San Luis Water District, and City of Los Banos have collaborated on development of the Los Banos Creek Conjunctive Use Project. The concept is to utilize the stream bed and abandoned gravel mining pits along the creek, west of the City of Los Banos, to store temporarily surplus or conserved water from federal and exchange contract water rights holders. Water would be banked in years of surplus for extraction in years of shortage. The project would also provide the City of Los Banos a groundwater recharge program.

Preliminary investigations have identified the area as having aquifer storage potential through artificial recharge by use of spreading basins in or near the creek channels. Other studies have examined the potential for the Los Banos Creek Reservoir to provide recharge flow through altered operations utilizing both natural inflow and additional water pumped into the reservoir for such purposes. Further evaluations are needed to establish the full practicality of the project.

If project implementation evolves, formal agreements between the water purveyors and City of Los Banos would have to be negotiated to govern matters such as extraction volumes, cost shares, and operations & maintenance responsibilities.

D.6.0 PLEASANT VALLEY GROUNDWATER BANKING PROJECT

D.6.1 General Description

Pleasant Valley Water District (PVWD) proposes to assist in the establishment of a groundwater banking project in Pleasant Valley for the mutual benefit of US Fish & Wildlife Service, California Department of Fish & Game, City of Coalinga, Westside RCD, Fresno County, Westlands Water District, I-5 Business Development Corridor, Pleasant Valley WD, and various banking partners as part of its integrated regional water management planning.

The development of groundwater storage in Pleasant Valley is facilitated by an isolated, well defined groundwater basin and close proximity to federal conveyance facilities. To this end, PVWD has conducted feasibility studies and implemented a pilot project under a $500,000 Proposition 13 grant. The work to date demonstrates that intentional recharge is possible using infiltration basins located on land adjacent to the stream channels, particularly along Zapato Chino Creek in the southerly portion of PVWD.

D.6.2 Proposed Project Facilities

The proposed facilities for this groundwater banking project include infiltration basins, an extraction well, two pump stations, and 4.5 miles of pipeline and canal. More specifically, the ensemble of new banking facilities consist of a 200-acre complex of infiltration basins, one new extraction well for removal of water from the aquifer (in excess of existing extraction well capacities), one 200 hp booster pump station to move water around the basin complex, one 1,000 hp booster pump station at the Coalinga Canal for lifting water to a new conveyance structure, namely, a proposed 4.5 mile length of pipeline and canal connecting the infiltration basins to the existing network of nearby canals and pipelines.

D.6.3 Water Supply Reliability

Current CVP contract supplies for the cities are insufficient to meet their needs and PVWD has no long-term water supply. It is proposed that 5,000 acre-feet of CVP M&I or Irrigation contract water be purchased from willing sellers to improve water supply reliability.

Depending on local conditions, imported surface water could be either used directly or recharged to the groundwater bank for conservation and future use by participating banking partners.

D.6.4 Habitat Protection and Improvement

A portion of water purchased from contract supplies will be allocated annually to support a number of environmental and habitat protection and improvement initiatives. For example, one-hundred twenty acres of wetted area within the infiltration basin complex will create a temporary wetlands and riparian habitat. The basins will be flooded for up to six months a year and possibly more in wet years, providing food, water, and habitat diversity for a variety of residential and migratory wildlife. Second, construction plans call for a setback of 100 feet from the Zapato Chino Creek banks to allow native and riparian habitat along the creek to flourish. The project will purchase this 19 acre conservation buffer zone measuring 200 feet wide and 4,100 feet long. Third, US Fish & Wildlife Service and CA Department of Fish & Game are stakeholders interested in banking water in Pleasant Valley for habitat projects including the Turk Station project, a private reserve currently developing wetlands habitat in collaboration with these agencies.

D.6.5 Water Quality

Current groundwater quality in much of Pleasant Valley is of moderate to high salinity making it more costly for treatment for municipal use and having potentially negative impacts on local wildlife and irrigated land. This banking project will improve local water quality in two ways through the purchase of surface water. By banking higher quality surface water, and therefore mixing it with the native groundwater, the resulting groundwater extracted in the future will be of higher quality. Second, it will be possible at times to use surface water directly for wildlife habitat, municipal treatment, and irrigation thus providing an alternative to using lower quality groundwater. Extensive technical investigations have been conducted to characterize existing quality of various water sources utilized in this project as well as to estimate potential water quality improvements for its multiple end-uses.

D.6.6 Groundwater Management

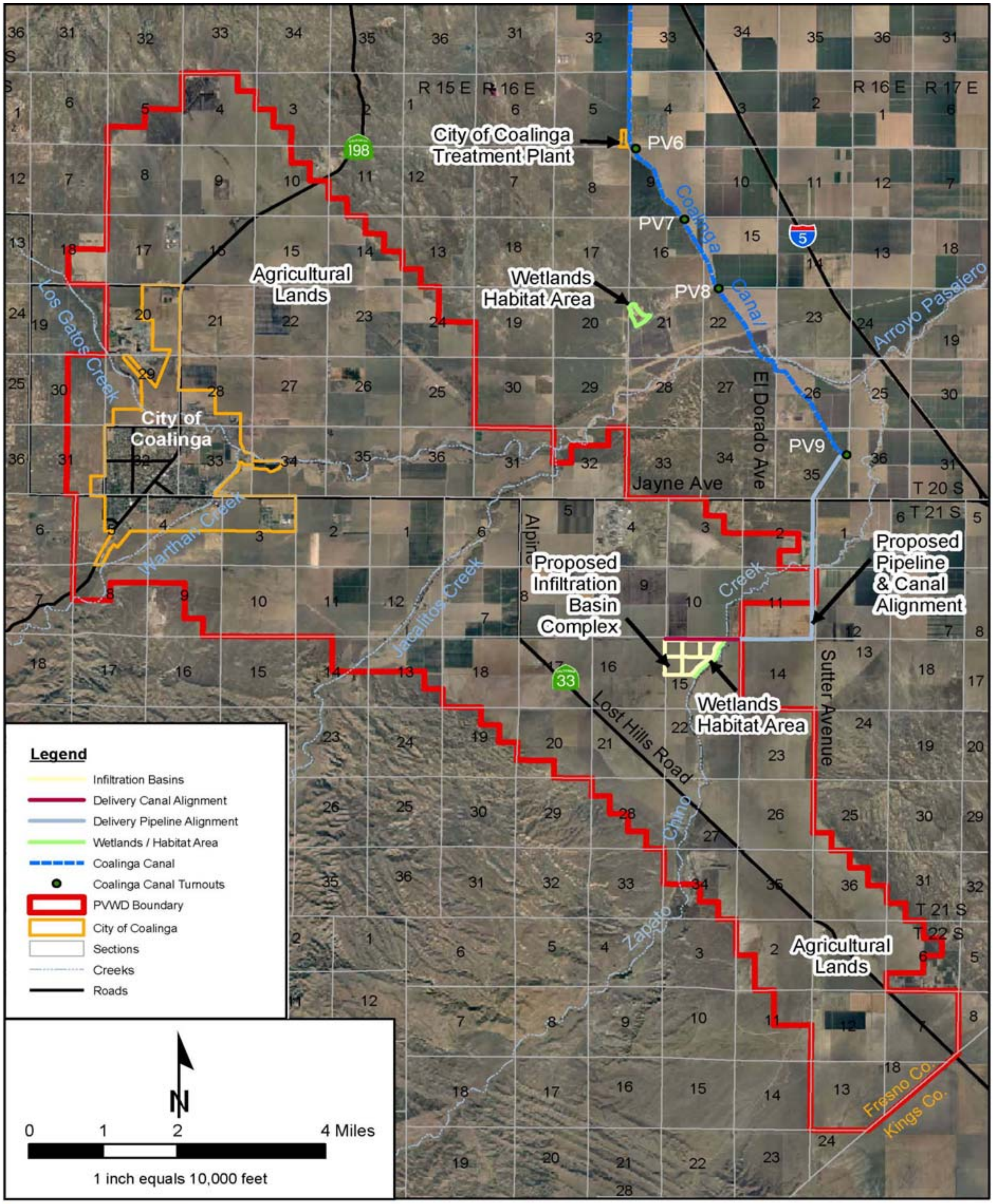
PVWD's water management planning seeks to correct groundwater overdraft in the underlying basin. One objective of this project when implemented in conjunction with PVWD's Groundwater Management Plan is to provide sufficient groundwater recharge and conservation to reverse existing overdraft conditions. Surface water will be intentionally recharged in infiltration basins for extraction at a later date when it is needed by banking partners to supplement other supplies. Banked groundwater will be also be conserved as the Groundwater Management Plan limits future extraction to 85 percent of recharged water. Further, landowners will pump less groundwater in the future when surface water supplies are available for use directly for irrigation. PVWD's hydrogeologist has estimated the total potential banking capacity in Pleasant Valley to be approximately 1,000,000 acre-feet.

D.6.7 Project Operations

In wet years, the 5,000 acre-feet of purchased water and any additional unscheduled or flood waters would be diverted through the Coalinga Canal to this project's proposed conveyance structures and infiltration basin complex for wildlife habitat and banking purposes. In normal years, purchased water would be used for wildlife habitat and for irrigation by landowners along the delivery system (4,400 acre-feet, 2 out of 3 years). In dry years purchased water would be used by the cities (about 75% of contract or 3,650 acre-feet every third year) and allocation for wildlife habitat improvement would be reduced. In critically dry years, it will be necessary to extract banked water to supply city and agricultural needs.

D.6.8 Estimated Project Costs

Estimated water supply contract cost is $10 million. Project construction is estimated at $6 million. Approximate unit cost is $130/acre-foot assuming $14.4 million outside funding and $1.6 million local cost share.



Pleasant Valley Water District
Groundwater Banking Project
Location Map

D.7.0 SAN JOAQUIN RIVER – DELTA-MENDOTA CANAL PIPELINE CONNECTION

D.7.1 Operational Objectives

Deliver a maximum of 100 CFS from Banta-Carbona Irrigation District's (BCID) inlet channel located along the San Joaquin River (upstream of Pumping Plant #1, but after the fish screen) to the DMC. This capacity will allow for water transfers from eastside water agencies to the Westside water agencies and for the capture of excess storm flow when available. It could also be utilized to pump recirculated water as part of a contemplated DMC – San Joaquin River recirculation program.. Potentially, a maximum of 73,000 AF annually can be delivered to the DMC to supplement water supplies south of the Delta, assuming no hydrologic or regulatory constraints. Project beneficiaries will be identified as this concept develops.

In addition, the Project would provide additional flexibility and efficiency to BCID's normal operations. This would be about 40 CFS extra (+/- 20 CFS), based on +/- 10% of the total 200 CFS District demand. The 40 CFS extra capacity would be on top of the 100 CFS base flow to the DMC, requiring an average flow of 120 CFS at the head of the pipeline.

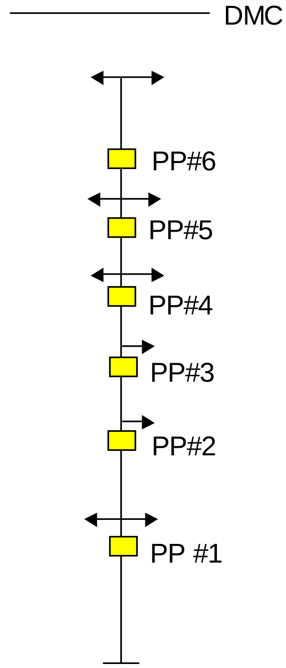
If the demand from BCID's customers exceeds the ability of the canal pumps, plus the additional 40 CFS, then the flow rate to the DMC would be decreased below 100 CFS. The top operational priority of the Project would be satisfying BCID's internal demands.

The pumping analysis is based on:

- 80% pump efficiency
- 94% motor efficiency
- $.07/Kw-hr, including demand charges
- 0.95 power factor (which is paid for by BCID)

A simple illustration of the existing BCID main canal (ignoring the existing pipeline from the DMC) is seen in Figure D-1.

Figure D-1: Simplified view of BCID main canal at the present. Arrows indicate deliveries to secondary channel.



D.7.2 Overview of the Proposed Design and Future Operation

It is essential to begin a design with an idea of how the pipeline operation will be integrated with the canal system on a minute-to-minute basis. A new pipeline would provide BCID with a great opportunity to improve operational flexibility and efficiency while easing management of the main canal. Therefore, any design should not be limited to an objective of solely moving water from the San Joaquin River to the DMC.

The proposed strategy will require physical modifications that can be implemented in steps. The backbone will be the new pipeline, but there are many upgrades that will eventually be required at various canal lift stations and structures. This strategy provides the most simple and physically realistic dynamic water control approach; however, there are some limitations due to existing District control schemes, such as downstream control of the pumps on the main canal.

D.7.3 Project Implementation Alternatives

Option #1 – Pumping plant #6 will remain in place.

A simplistic illustration of the proposed design is seen in Figure D-2. The new pipeline would have 2 pumping plants. One would lift the water to the elevation of pool #5. The other would be capable of lifting water further to the DMC. An outlet from the first pipeline would provide water to pool #5 “on demand”. Pool #5 will act as a level pool with no check structures in it.

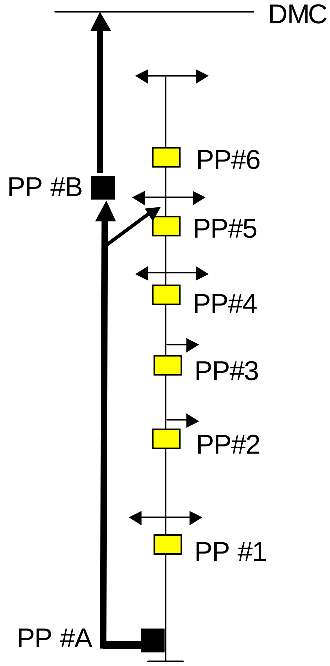


Figure D-2: Pipeline, pump stations, and connections for Option #1.

Option #2 – Pumping Plant #6 will be removed.

A simplistic illustration of the proposed design is seen in Figure D-3. The existing Pumping Plant #6 would be removed and the new pipeline would supply water to both Laterals 5 and 6. A connection to Lateral 6 would supply all of the water used in Lateral 6. The connection to Lateral 5 would only supply the difference between the water pumped by Pumping Plant #5 and the demands of Lateral 5. This alternative increases operational efficiency for BCID:

Assuming an annual delivery of 4,500 AF into Lateral 6, the annual savings in power relative to the existing facility would be about:

- Power Saved: New pumps versus old saves 20 kWhr / AF due to improved efficiency for an annual reduction in consumed power of 90,000 kWhrs.
- Cost Savings: New pumps versus old saves $1.40 / AF due to improved efficiency for an annual reduction is cost of $6,300.

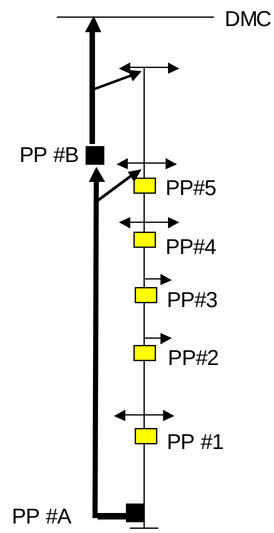


Figure D-3: Pipeline configuration for Option #2. PP #6 has been removed.

D.8.0 SAN JOAQUIN RIVER EXCHANGE CONTRACTORS WATER AUTHORITY AND SAN LUIS & DELTA-MENDOTA WATER AUTHORITY WATER TRANSFER PROGRAM

D.8.1 General Summary

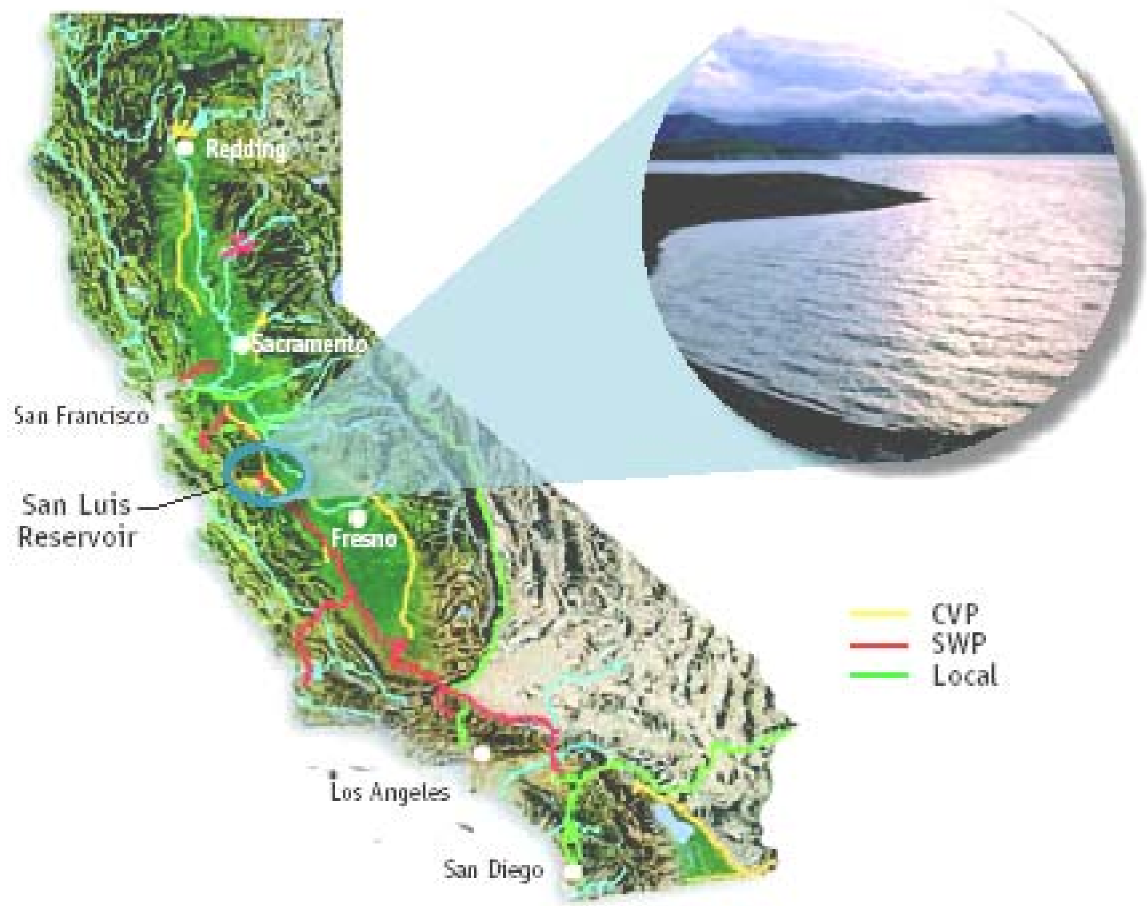
The Water Authority & SJRECWA Water Transfer Program exists to potentially provide water for (1) the wildlife refuges (Incremental Level 4 under the CVPIA), (2) transfers and exchanges of CVP water from the Exchange Contractors to other CVP contractors, and (3) EWA contracts that would benefit CVP operations. The Exchange Contractors, as the lead agency for the State, have prepared environmental documentation to examine the environmental impacts of the transfer and exchange of their CVP water (up to 130,000 acre-feet per year for the next 10 years) in the San Joaquin Valley, the Sacramento-San Joaquin River Delta (Delta), San Benito County, and Santa Clara County (receiving areas). The Exchange Contractor, when possible, make water available for transfer and exchange to some combination of uses by the refuges, CVP contractors (Municipal & Industrial (M&I) and agricultural uses), and the USBR or the California Department of Water Resources (DWR) for use by the EWA in the CVP Delta export service area.

The Program utilizes water conservation, source control, recirculation, land use management, and ground water management strategies to make water available for the uses outlined above.

D.9.0 SAN LUIS RESERVOIR LOW-POINT IMPROVEMENT PROJECT

D.9.1 SLR Background

The San Luis Reservoir is one of the largest reservoirs in California, and is the largest "off-stream" water storage facility in the world. The SLR has a water storage capacity of more than 2 million acre-feet and is a key component of the water supply system serving the federal Central Valley Project (CVP) and California's State Water Project south of the Delta.



Currently, the state and federal water projects cannot fully utilize water stored in the SLR without impacting the reliability of water deliveries to all south-of-Delta CVP contractors; which are also all Member Agencies of the Water Authority. The location of the San Felipe intake, Delta operations, system-wide demands, and diminished water quality together reduce project water supplies south of the Delta. Removing those constraints so that the reservoir can be used more efficiently for all water users is the goal of the San Luis Reservoir Low-Point Improvement Project.

When the reservoir was constructed in 1968, state and federal systems' operational flexibility was greater. The location of the San Felipe Division intake was not viewed as a constraint and the low-point problem did not exist. However, as flexibility has diminished, due to increasing demands and operational restrictions, the low-point has emerged as a persistent and serious problem with potential increasing reliability impacts for all SLR users.

The San Luis Reservoir provides the sole source of CVP water supply for the San Felipe Division contractors – Santa Clara Valley Water District, San Benito County Water District and, Pajaro Valley Water Management Agency. In eight of the past nine years, San Felipe contractors have been faced with operational forecasts that show storage in the San Luis Reservoir dropping to a level that would cause serious water quality problems and potentially an interruption in water service.

In order to avoid the low-point problem, Reclamation has operated the SLR to maintain water levels above the critically low elevation – the "low point" – resulting in 200,000 acre-feet of effectively "nonusable" storage, which translates to a like amount of undelivered water to south of the Delta federal water users. The frequency of the low-point problem will increase in the future as state and federal demands grow and use of all of the water in San Luis Reservoir becomes evermore necessary.

D.9.2 Project Need

The Region faces a growing risk of a water supply interruption that threatens public health and safety, major agricultural and industrial economies, as well as the Delta and south-of-Delta environments. This growing problem is caused by a number of predictable and unpredictable interacting factors, including: increased statewide water demand, changing water quality requirements, unforeseeable species related issues, potential levee failure, hydrologic uncertainty (both drought and flood), project operational constraints or failures, earthquakes, and variable regulatory requirements. These interacting factors have both immediate and long-term water supply implications to the Regions agricultural and M&I water users that must have their supplies delivered at a particular time and place. These factors also contribute to chronic water supply shortages for many Member Agencies, particularly the federal agricultural service contractors.

The 2004 Delta Improvements Package (DIP) adopted by the Bay-Delta Authority outlines actions needed to more aggressively operate the CVP and SWP collaboratively to achieve "higher, earlier allocations." This strategy includes improving the operational flexibility of the south-of-Delta system by working within CALFED to, among other things, eliminate the operational constraints in the San Luis Reservoir. Successful implementation of this project will minimize many risk factors that currently inhibit optimal water use efficiency and supply forecasting for Regional CVP water users.

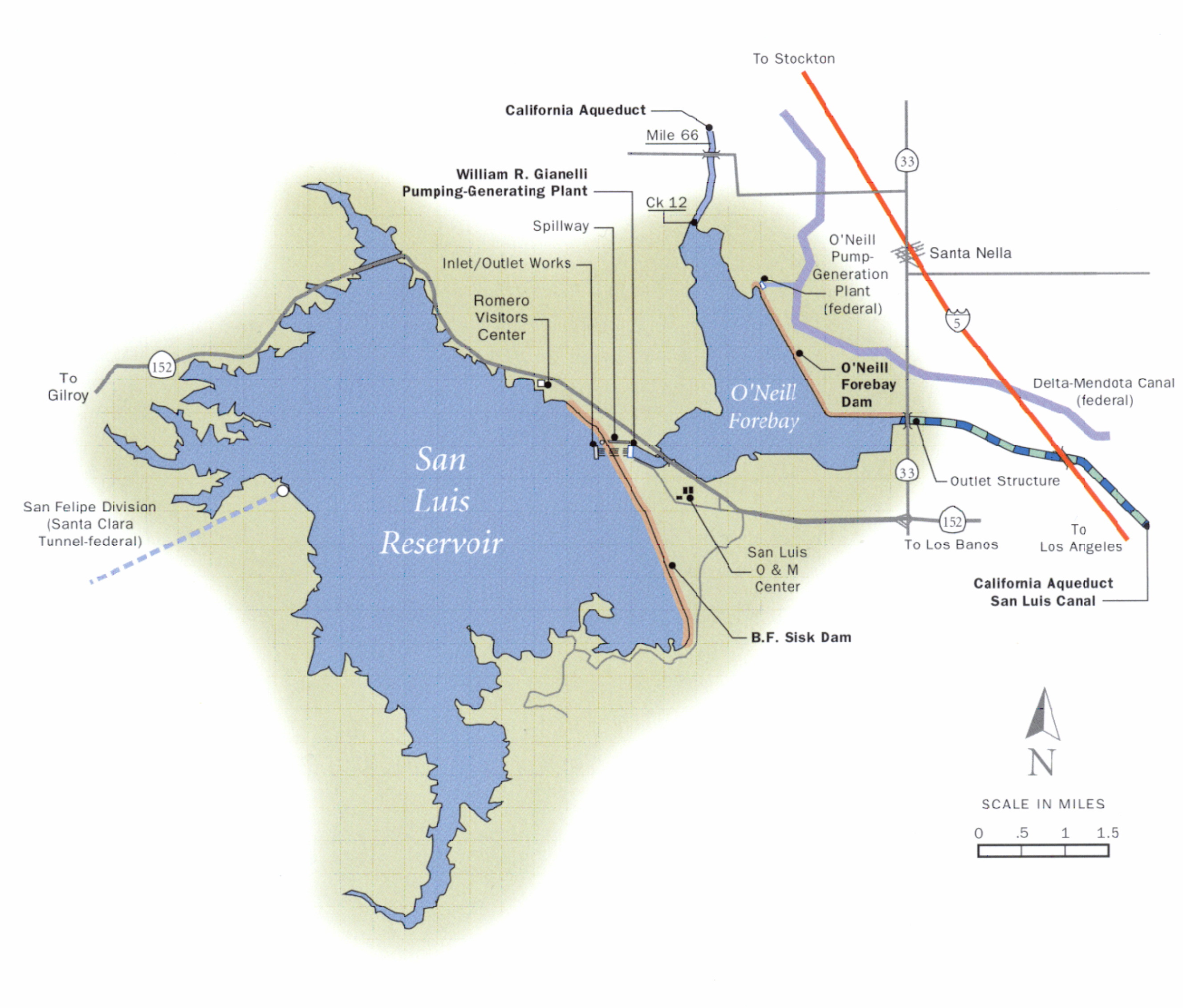
Every year Member Agnencies face uncertainty in receiving allocated water supplies of suitable quantity and timing. This uncertainty is the product of Delta risk factors and operational constraints in San Luis Reservoir. CALSIM modeling runs show best case future delivery problems in 1 out of every 2 years. Delta risk factors exacerbate this shortage scenario. These factors include real events like those in 1997, 1999, and 2004 where Anadromous Fish Restoration Program (AFRP) implementation, Delta Smelt, and Levee Failure (respectively) curtailed exports, placing Member Agencies at risk of losing, or not being able to fully utilize, much needed CVP supplies.

D.9.3 Potential Solutions Consideration

The operational constraints in San Luis Reservoir include satisfying the dual functions of the reservoir (storage and conveyance) as well as coordinating the distribution of the water in the reservoir between SWP and CVP users. This dual function constraint requires simultaneous operations. The conveyance function must provide for the conveyance of water through the San Luis Reservoir in a manner fully integrated with San Felipe Division facilities and demand schedules. The storage function must release stored reservoir water to meet Westside CVP irrigation demand schedules and M&I needs (Avenal, Coalinga, Huron.). Consistent with the Supplemental Operating Agreement for San Luis Reservoir, USBR and DWR coordinate state and federal operations to manage storage in the reservoir. Often the CVP is able to rely on SWP storage at low point to maintain conveyance to the San Felipe Division. As SWP contractors' demands grow requiring full utilization of SWP water supplies, the CVP will be able to rely less on SWP storage at low point. Accordingly, the in-Delta risks and the operational constraints within San Luis Reservoir create the possibility that scheduled deliveries of annual CVP allocation may be reduced or interrupted.

The goal of the San Luis Reservoir Low Point Improvement Project therefore is to increase the certainty of meeting the requested delivery schedule of annual CVP allocations to Member Agencies and to increase the operational flexibility of storage in SLR to ensure a high quality, reliable water supply for the Region.

Figure D-4: San Luis Reservoir & Appurtenant Facilities



In 2002, the Santa Clara Valley Water District commissioned Jones & Stokes to perform a scoping study and produce a summary report. The session presented an overview of the Low-Point problem and conceptual alternatives and solicited and captured comments and questions. The scoping session was followed by development of a Draft Alternative Screening Report produced by the SCVWD, Jones & Stokes, and Montgomery, Watson, Harza (MWH). Informed by these previous efforts, in December 2002, SCVWD and the Water Authority began collaborating on the project in recognition of the problems' Regional impact. In October 2004, the United States recognized the seriousness of the problem when it authorized USBR to implement a solution, exclusive of storage expansion, through passage of the California Water Security and Environmental Enhancement Act. Since that time, the

Water Authority, SCVWD, and USBR have been working together to further flesh out solution alternatives.

D.9.4 Solution Status

The USBR, SCVWD, and Water Authority have defined the outcome of the project as to increase the operational flexibility of storage in SLR while ensuring a high quality, reliable water supply for south of Delta CVP contractors, including the San Felipe Division. The project is intended to produce solutions of the following priorities:

1) Increase the certainty of meeting the requested delivery schedule of annual allocation to San Luis Reservoir south of Delta CVP contractors.
2) To the extent possible, while meeting the first objective, increase the reliability and quantity of annual allocations to CVP contractors.
3) To the extent possible, while meeting the first objective, forecast the final allocation to San Luis Reservoir dependent contractors earlier in the season.

Several additional opportunities may also be presented as a result of addressing the above objectives. These include improving water quality conditions for the San Felipe Division contractors and providing ecosystem restoration opportunities.

To date, the collaboration has produced an Appraisal Report establishing the federal interest in the project and a Plan of Study intended to guide the upcoming feasibility studies. Currently, USBR is preparing to award a consultant agreement to begin the Federal feasibility study by September 2006. Further information regarding project schedule and funding are provided elsewhere in this Plan.

D.10.0 SOUTHWEST STANISLAUS COUNTY REGIONAL DRAINAGE MANAGEMENT PROJECT

D.10.1 General Summary

This project would modify the Marshall Road drain to reduce silt loading and chemicals in drainage water, while conserving water through a system to recover operational spills and tail water. Phase I, a 10 to 20 acre desilting and tail water recovery reservoir developed next to the drain to allow water to be recycled back through the system, has been completed and is operational. In Phase 2, a master plan would be developed for drainage channels in southwest Stanislaus County. Upon full implementation, total increase in reuse would be about 20,600 acre-feet annually.

D.11.0 WESTSIDE REGIONAL DRAINAGE PLAN

D.11.1 Summary Description

The Westside Regional Drainage Plan integrates several interdependent strategies into a single project to eliminate discharge of sub-surface agricultural drainage water from, and enhance water supply reliability for, about 90,000 acres in the solution area as shown in Figure D-5. The project began as an effort known as the Grassland Bypass Project to reduce selenium discharges to the San Joaquin River. The resounding success of the that endeavor has prompted this proposal for expansion to go beyond regulatory requirements and eliminate selenium, boron, and salt discharges to the San Joaquin River while maintaining productivity of agriculture lands in the solution area and enhancing water supplies for the region. The project will also resolve long standing conflicts between neighboring water and drainage districts regarding localized impacts of sub-surface agricultural drainage.

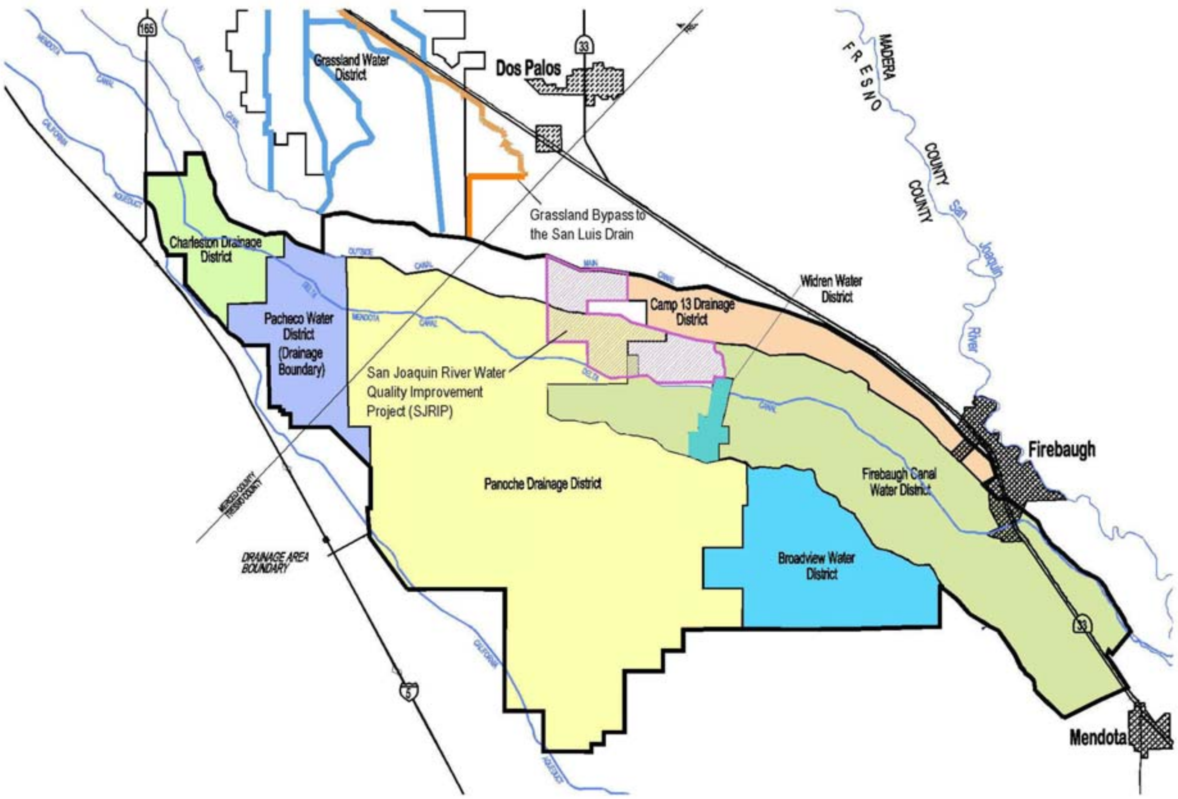


Figure D-5
Westside Regional Drainage Plan

Solution Area and Districts

D.11.2 Outcomes and Approaches

The overall goal of the Westside Regional Drainage Plan is to eliminate the discharge of sub-surface agricultural drainage to the San Joaquin River from field drainage systems in the Grasslands Basin. Project outcomes include:

A. Maintaining agricultural productivity and the community employment base;

B. Combining measures to avoid drainage conflicts and to adjust supplies between neighboring water districts within the Water Authority;

C. Managing saline groundwater to protect usable groundwater for domestic and agricultural use;

D. Improve Regional water supplies;

E. Address objectives of the Salinity and Boron and Dissolved Oxygen TMDLs;

F. Achieve or exceed selenium discharge requirements and permit conditions for use of the San Luis Drain and provide management of drainage containing selenium following expiration of current management program utilizing the Drain.

The Drainage Plan relies on five general approaches to reduce and then eliminate high salinity sub-surface irrigation drainage from the solution area:

1) Reduction of drainage volumes to be managed through source control and efficient water management techniques such as replacement of furrow irrigation with micro-irrigation technology, and lining of earthen delivery canals;

2) Recirculation and blending of tilewater for use on primary irrigation lands;

3) Collection and reuse of tile drainage water on halophytic croplands in order to concentrate drainage;

4) Installation of groundwater wells to lower groundwater in strategic locations to eliminate groundwater infiltration into tile drains.

5) Treatment of remaining drainage water for irrigation reuse and production of marketable salt product.

The use of these techniques and the subsequent reduction in drain water is graphically displayed in Figure D-6.

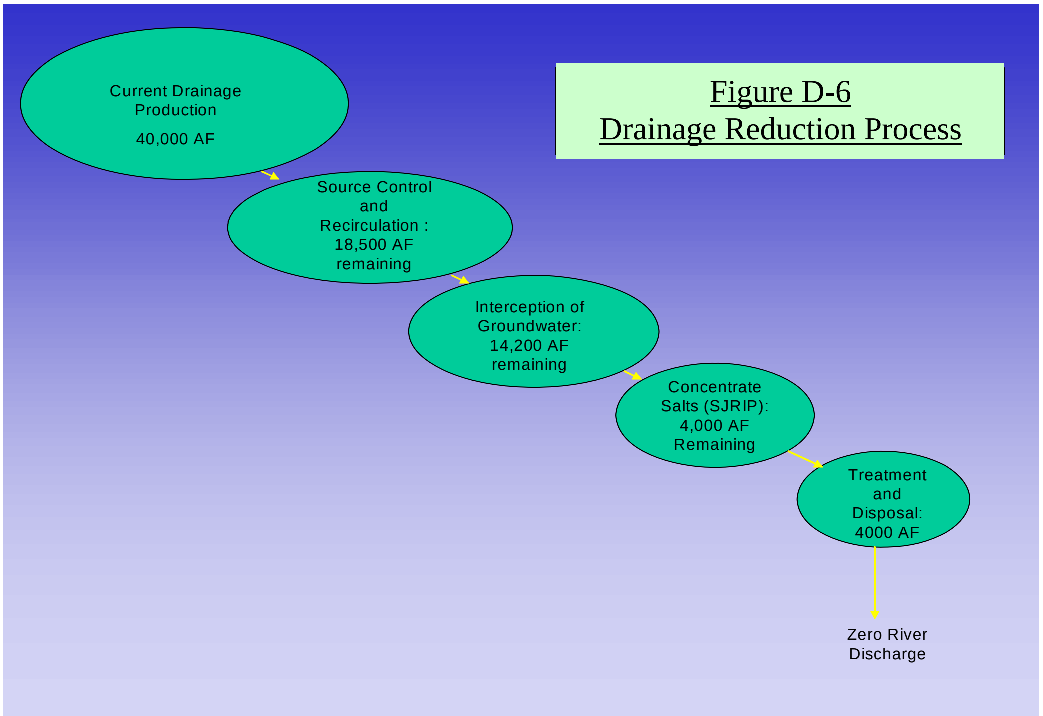


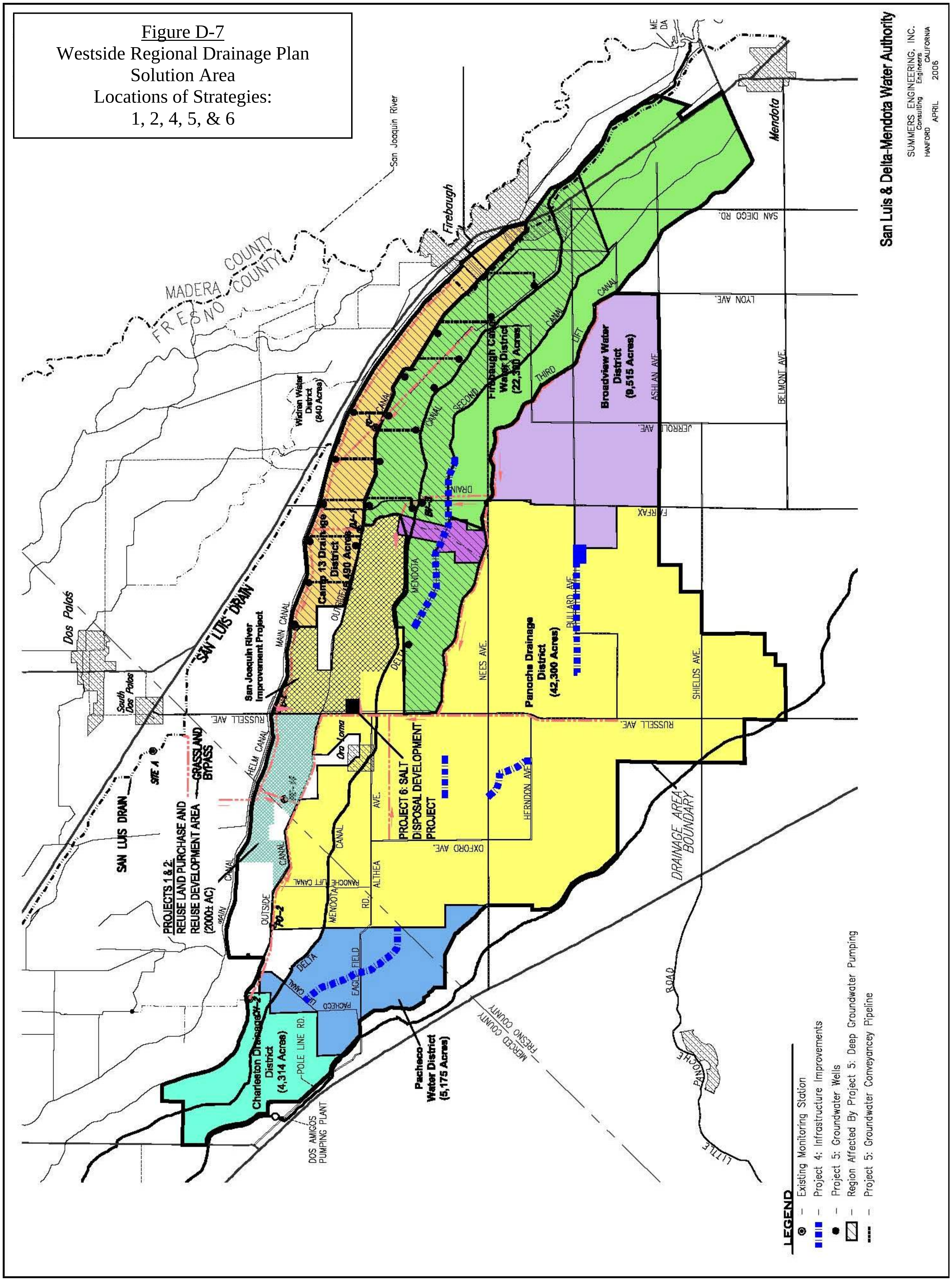
Figure D-6
Drainage Reduction Process

Current sub-surface drainage discharges to the San Joaquin River through the San Luis Drain and Mud Slough have been decreased by the project through redirection to about 4,000 acres of halophytic cropland. Expansion of the reuse area will eliminate the remaining discharge. An incidental benefit of the project, identified through analysis by the San Joaquin River Water Quality Management Group, is that it assures compliance with salinity objectives at Vernalis and reduces the frequency in violations of objectives at Brandt Bridge by 71% over a 73-year hydrology.

D.11.3.0 Interdependent Project Strategies

Like most projects contained in this Plan, the Westside Regional Drainage Plan consists of several interdependent strategies that when fully implemented provide the project with a complete solution toward addressing Regional drainage, ground water management, recycling, water conservation, and water supply reliability problems and associated conflicts within the project's solution area, while aiding state and federal efforts toward ecosystem restoration and environmental, habitat, and water quality improvements on the lower San Joaquin River and Delta. The following describes each project strategy to be implemented within the solution area (Figure D-7).

Figure D-7
Westside Regional Drainage Plan
Solution Area
Locations of Strategies:
1, 2, 4, 5, & 6



D.11.3.1 Reuse Land Purchase

Projected Strategy Cost: $9,220,000 Requested IRWM Grant Funding: $7,570,000

Description: The Reuse Land Purchase the acquisition of approximately 2,000 acres of strategically located agricultural land. This land is geographically located such that sub-surface drain water from all portions of the solution area may be diverted to the property for reuse without the need for additional significant conveyance infrastructure. The property is located within the solution area but is not part of a water or drainage district; no water rights will be transferred with the purchase. The property value was assessed in 2000 and the current landowner is a willing seller. This Reuse Land Purchase is the highest priority action within the Westside Regional Drainage Plan.

Procedures: The owner of the parcel is a willing seller at the appraised value. A template buy-sell agreement has been prepared. Once funding is secured, CEQA evaluation of the action will be undertaken followed by a formal offer presented through the Water Authority or WRDPJPA. Once and offer is made and accepted, a buy-sell agreement will be executed and escrow opened.

Standards: The Reuse Land Purchase does not include any construction, monitoring, or health and safety issues that would have applicable standards. The land sale transaction will take place in accordance with standard real estate practices and Federal and State laws.

Development of PAEPs, MPs, and QAPPs: The Reuse Land Purchase is not an activity that would require monitoring. This does not apply.

Status of Land Acquisition: The property is located within the solution area but is not part of a water or drainage district; no water rights will be transferred with the purchase. The property was considered for acquisition as part of the initial 2000 reuse land acquisition and the current landowner is a willing seller. The property was appraised at that time and the report fixed the value at $4,000 per acre. Formal terms have not been completed and a final written offer has not been made nor accepted. The landowner has other agricultural interests in the region and is a strong supporter of the Westside Regional Drainage Plan.

Project Merits: The Reuse Land Purchase is a necessary to expand the current reuse area in order to entirely eliminate the discharge of sub-surface drainage into the San Joaquin River. Analysis of the future demand for drainage management within the solution area indicates that after the source control measures such as canal lining and irrigation improvements have been implemented, approximately 6,000 acres of reuse area will be required to manage all of the produced sub-surface drain water within the project. The current reuse area is approximately 4,000 acres and is insufficient for eliminating discharge into the San Joaquin River. The additional 2,000 acres purchased by this action will provide the additional capacity necessary to fully maximize the drainage reuse component of the project. Additional planting of halophytic croplands and refinement of the infrastructure within the reuse area will be completed in the Reuse Area Development phase.

Required Permits: Waste discharge requirements for the existing Grassland Bypass Project provide permitting for discharges as this action gears up to eliminate discharge. No other special permits are necessary for the action.

To date, the Water Authority has been facilitating development of the WRDP. As the project progresses, the need for facilitation is diminishing; consequently, the project stakeholders are exploring development of a more formal management structure. Currently, a joint powers agency is being formed by Broadview Water District, Camp 13 Drainage District, Central California Irrigation District, Charleston Drainage District, Firebaugh Canal Water District, Pacheco Water District, Panoche Drainage District, Panoche Water District, and Westlands Water District. The WRDPJPA or one of its member agencies will hold title to the new reuse area. Construction of the drainage systems, groundwork, planting and mitigation implementation will be performed through Panoche Drainage District, Firebaugh Canal Water District, and Camp 13 Drainage District, coordinated through agreements with the newly forming WRDPJPA.

CEQA Compliance: A CEQA Negative Declaration that evaluated the purchase of up to 6,200 acres, including the 2,000 acre anticipated purchase, for drainage reuse was filed in September 2000.

Groundwater Management Plan: A groundwater management plan is not required for this action.

Progress Reports and Milestones: The Reuse Land Purchase includes two milestones: 1) the negotiation of land value and final price, and 2) the final purchase of the property. The Water Authority will report this progress through quarterly progress reports and provide copies of all relevant documents such as the purchase agreement and title.

Other Work: There is no other work associated with this action.

Plans and Specifications: There are no specifications relevant to this action. A location map is provided and Figure A-1 and a detail of the property is provided in Figure A-2.

D.11.3.2 Reuse Area Development

Projected Strategy Cost: $8,988,000 Requested IRWM Grant Funding: $7,128,000

Description: Reuse Area Development includes the construction of subsurface drainage systems and planting of salt tolerant crops on the lands purchased to expand the reuse area. It also includes the installation of subsurface drainage systems in the 2,200 acres of currently undrained fields within the solution area. A proposed crop map and facilities map of the new reuse area is included in Figure D-8. The purpose of this action is to develop the usable acreage of reuse area so as to increase the capacity of drainage reuse. All of the crops under consideration for reuse development have high annual crop water requirements, usually greater than 3.5 acre feet per acre, and high salt tolerance. Prior to planting, each field in the reuse area will be properly worked in accordance with standard farming practice, which includes disking, development of field borders, pre-irrigation and other activities necessary to prepare the ground for seed germination. Planting would be done through either direct seed insertion by tractor or aerial application. Initial germination will be done with fresh water provided by project participants and will be applied with sprinklers so as to efficiently leach salt from the germination zone and avoid washing out the seed. Once a healthy stand has developed sub-surface drain water will be applied from the solution area. The water quality of the drainage diverted to the reuse areas varies throughout the year, but the salinity ranges from a TDS of 3,000 to 5,000. Selenium concentrations range from 60 ppb to 110 ppb, and boron concentrations range from 6 ppm to 12 ppm. Crops will be selected with this water quality in mind.

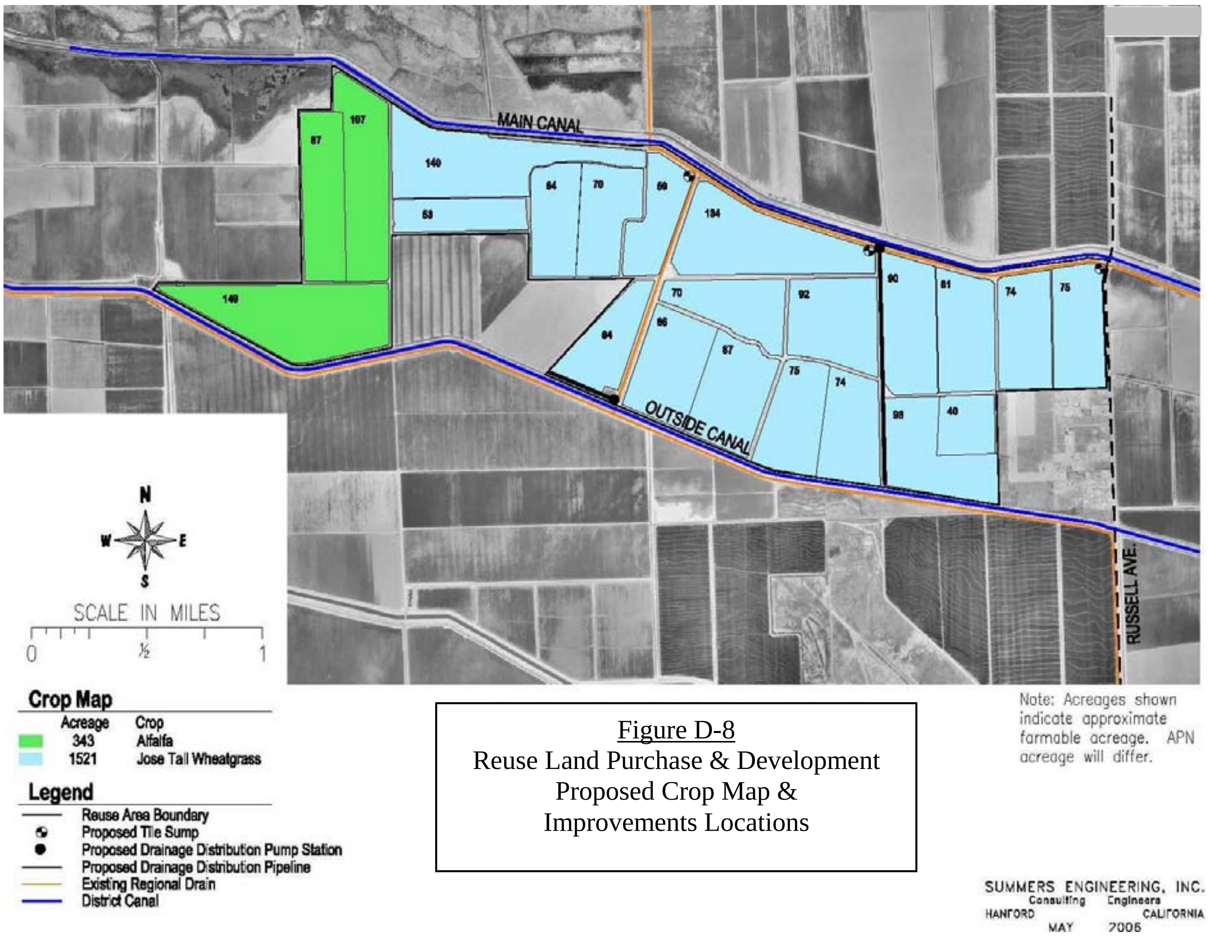


Figure D-8
Reuse Land Purchase & Development
Proposed Crop Map &
Improvements Locations

Three new pump stations and conveyance pipelines will be required to divert sub-surface drain water from project drains onto the new reuse area. These facilities will generally consist of precast concrete sumps, electric pumps, steel manifolds, and PVC pipelines. The pipelines will be sized for efficient transmission of water using accepted engineering standards. Delivery turnouts will be located based on the final crop map. Design drawing and specification showing pump station locations and details, pipe alignment and size, turnout locations, and other miscellaneous details will be developed.

The drainage system designs will be balanced between the need to remove excess salt from the soil while removing the least possible amount of perched groundwater. A variety of drainage system concepts have been proposed to maintain this balance, varying from shallow versions of the conventional subsurface drainage system to the "Shallow Groundwater Management" system proposed by the US Department of Agriculture5. In the recent past,

5 Ayars et al., 1999.

the project has experimented with variations in drainage system design. The performance of these variations will be evaluated prior to the final drainage system design. Available groundwater data will also be analyzed during the design process. The system will consist of perforated polyethylene tubing that will collect perched groundwater and transport it to metered drainage sumps. The drainage sump will pump this water into the reuse conveyance channels. In the near term, this will allow the collected water to be blended with other sub-surface drainage water generated by the project and reused within the reuse areas. In the long term, this water will be delivered to a disposal system either through drainage treatment or evaporation through solar power generation. Design drawing for the subsurface drainage systems, showing drainage tubing layout, size, grade, and tile sump locations will be developed. The design and construction team for the drainage improvements will largely be the same group that has successfully constructed and operated the existing drainage systems and will incorporate other drainage management tools that have been developed since the inception of the project.

Procedures: Management of the expanded and developed reuse are will occur under the WRDPJPA, which is being formed by Broadview Water District, Camp 13 Drainage District, Central California Irrigation District, Charleston Drainage District, Firebaugh Canal Water District, Pacheco Water District, PDD, Panoche Water District, and Westlands Water District. The WRDPJPA or one of its member agencies will hold title to the new reuse area. Construction of drainage systems, groundwork, planting, and mitigation implementation will be performed by PDD, Firebaugh Canal Water District, and Camp 13 Drainage District, under direction of the WRDPJPA.

Standards: The subsurface drainage systems will be designed to leach the accumulated salts from the project area while minimizing the amount of perched water "mined" from the soil. The natural slope of the land will be determined by a perimeter level circuit performed under the observation of the project engineer. The parameters of the subsurface drainage system, such as depth, spacing, and slope of the tubing, will be determined using available soil data, information developed during PDD's experimentation at SJRIP and standard engineering practices. The drained fields will be divided in a logical manner according to geographic location and crop. Drainage sumps will be located to maximize ease of operation and maintenance and drain water distribution. Construction of the drainage systems with be with materials appropriate to drainage system construction, including HDPE perforated drainage tubing, and precast concrete sump structures. Construction of the pump stations and conveyance pipelines will be performed using standard installation methods according to the design drawings and specifications developed during the design process. Groundwork and planting will be done in accordance with standard farming practices for the region to ensure seed germination and a healthy crop.

Development of PAEPs, MPs, and QAPPs: Project assessment and evaluation will be made through the direct measurement of drain water and water quality diverted to the reuse projects for irrigation. PDD has implemented a monitoring plan and QAPP for the SJRIP and modifications to these documents will be made to encompass the additional developed regions.

Status of Land Acquisition: The land required for this project will be acquired as describe in section D.10.3.1.

Project Merits: A critical strategy of the Westside Plan is drainage reuse, an effective and efficient means of reducing drainage volume through crop water consumption in order to make final disposal feasible. This action will make approximately 2,350 acres of salt tolerant crops available to receive project sub-surface drain water as irrigation. This will consume approximately 8,200 acre feet of drain water once fully developed based on the current the crop water demand for similar crops planted in the existing project area. This action, combined with the existing capacity will reuse more than 21,000 acre-feet annually. This drainage reuse capacity will allow the project to manage all of the agricultural drainage within the solution area.

Required Permits: No special permits are necessary for this action. This action will be developed in accordance with Federal, State, and local laws and in compliance with local zoning ordinances.

CEQA Compliance: A CEQA initial study to analyze the impacts of the expanded reuse area and determine what mitigation measures, if any, would be required is currently under development. As of May 2006, this document was not yet complete; however, a draft is expected by July 2006. It is anticipated that the initial study will lead to a negative declaration or mitigated negative declaration for the reuse area expansion and development The final analysis will be completed before the end of 2006. Any required mitigation measures will be addressed in conjunction with implementation of the actions.

Groundwater Management Plan: A groundwater management plan is not required for this action.

Progress Reports and Milestones: This action includes a number of milestones, which will be reported in quarterly and annual progress reports. These milestones include the completion of the cropping map, conveyance system designs, drainage system designs, construction progress, and drainage diversions. Design documents and progress photos will be submitted with quarterly and annual reports as appropriate. Summaries of drainage diversions, including water quality will be submitted with annual reports.

Other Work: There is no other work associated with this action.

Plans and Specifications: Design plans and specifications will need to be developed for the overall cropping pattern and operation map for the expanded reuse area, the subsurface drainage systems, and the drainage conveyance systems. Figure A-2 provides a conceptual model of these aspects.

D.11.3.3 Irrigation Improvements

Projected Strategy Cost: $18,020,000 Requested IRWM Grant Funding: $0

Description: This action includes the installation of high efficiency irrigation systems within the solution area. The Westside Regional Drainage Plan estimates that irrigation systems on more than 30,000 acres within the project could be improved. In response to this, project participants have implemented funding incentives to encourage irrigation method improvements. PDD, Pacheco Water District, and Charleston Drainage District have participated in the State Revolving Fund and the Agricultural Drainage Loan Program, which provide low interest loans to growers for irrigation equipment improvements. Firebaugh Canal Water District provides a similar program funded internally through district reserves. Significant individual investment is also common.

The purpose of these incentives is to reduce subsurface drainage production through uniform irrigation application, which reduces deep percolation. Common, lower efficient irrigation methods, such as furrow irrigation, provide water to crops by using gravity to push water down a furrow and to pull water into the soil root zone (percolation). Furrow and other surface irrigation methods start at the upper (head) end of the field and flow to the tail end, thus the head end of the field has more water applied to it for a longer period than the tail end. The result of this is that a deeper swath of the soil profile will be unnecessarily saturated at the head end of the field. Water penetrating the soil profile beyond the root zone becomes deep percolation and is the major source of subsurface drainage. High efficiency irrigation systems such as drip are designed to provide uniform volume of water through the whole field. Properly operated, a drip system can virtually eliminate deep percolation.

Procedures: Irrigation improvements will be implemented by private landowners and growers at their discretion. Grower deciding to install improved irrigation systems will coordinate with the districts to ensure that the irrigation system is compatible with the district's delivery system. At this point, district staff will also review the proposed improvements and available funding programs to determine if funding assistance through loans or grants is appropriate. If funding assistance is provided, the project will proceed under the guidelines and requirements of the funding program. If funding assistance is unavailable, the grower may proceed with the project using internal or individual funding.

Standards: Improved irrigation systems will be installed in accordance with typical construction and material standards for the installation of agricultural irrigation systems. These standards are system and site specific but generally, underground pipelines will be PVC, drip tubing and microsrpinklers will be HDPE. Pumps are typically electric and metered for flow, and filter systems are sand media in stainless steel tanks.

Development of PAEPs, MPs, and QAPPs: The effect of this action will be measured through the tracking of the location and size of improved systems installed and the subsequent impact of tile sump discharge. The districts will track the location, size and type of each irrigation system improvement. Tile sump meter readings are made each month and water quality measurements are made several times each year. The combination of these two observations will allow a weight of evidence analysis of the impact of improved irrigation systems on subsurface drainage discharge. The districts have already implemented a tile sump monitoring program as part of the current project.

Status of Land Acquisition: Acquisition of land is not required as part of this project.

Project Merits: Deep percolation from applied water, either through irrigation or rain fall, is the primary source of subsurface drainage production. The Westside Regional Drainage Plan has identified approximately 30,000 acres within the solution area that are under consideration for irrigation system improvements**6**. Installation of drip and other high efficiency irrigation systems may reduce deep percolation by 7,400 acre-feet annually.

6 This is based on conversations with district growers regarding their long term irrigation and cropping plans.

Assuming 73% (weighted average based on drainage system coverage) of this water flows into deep drains or tile systems, the improvements result in a 5,400 acre-feet annual reduction in drainage production. This improvement does not consider the concomitant water conservation and economic benefits of increased productivity, which are currently unquantified.

Required Permits: No permits are required for this action.

CEQA Compliance: Private landowner constructions of irrigation systems consistent with current conditions are exempt from CEQA. District programs to fund improved irrigation efficiency within District boundaries will be reviewed pursuant to CEQA and are expected to be categorically exempt.

Groundwater Management Plan: A groundwater management plan is not required for this action.

Progress Reports and Milestones: Progress of this action will be monitored and reported through the tracking of the acres of land converted to high efficiency irrigation systems and the amount of funding assistance provided.

Other Work: There is no other work associated with this action.

Plans and Specifications: In the case of privately funded irrigation projects, design plans and specifications will be developed by the landowner or grower with minimal oversight from the associated district. In the cases of projects obtaining funding assistance, specification will be required in accordance with the funding program guidelines. These typically include a location map and list of equipment, but are project specific and developed at the time of implementation.

D.11.3.4 Infrastructure Improvements

Projected Strategy Cost: $12,590,000 Requested IRWM Grant Funding: $0

Description: Infrastructure Improvements address the deep percolation contribution of unlined irrigation canals within the solution area by installing concrete lining or pipelines. More than 32 miles of canals within the project are unlined and contribute to the subsurface drainage production in the form of seepage. By lining or piping these systems, it has been estimated that drainage production can be reduced by 12,100 acre feet per year. No IRWM grant funding for this action is being sought; however the Water Authority is planning to submit a proposal for the lining or piping of approximately 12 miles of canals and laterals under Proposition 40. The proposal includes $5,000,000 of state funding and a local match of $1,670,000.

Procedures: Infrastructue improvements will be implemented by the individual districts owning the facility. Improvements for the facility will be designed by a licensed civil engineer, who will develop design drawings and specifications, and a qualified contractor will be selected to construct the improvements. The construction procedure would be specific to each project.

Standards: Infrastructure improvements will be constructed using standard construction practices for the lining of canals and installation of pipelines. Pipelines will be either reinforced concrete or PVC and shall be manufactured in accordance with ASTM specifications appropriate for the material, internal pressure, and loading. Canal lining shall be placed over a properly cut compacted canal prism. Specifications for concrete lining and required compaction will be included in the design drawing and will be based on site conditions.

Development of PAEPs, MPs, and QAPPs: Evaluation of the impacts of infrastructure improvements will be measured by comparing the pre-project seepage rate to the post-construction seepage rate. After the construction of representative facilities, a seepage test will be performed to determine the subsequent seepage.

Status of Land Acquisition: Acquisition of land is not required as part of this action.

Project Merits: Deep percolation attributed to seepage from unlined canals is estimated to contribute 12,100 acre feet per year to the sub-surface drainage production, approximately 30% of the total drainage production within the project area. Not only does this water contribute to the volume of subsurface drainage that needs to be managed, but it is also lost as a resource that can be applied to other beneficial uses.

Required Permits: No permits are required for this action.

CEQA Compliance: The infrastructure improvements will be designed and constructed under the oversight of the district which owns them. Each district will be responsible for complying with CEQA for their facilities, which in most cases will require a categorical exemption under Section 15301 of the CEQA Guidelines as the activity will result in only minor alteration of the facilities with no expansion of use. New facilities or extensions of existing facilities may require a negative declaration which will be completed prior to completion.

Groundwater Management Plan: A groundwater management plan is not required for this action.

Progress Reports and Milestones: Progress of this action will be monitored and reported through the tracking of the miles of canals lined or piped.

Other Work: There is no other work associated with this action.

Plans and Specifications: Design drawings and specifications will be developed at the discretion of the district owning the facility to be improved. At a minimum, design drawings will detail the project location, alignment, size, and grade. Specifications will outline construction methods, material requirements, and compaction requirements. The five highest priority facilities have been identified and are indicated on Figures D-9, 10, & 11; however no design drawings have been completed.

Figure D-9

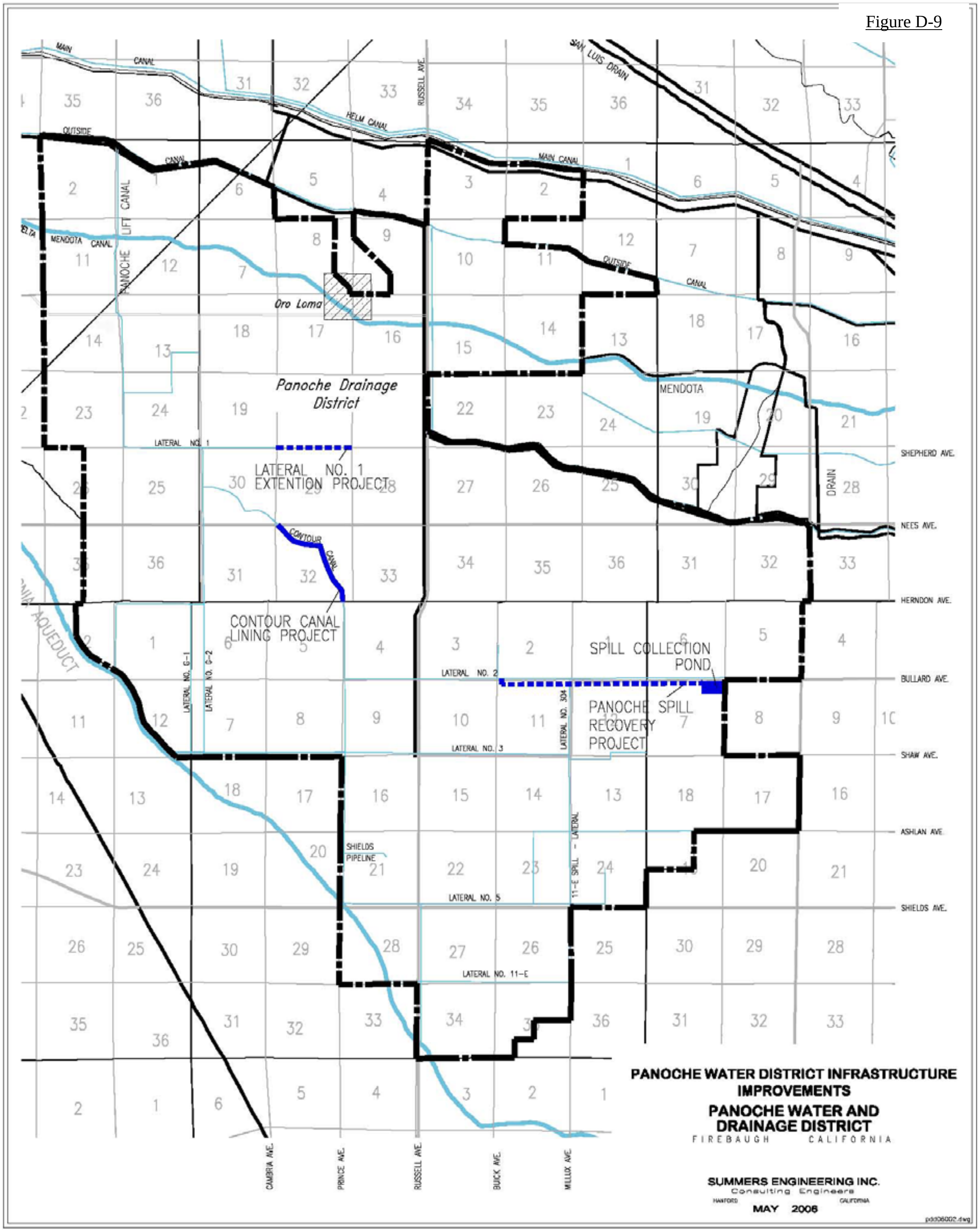

Panoche Drainage District
Oro Loma
MENDOTA
LATERAL NO. 1 EXTENTION PROJECT
CONTOUR CANAL LINING PROJECT
SPILL COLLECTION POND
PANOCHE SPILL RECOVERY PROJECT
SHEPHERD AVE.
NEES AVE.
HERNDON AVE.
BULLARD AVE.
SHAW AVE.
ASHLAN AVE.
SHIELDS AVE.
CAMBRIA AVE.
PRINCE AVE.
RUSSELL AVE.
BUCK AVE.
MILLUX AVE.
PANOCHE WATER DISTRICT INFRASTRUCTURE IMPROVEMENTS
PANOCHE WATER AND DRAINAGE DISTRICT
FIREBAUGH CALIFORNIA
SUMMERS ENGINEERING INC.
Consulting Engineers
MAY 2006

Figure D-10

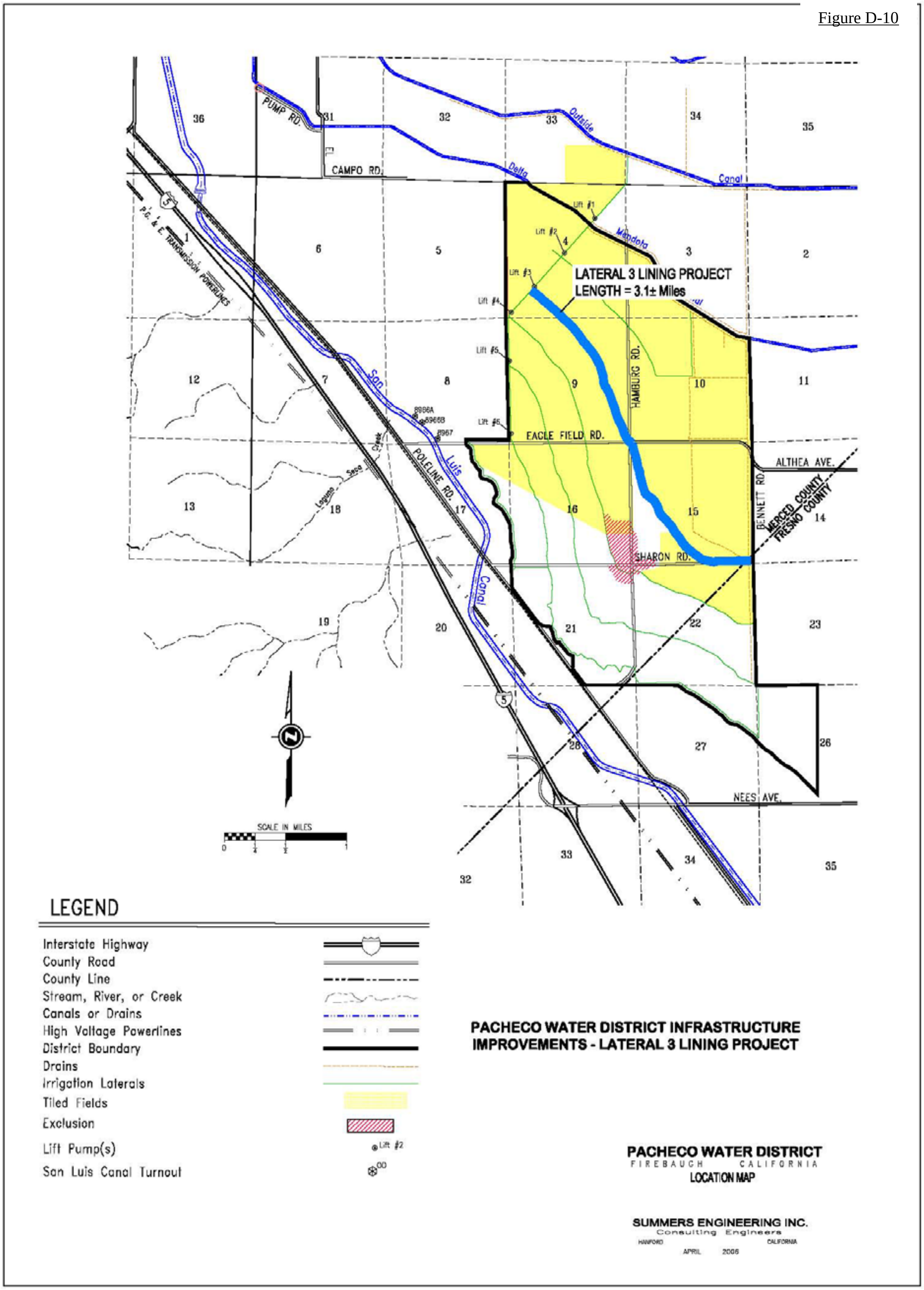
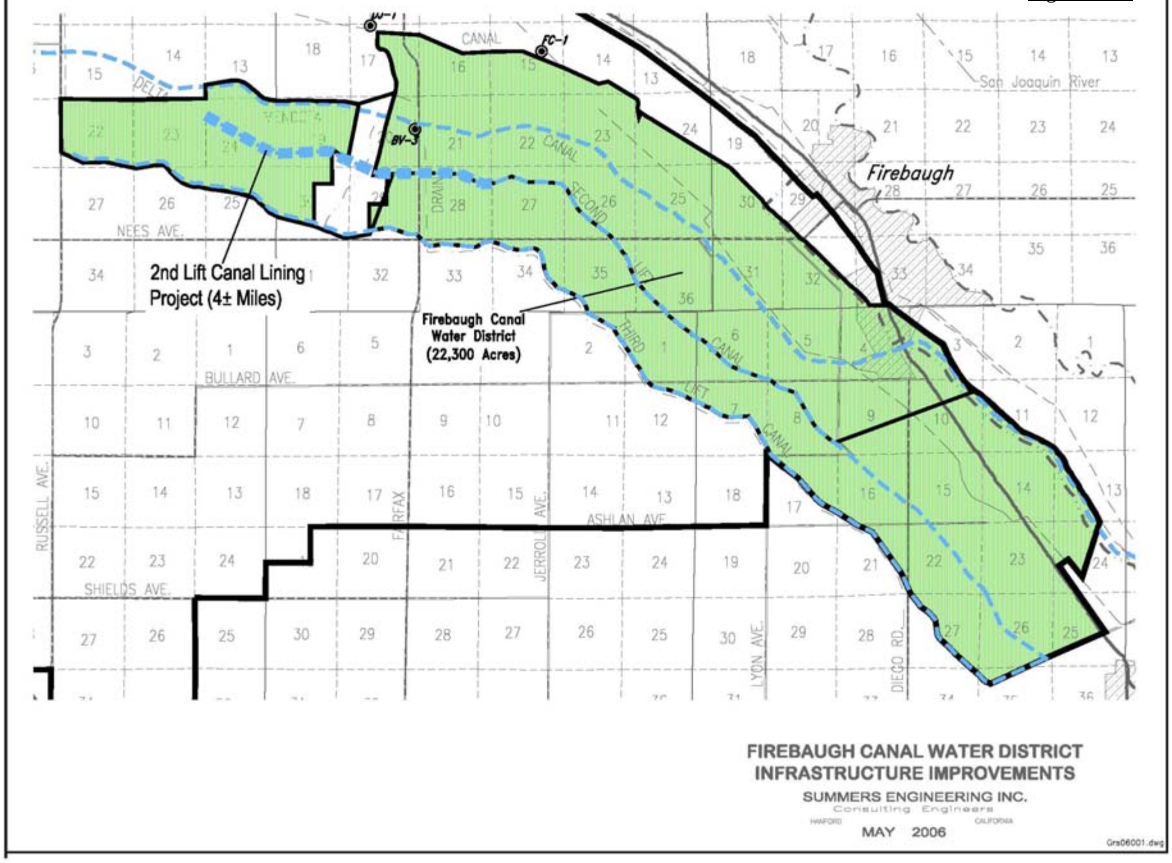

LATERAL 3 LINING PROJECT
LENGTH = 3.1± Miles
PUMP RD.
CAMPO RD.
EAGLE FIELD RD.
HAMBURG RD.
ALTHEA AVE.
BENNETT RD.
SHARON RD.
NEES AVE.
POLELINE RD.
MERCED COUNTY
FRESNO COUNTY
Outside
Delta
Canal
Mendota
San
Luis
Canal
P.G. & E. TRANSMISSION POWERLINES
SCALE IN MILES
LEGEND
Interstate Highway
County Road
County Line
Stream, River, or Creek
Canals or Drains
High Voltage Powerlines
District Boundary
Drains
Irrigation Laterals
Tiled Fields
Exclusion
Lift Pump(s)
San Luis Canal Turnout
PACHECO WATER DISTRICT INFRASTRUCTURE
IMPROVEMENTS - LATERAL 3 LINING PROJECT
PACHECO WATER DISTRICT
FIREBAUGH CALIFORNIA
LOCATION MAP
SUMMERS ENGINEERING INC.
Consulting Engineers
HANFORD CALIFORNIA
APRIL 2006

Figure D-11



D.11.3.5 Groundwater Pumping

Projected Strategy Cost: $5,852,000 Requested IRWM Grant Funding: $5,702,000

Description: CCID and FCWD will install up to 20 groundwater wells and conveyance systems to pump between 10,000 and 20,000 acre feet per year from the deep aquifer. These wells will typically be between 300 and 400 feet deep and positioned above the Corcoran Clay layer. The water developed by these wells will be of sufficient quality that, when blended with other surface water supplies, will be suitable for irrigation use. Based on studies performed by Hydrofocus, Inc. (see Appendix C) and other agencies, it has been determined that pumping water from the deep aquifer will reduce the volume of produced sub-surface drain water by an estimated 1,000 acre feet each year.

Procedures: Water developed through this project will be metered and pumped into the districts' irrigation conveyance systems. A like volume of their CVP water supply will then be available for sale within the Region with the revenue generated being used to further fund the drainage action identified in the Westside Regional Drainage Plan.

Standards: Wells and conveyance pipelines will be constructed using construction practices typical to such installations. Well and pipeline materials will conform to the appropriate ASTM specification. Well motors will be diesel and air quality standards compliant.

Development of PAEPs, MPs, and QAPPs: The potentially large effect of this action combined with the myriad factors that impact drainage production result in difficulty monitoring and evaluating this action in terms of drainage impacts. As such, the volume of groundwater pumped and revenue generated will be monitored. An MP and QAPP will not be required for this action.

Status of Land Acquisition: Acquisition of land is not required as part of this action. Wells and conveyance infrastructure will be constructed within districts' right-of-way.

Project Merits: This action potentially removes up to 1,000 acre-feet annually from the sub-surface drainage stream while contributing up to 20,000 acre-feet per year to the Regional water supply. This project will also generate much needed funds to implement other components of the Westside Regional Drainage Plan.

Required Permits: Fresno County will require permits for well construction and road crossings. The districts are in the process of complying with these permit requirements.

CEQA Compliance: The SJRECWA is working with the USBR in developing a CEQA Initial Study and NEPA documentation to evaluate this action in compliance with State and Federal environmental regulations.

Groundwater Management Plan: A groundwater management plan is being developed by the SJRECWA. This plan will be completed by May 2007.

Progress Reports and Milestones: Progress of this action will be monitored and reported through the tracking of the number of well and conveyance systems installed. This will be reported in quarterly reports.

Other Work: There is no other work associated with this action.

Plans and Specifications: A well and conveyance systems maps have been developed. Design drawing of the conveyance systems will be developed and submitted by the districts.

D.11.3.6 Salt Disposal Development Project

Projected Strategy Cost: $4,915,000 Requested IRWM Grant Funding: $4,600,000

Description: In order to ensure long-term operation of the Westside Regional Drainage Plan, some means of managing the salt removed from the soil profile will need to be developed. Currently, two actions are under consideration: 1) Treatment and salt marketing and 2) Power generation through solar cells.

A bench-scale evaluation and engineering report for a potential treatment process was completed in April of 2006. This process uses a combination of technologies to condition the drain water and remove the dissolved solids through a combination of electrolytic cells and membrane treatment. The process will generate a volume of clean, reusable water and salts separated into gypsum (calcium sulfate) and sodium chloride, both of which can be sold to offset costs.

The power generation option will utilize a series of parabolic solar arrays to generate heat. This heat will convert the drain water from the reuse areas into steam, which will, in turn, run a steam engine or turbine to generate power that will be net-metered back on to the grid to offset costs. Approximately 70% of the steam will be recaptured as distilled water for reuse. The boiling process will generate a dry salt that will be stockpiled onsite and either marketed or hauled off for disposal.

There are significant unknowns with both action alternatives. As such, this action is being pursued sequentially. First, a feasibility analysis of both actions will be performed (Phase I). Second, a preferred alternative will be selected and a pilot system for that alternative will be constructed to test the process and define costs for a full scale system (Phase II).

Procedures: PDD will act as the lead agency for this action insofar as selecting the preferred alternative and providing oversight to the pilot project. An MOU between PDD and the WRDPJPA will be developed to outline responsibilities and reporting requirements.

Standards: Phase I will use standard benefit-cost evaluation methods and will account for capital and O&M costs, system complexity, drain water consumption (either through treatment or evaporation), and will ultimately develop a cost per unit of drain water consumed. Phase II will be performed using standard design and construction practices.

Development of PAEPs, MPs, and QAPPs: This action will be evaluated through the analysis of the performance of the selected alternative. The performance parameters will include the capital and O&M costs of the selected alternative, the volume of drain water consumed by the project, and the quantity of the usable product produced (i.e. volume of treated water, kw of power generated, and marketable salts). A PAEP and MP will be developed for this action; however a QAPP will not likely be necessary.

Status of Land Acquisition: The pilot facilities constructed during this action will be located on the existing reuse area, which is currently owned by PDD. No additional land acquisition will be required.

Project Merits: This action provides the final element of a complete solution toward eliminating sub-surface discharge into the San Joaquin River. The source control projects, such as irrigation improvements and groundwater pumping, and drainage reuse included in the Westside Regional Drainage Plan will reduce the overall volume of subsurface drainage to a manageable level; however, some form of ultimate salt removal is required if the project area is to remain a viable agricultural center. This action advances the salt disposal element by evaluating two alternate processes for removing salt, selecting a preferred alternate, and demonstrating its capabilities in the field. The results of this action will provide detailed information on the costs and capabilities of a salt disposal method.

Required Permits: No permits are required for this action.

CEQA Compliance: Phase II of this action will required an Initial Study to comply with CEQA. It is anticipated that this study will result in a Negative Declaration or mitigated

Negative Declaration. This process will be initiated after a notice of award for grant funding has been provided.

Groundwater Management Plan: A groundwater management plan is not required for this action.

Progress Reports and Milestones: The milestones for this action will be 1) selection of preferred alternative, 2) completion of pilot plant construction, 3) operation of pilot plant, and 4) final evaluation of pilot plant operation. Progress towards each of these milestones will be tracked through quarterly reports. The final evaluation of the pilot plant operation will be detailed in a final report at the completion of this action.

Other Work: There is no other work associated with this action.

Plans and Specifications: Preliminary designs and proposals for each of the two alternatives have been completed.

D.12.0 WESTSIDE SURFACE STORAGE RESERVOIR PROJECT

D.12.1 Overview of the Propose Project

Westlands Water District (WWD) is planning the construction of a surface storage reservoir project within District boundaries on land owned by the District. The proposed surface storage project would use land that was previously drained, has now been retired, and has been in the public eye for many years. The project would be located south of the City of Mendota, near the intersection of Derrick Ave. and Adams Ave. A conceptual report was prepared by the District in 2002, followed by a feasibility study in 2003, and a pilot project constructed in March 2004 which continues to gather data after a progress report in April 2005.

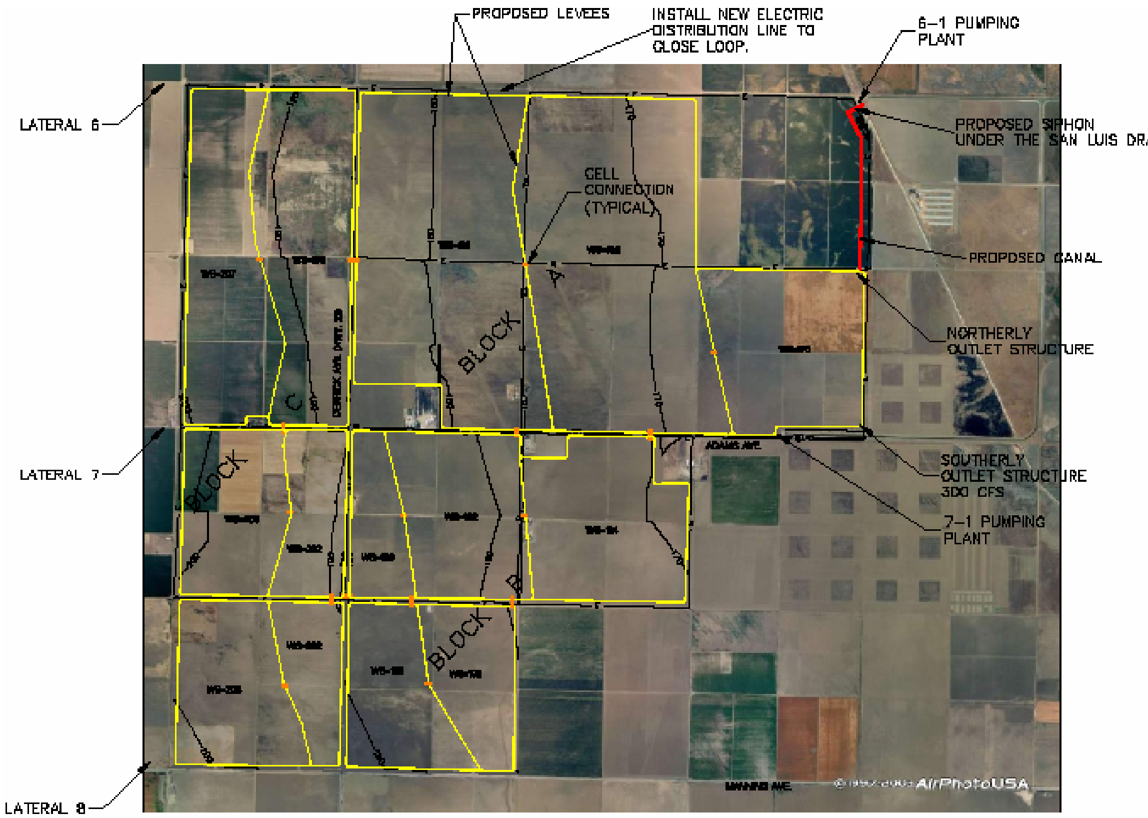
In general the project would consist of building levees to create above ground storage on the project site, building interconnections to tie the various portions of the reservoir together, adding inlet structures from Laterals 6 and 7, and building a channel to take water from the project outlet to the Mendota Pool (MP). Once in the MP, the water would either be exchanged with the Exchange Contractors or other CVP contractors, or pumped back to the SLC via Laterals 6 and 7 for redistribution within the District through the District's delivery system. In utilizing this storage project Westlands frees capacity in the SLC, San Luis Reservoir, DMC, and Tracy Pumping Plant for utilization by other Regional agencies.

The project would be utilized to store water from a variety of sources, including CVP contract water, rescheduled water, surplus water, and water from other sources including San Joaquin River and Kings River flood flows, refuges, and other CVP contractors. The primary project components would lie east of Derrick Ave. on approximately 8 sections of land and would have the capability of storing approximately 50,000 acre-feet (AF) of water. The project could also be expanded to include an additional 4 sections of land west of Derrick Ave. to increase storage to 75,000 AF. Figure D-12 shows the site separated into blocks A, B, and C with proposed improvements.

A full-size storage project would likely be phased, and would begin with Block A. For this reason, the pilot project consisted of building four ponds on slightly different soil types within Block A of the project. The ponds were constructed in accordance with the preliminary geotechnical recommendations for the storage project, with a top levee width of 15 feet, over 5 feet deep and having a floor area of approximately 100 feet by 100 feet each. The intent of the pilot project was to provide answers to some questions that need to be addressed prior to proceeding with environmental documentation or final design of the proposed surface water storage project. By constructing and operating the pilot project, the District could demonstrate to surrounding landowners, potential critics, and others what would happen if up to 12 sections of land are developed into a surface water storage facility. Construction was completed in mid March 2004 and two trials were conducted, with some pond modifications occurring between the first and second trials. Total cost for the pilot project was $155,000.

While a significant amount of useful information was gathered during the pilot study, there are still some unanswered questions that must be addressed before a determination to proceed with the full project can be made. The District is now moving forward with a larger, Phase 2 pilot study with some additional soil testing and mapping.

Figure D-12



The Phase 2 pilot project will consist of constructing a 40 acre pilot basin within Block A of the proposed project, holding water at the average maximum water depth of the proposed reservoir, approximately 10 feet deep. The height of the Phase 2 levees will be an average of 12 feet high to provide 2 feet of freeboard in the basin. Monitoring wells will be constructed to help determine how the groundwater mound develops and how quickly infiltrated water will move laterally through the soil, as well as allow for sampling of the shallow groundwater quality.

Soil mapping using Cone Penetrometer Testing (CPT) will be performed on a quarter-mile grid over Block A to identify those soils that may have higher infiltration rates. This will help determine a more accurate overall seepage loss rate. Clay mineralogy testing will also be conducted to determine if amending the soil with soda ash would help seal the basin floor. Shallow groundwater modeling will also be performed and studied in greater detail. Cost estimate for Phase 2 is $622,700.

D.12.2 Preliminary Cost Analysis for Full Project

In order to assess the cost-effectiveness of the proposed project, reconnaissance level construction costs were developed. The construction costs assumed that the project would be filled over a two month period, and emptied over a two month period. Included in the construction costs are the major components of the work such as earthwork, major structures, utility relocation, and improvements to District facilities. In addition to the construction costs 10% was added for engineering, geotechnical, and administrative costs, as well as a 20% contingency. An analysis of the costs for construction cost of the full project is estimated at $28,813,000.

A brief cost analysis was performed on the full project to determine what loss rates would yield the same or lower water cost ($/AF) as the current practice of purchasing water on the spot market to replace the water lost to rescheduling. For this analysis the following assumptions were made:

- The current cost of CVP water paid by WWD is $65 per AF;
- In a normal year, 35,000 AF of rescheduled water is lost and paid for;
- WWD would purchase 35,000 AF of supplemental water on the spot market for $120 per AF;
- If built, the storage project costs would be recovered over a period of 30 years at a rate of 5.5%;
- Operations and maintenance costs of the storage project would be 5% of the annual capital recovery cost.

Based on the assumptions above, WWD ultimately pays approximately $185 per AF for the 35,000 AF purchased on the spot market. This is because the District must pay $65 per AF for the CVP water even though the water was not received, and must pay approximately $120 per AF to purchase water on the spot market to replace the water lost to rescheduling. The project water costs vary with the percent of water recovered from storage, and the amount of water delivered to the project. A sample calculation is provided to show the probable unit cost of water stored:

- Preliminary Construction Cost Estimate = $28,813,000
- Capital Recovery Cost (30yrs @ 5.5%) = $1,982,000
- Operations and Maintenance Cost (5% of Capital Recovery) = $99,000
- Total Project Annual Cost = $2,081,000
- Assumed Deliveries to Project = 35,000 AF @ $65 / AF = $2,275,000
- Overall Loss Rate = 68%
- Assumed Annual Yield = (35,000 AF x 68%) = 23,800 AF
- Unit Cost of Stored Water = ($2,081,000 + $2,275,000) 23,800 AF = $183 / AF

This preliminary cost analysis indicates that for whichever portion of the project is built, if the entire capacity of the project is utilized every year, and roughly 68% of the water is recovered; the annual cost of the water is less than the current practice of losing the rescheduled water and purchasing supplemental water on the spot market. This does assume however, that the water can be exchanged in the Mendota Pool.

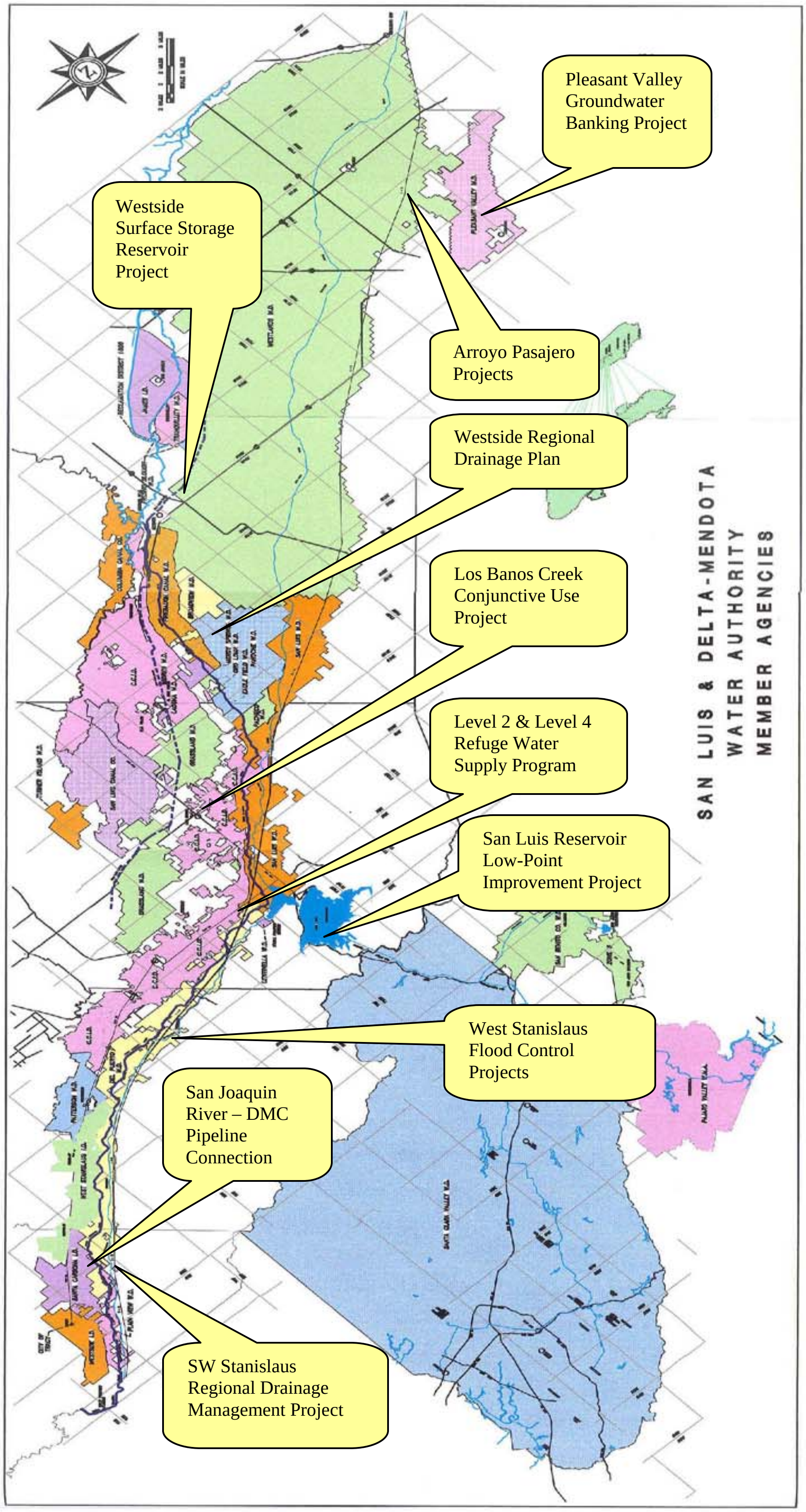
D.13.0 WEST STANISLAUS FLOOD CONTROL PROJECT

D.13.1 General Summary

The project will identify a plan to reduce flood damages in Newman, Patterson and surrounding agricultural lands by improving hydraulic capacity of Orestimba, Salado and Del Puerto Creeks. Multi-purpose detention basins are proposed for Del Puerto Creek to achieve water supply, hydropower and recreational benefits. A Notice of Intent (NOI) and Notice of Preparation (NOP) for an EIS/EIR were issued March 2001. Potential water supply benefits are unknown.

D.14.1 MAP ILLUSTRATING PROJECT LOCATIONS

The following map provides a general illustration of project locations. More specific information is included in this Plan for projects ready for implementation. The Water Authority has embarked on development of a digital Regional map will be able to provide specific information down to the parcel level. The new map will be able to identify land use information such as agricultural, urban, managed wetlands, drainage affected, natural grasslands, etc. Existing geographical information from Regional and federal sources is being gathered and compiled. It is anticipated the new map will be completed by the end of 2006.


Pleasant Valley Groundwater Banking Project
Westside Surface Storage Reservoir Project
Arroyo Pasajero Projects
Westside Regional Drainage Plan
Los Banos Creek Conjunctive Use Project
Level 2 & Level 4 Refuge Water Supply Program
San Luis Reservoir Low-Point Improvement Project
West Stanislaus Flood Control Projects
San Joaquin River – DMC Pipeline Connection
SW Stanislaus Regional Drainage Management Project
SAN LUIS & DELTA-MENDOTA
WATER AUTHORITY
MEMBER AGENCIES

SECTION E: INTEGRATION

E.1.1 WATER MANAGEMENT STRATEGIES

The Plan incorporates water management strategies intended to support and advance the Regional objectives of the Water Authority's membership. While individually worthy, the integration of actions otherwise pursued independently allows for the maximization of a project's benefit, provides expanded operational efficiency and flexibility potential, and best achieves the objectives of the Region.

As previously discussed, the Plan identifies alternatives to reduce the imbalance between water demand and supply while improving environmental and socio-economic status through a series of drainage, flood control, groundwater management, land use, water conservation, water quality, water supply, water use efficiency proposals. The overarching goal of the Plan is to minimize Regional conflict by addressing the most problematic sources of tension affecting our agricultural, municipal, and environmental water use, namely water supply reliability, drainage, and water quality.

Specifically, the following projects employ or could employ varying strategies in order to achieve Regional objectives:

E.1.2 Arroyo Pasajero Flood Control Project

Strategies Employed: Flood control, surface storage, supply supplementation.

Objectives Achieved: Habitat Improvement, Flood Management, Storm Water Capture, Water Conservation.

E.1.3 Arroyo Pasajero Groundwater Banking Project

Strategies Employed: Land use management, storm water capture, groundwater storage development, supply supplementation, water transfers.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Storm Water Capture, Water Conservation, Wetlands Enhancement.

E.1.4 Level 2 & Level 4 Refuge Water Supply Diversification Program

Strategies Employed: Groundwater management, operational flexibility, supply supplementation.

Objectives Achieved: Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Recreation, Wetlands Enhancement.

E.1.5 Los Banos Creek Conjunctive Use Project

Strategies Employed: Land use management, storm water capture, groundwater storage development, supply supplementation, water transfers.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Storm Water Capture, Water Conservation, Wetlands Enhancement.

E.1.6 Pleasant Valley Groundwater Banking Project

Strategies Employed: Land use management, storm water capture, groundwater storage development, supply supplementation, water transfers.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Storm Water Capture, Water Conservation, Wetlands Enhancement.

E.1.7 San Joaquin River – DMC Pipeline Connection

Strategies Employed: Conveyance expansion, energy conservation, operational flexibility, storm water capture, supply supplementation, water transfers.

Objectives Achieved: Water Supply Reliability, Groundwater Management, Storm Water Management, Water Conservation, Water Quality Improvement.

E.1.8 San Joaquin River Exchange Contractors Water Authority and San Luis & Delta-Mendota Water Authority Water Transfer Program

Strategies Employed: Groundwater management, land use management, recirculation, source control, supply supplementation, water transfers, and water use efficiency.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Water Conservation, Water Quality Improvement

E.1.9 San Luis Reservoir Low-Point Improvement Project

Strategies Employed: Conveyance expansion, operational flexibility, source shifting, supply supplementation, water transfers, water conservation.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Water Conservation, Water Quality Improvement

E.1.10 Southwest Stanislaus County Regional Drainage Management Project

Strategies Employed: Flood control, recycling, surface storage, supply supplementation, water conservation.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Water Conservation, Water Quality Improvement, Recycling.

E.1.11 Westside Regional Drainage Plan

Strategies Employed: Conveyance improvement, groundwater management, land use management, recirculation, recycling, source control, supply supplementation, treatment, water quality protection and improvement, water transfers, water use efficiency.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Water Conservation, Water Quality Improvement, Recycling.

E.1.12 Westside Surface Storage Reservoir Project

Strategies Employed: Conveyance expansion, land use management, storm water capture, surface storage development, supply supplementation, water transfers.

Objectives Achieved: Ecosystem Restoration, Environmental and Habitat Protection and Improvement, Water Supply Reliability, Groundwater Management, Storm Water Capture, Water Conservation, Wetlands Enhancement.

E.1.13 West Stanislaus Flood Control Project

Strategies Employed: Flood control, hydro-power generation, surface storage development, supply supplementation.

Objectives Achieved: Habitat Improvement, Water Supply Reliability, Flood Management, Groundwater Management, Recreation, Storm Water Capture, Water Conservation, Wetlands Enhancement.

E.2.1 PROJECT INTEGRATION

As illustrated above, the Plan relies on integration at two separate levels, each with different aspirations and requirements. The Plan's overarching approach relies on the selection of individual projects that as a collective provide measured progress toward meeting Regional objectives. No single project can fully realize the objectives of the Region; therefore, the Plan identifies projects that are complementary in their Regional benefit. In this context, integration at the Plan level is viewed as the mix of projects, each with its own ingredients, that provides some essential element toward achieving the recipe of Regional objectives. Put another way, the Arroyo Pasajero Flood Control Project provides a needed flood control solution but offers no wetlands enhancement, a benefit derive through implementation of the Level 2 & Level 4 Refuge Water Supply Diversification Program, which offers no progress toward water quality improvement; that can be found in the Westside Regional Drainage Plan.

The second level of integration is of the strategies necessary to implement the projects. At this sub-project level, integration of strategies are often necessarily technically, financially, and politically interdependent in order to provide an otherwise elusive solution to a particular problem(s) or conflict(s). For example, the Westside Regional Drainage Plan integrates various strategies across district boundaries, such as irrigation improvements, distribution facility improvements, reuse projects, and water treatment, to develop a zero discharge solution otherwise unachievable if each were implemented independently or pursued by individual districts.

While integration of the WRDP technical solutions is important, interdependency is essential in that the benefits derived through reuse, as an example, are minimized if concurrent improvements in irrigation methods and distribution facilities are not made. Furthermore, interdependency, as it extends into the funding and political realms, is arguably more critical in that here lays the foundation for vital stakeholder support. Implementing a WRDP transfer strategy provides revenue to support advancement of the project; advancement of the project minimizes conflict over drainage, which in turn fosters other opportunities. Thus, the interdependency of strategies at the sub-project level can foster integration of stakeholders' efforts at the Plan level and beyond.

SECTION F: REGIONAL PRIORITIES

F.1.0 Regional Priorities

The Region, composed of the Water Authority's 32 Member Agencies, is primarily agricultural in nature. The majority of the area represented is in unincorporated county areas and, as such, is largely disenfranchised from typical governmental planning processes at all levels, which tend to focus on managing urbanization. Member Agencies recognizing the vacuum in coordinated planning relative to agricultural needs have either assumed the responsibility or delegated the role to the Water Authority. The 2006 Westside Integrated Water Resource Plan is a compilation of these efforts. The projects contained herein represent the Region's current view of the projects and priorities that will most likely achieve the breadth of outcomes identified in the Regional objectives while contributing to many identified state and federal water resource management priorities.

The projects identified in the Plan primarily address chronic problems that threaten the future socio-economic viability of the Region. Solutions to core issues such as expanding water supply and improving reliability, managing groundwater, improving water quality, and enhancing habitat are at the heart of the identified Regional objectives. The development of the Plan is intended to bring to prominence the locally understood solutions to these long standing problems and resultant conflicts. Selection and prioritization of projects therefore is reflective of an ability to add value to the Region by addressing the core issues and resolving strife in order to achieve the desired objectives.

F.1.1 Project Prioritization

Ideally, all of the Plan's projects would be implemented simultaneously; however, many factors influence the readiness of a project. Aside from technical preparedness, a project must secure adequate funding and be politically feasible. Projects identified in this Plan were evaluated at two levels, technical and policy, and then segregated into either short term or long term priorities. In this context short term priorities include those projects that have the most significant and immediate potential to address core issues and settle conflicts thereby providing the greatest Regional benefit. Long term projects offer similar value but do not require the same immediacy for implementation. All projects in the Plan provide incremental progress toward full accomplishment of the Region objectives.

The technical assessment was conducted by a work group comprised of districts' staff and consultants, primarily engineers. This group evaluated the technical and economic feasibility of projects and segregated them into three tiers reflective of a project's stage in planning. The policy steering committee, comprised of managers and board members of representative districts, evaluated the segregated projects based upon their relative benefit to the Region and relationship to broader state and federal goals.

Reevaluation of project priorities is essential toward maintaining relevance in an ever changing world. By iteratively assessing the potential of a project to positively affect progress toward the Regional objectives as well as external aims, a project's priority may change irrespective of its development status. Put another way, a project may become a short-term priority even if it requires further study or planning because it shows new potential for meeting Regional, state, and federal objectives.

F.2.1 Short Term Priorities

Projects considered short term priorities are those that have the most significant and immediate potential to address core issues and settle conflicts thereby providing the greatest Regional benefit.. These include the Arroyo Pasajero Flood Control Project, Level 2 & Level 4 Refuge Water Supply Diversification Program, San Luis & Delta-Mendota Water Authority and San Joaquin River Exchange Contractors Water Authority Water Transfer Program, San Luis Reservoir Low-Point Improvement Project, Southwest Stanislaus County Regional Drainage Management Project, and Westside Regional Drainage Plan.

F.3.1 Long Term Priorities

Projects considered long term priorities are those that offer similar value as short term projects but do not require the same immediacy for implementation. These include the Arroyo Pasajero Groundwater Banking Project, Los Banos Creek Conjunctive Use Project, Pleasant Valley Groundwater Banking Project, San Joaquin River – DMC Pipeline Connection, Westside Surface Storage Reservoir Project, and West Stanislaus Flood Control Project.

F.4.1 Project Ranking and Tentative Schedule

Table F-1 presents the Plan's projects listed in priority ranking order, from highest to lowest, and tentative implementation schedule. The schedule only forecasts a period of five years as this period is considered as a reasonably predictable event horizon. The Plan will be updated and revised periodically within this period, which may affect future ranking order and schedule.

The following legend applies to the abbreviations utilized in the schedule and is intended to provide only a general sense of project progress. Implementation of individual strategies within each project will occur at varying rates; more information is provided in Section G.

F&P – Feasibility and Planning;

DERP – Design, Environmental Review, and Permitting;

C&IoS – Construction and Initiation of Service (not all projects require construction).

Table F-1: Project Prioritization and Tentative Schedule

Projects	2006	2007	2008	2009	2010
Westside Regional Drainage Plan	F&P	DERP	DERP	C&IoS	C&IoS
San Luis Reservoir Low-Point Improvement Project	F&P	F&P	DERP	DERP	C&IoS
Level 2 & Level 4 Refuge Water Supply Diversification Program	DERP	C&IoS	C&IoS	C&IoS	C&IoS
SJRECWA and Water Authority Water Transfer Program	C&IoS	C&IoS	C&IoS	C&IoS	C&IoS
Southwest Stanislaus County Regional Drainage Management Project	F&P	F&P	DERP	DERP	C&IoS
Arroyo Pasajero Flood Control Project	F&P	F&P	DERP	DERP	C&IoS
Westside Surface Storage Reservoir Project	DERP	DERP	C&IoS	C&IoS	C&IoS
San Joaquin River – DMC Pipeline Connection	F&P	F&P	DERP	DERP	C&IoS
Pleasant Valley Groundwater Banking Project	F&P	F&P	DERP	DERP	C&IoS
Los Banos Creek Conjunctive Use Project	F&P	F&P	DERP	DERP	C&IoS
West Stanislaus Flood Control Project	F&P	F&P	DERP	DERP	C&IoS
Arroyo Pasajero Groundwater Banking Project	F&P	F&P	DERP	DERP	C&IoS

F.5.1 Priority Modification

The Water Authority has always viewed the Plan as a “living” document. Since its genesis in 2001, the Plan has been reevaluated and revised approximately every two years. This is a process that will continue in the future in order to address inevitable ecological, economic, resource, and social changes in a timely and thoughtful manner. Through this effort, old assumptions will be tested and new solutions developed and implemented to address the then current objectives of the country, state, and region.

F.6.1 Project Strategy Prioritization

The following prioritization of strategies at the sub-project level is provided where available. Projects included in this Plan do not all require utilization of multiple strategies for successful implementation.

F.6.1.1 San Luis Reservoir Low-Point Improvement Project

The SLRLPIP is just entering the feasibility study phase and, as such, has yet to identify project alternatives or resultant strategies; however, project outcomes have been identified and prioritized as follows.

The USBR, SCVWD, and Water Authority have defined the outcome of the project as to increase the operational flexibility of storage in SLR while ensuring a high quality, reliable water supply for south of Delta CVP contractors, including the San Felipe Division. The project is intended to produce solutions of the following priorities:

1) Increase the certainty of meeting the requested delivery schedule of annual allocation to San Luis Reservoir south of Delta CVP contractors.
2) To the extent possible, while meeting the first objective, increase the reliability and quantity of annual allocations to CVP contractors.
3) To the extent possible, while meeting the first objective, forecast the final allocation to San Luis Reservoir dependent contractors earlier in the season.

Several additional opportunities may also be presented as a result of addressing the above objectives. These include improving water quality conditions for the San Felipe Division contractors and providing ecosystem restoration opportunities. More detailed SLRLPIP implementation schedule information can be found in Section G.

F.6.1.2 Westside Regional Drainage Plan

Execution of the WRDP is intended to produce outcomes (*italics*) consistent with Regionally established objectives through implementation of the following described strategies.

a. *Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation.* The project improves water quality in areas of the lower San Joaquin River through the combination of source reduction and treatment projects. The improved River water quality in turn enhances conditions in the Delta.

b. *Improve south-of-Delta water supply reliability by an average of 25%.* The project provides for 15,000 acre-feet per year, on average, of new water supply to the Region.

c. *Maximize utility of local aquifers while reducing potential for overdraft.* The project provides for utilization and management of a previously untapped aquifer that will provide both new supplies after blending and will manage migration of saline groundwater.

d. *Always promote and enhance water conservation.* The project has specific components to conserve water through on-farm irrigation improvements and canal linings. Reuse of agricultural drainage will also displace the need for equivalent amounts of fresh water supply.

e. *Develop Regional solutions that provide opportunity for water quality improvement.* The project is a Regional solution made up of components managed by entities within the Water Authority that will reduced saline discharge to the lower San Joaquin River by 240,000 tons per year.

f. *Promote and enhance water recycling.* The project encompasses both drain water recirculation on primary production fields as well as reuse of drain water on salt-tolerant crop reuse areas.

This WRDP contains six strategies that will expand efforts currently underway in the Grassland Drainage Area. Table F-2 provides an overview of each of these strategies and its implementation priority relative to the success of the entire project as established by the WRDP stakeholders.

Table F-2: Project Summaries

Strategy	Abstract	Status	Priority	Implementing Agencies
Reuse Land Purchase	In order to provide adequate drainage reuse capacity, the WRDP estimates an additional 2,000 acres of reuse area will be required. The location of this property has been determined and the landowner is a willing seller.	Location determined, appraisal complete, 50% complete.	1	WRDPJPA
Reuse Area Development	This action will tile and plant the 2,000 acres purchased as part of this proposal. It will also plant the remaining 350 acres of the existing reuse area and install subsurface drainage systems in approximately 2,300 acres of the reuse area that is currently undrained.	Potential crops identified and tile system concept designs established. 10% complete	2	Panoche Drainage District
Irrigation Improvements	This action will install high-efficiency irrigation systems within the solution area. These systems will be grower installed and may include funding assistance from local water and irrigation districts. Conversion of irrigated lands from furrow irrigation to sprinkler, drip or other microirrigation on about 30,000 acres of lands will lower deep percolation of excess applied water by 7,400 acre-feet annually and reduce subsurface drainage production by approximately 5,700 acre-feet annually. Growers within the solution area have already spent several million dollars on irrigation	In Progress. Estimated 30% complete.	3	All Districts.

	improvements and the WRDP estimates that more than $20 million will be spent in the future**.**			
Infrastructure Improvements	This action will identify unlined irrigation distribution facilities within the solution area that are suitable for lining or piping.	In Progress. Approximately 12 miles of canals have been lined or piped since 2000. 40% complete.	4	Firebaugh Canal Water District, Panoche Water District, Pacheco Water District
Deep Groundwater Pumping	This action proposes to install a number of deep aquifer wells to pump between 10,000 and 20,000 acre-feet annually, possibly reducing the volume of drainage production by an estimated 1,000 acre feet each year. The well water produced will be delivered within the district of production thereby freeing up a like quantity of surface water for transfer. Revenue from sales will be reinvested into the WRDP.	Three wells for this project have been installed since 2005. Typical well designs have been completed and the preferred well locations have been identified. Design: 90% complete. Implementation: 15% complete.	5	Firebaugh Canal Water District, Central California Irrigation District
Salt Disposal Development Project	This action will evaluate two separate salt disposal alternatives: drainage treatment and power generation; identify a preferred alternative, construct a pilot demonstration plant, and evaluate the process selected. The purpose of this project is to develop the preferred means of disposing of the salt and other minerals removed from the reuse area root zone.	An engineering level feasibility report on drainage treatment has been developed. 10% complete	6	WRDPJPA

More detailed WRDP implementation schedule information can be found in Section G.

SECTION G: IMPLEMENTATION

G.1.0 IMPLEMENTATION PHILOSOPHY

The 2006 Westside Integrated Water Resources Plan is a catalog of locally developed initiatives promoted by Member Agencies and incorporated herein due to their potential to provide broader, Regional benefits through the integration of strategies at a project level to achieve incremental progress toward Regional objectives. The Plan is the sum of its projects and is too ambitious to require concurrent implementation of all, thus it measures progress toward implementation one project at a time. In order to accomplish this, strategic partnerships, both inside and outside the Region, have been formed to develop and implement the various projects.

The projects identified in this Plan are in varying stages of development; some are already underway while others exist merely as concepts. As such, the Plan does not attempt to define a global implementation schedule; rather the focus here is upon those projects that are currently technically, financially, and politically ripe for implementation. As this is intended to be a "living" document, the focus of the Plan may change in the future in order to address inevitable ecological, economic, resource, and social changes. This flexibility is enhanced by the Plan's lack of interdependency between implementation of projects.

G.1.1 Institutional Support Strategy for Project Implementation

Projects contained in the Plan are generally conceived at the Member Agency level, often to address a specific circumstance. Participation in the Water Authority allows Member Agencies to be exposed to the needs and circumstances of other agencies and to express the initiatives undertaken by their own. In this environment, the evolution of ideas is fostered, occasionally culminating in the formation of the strategic partnerships necessary to advance a project from conception to implementation.

Implementation of projects is generally approached in one of three ways. Under one model, Member Agencies develop the actions and strategic partnerships necessary to advance a project and then present the project to the Water Authority for support or participation. Under this approach, management of the project is external from the Water Authority, whose role is then equal to that of any other project participant. As with any other participant, the Water Authority may provide technical, financial, policy, and political support necessary to advance implementation at the guidance of the project's external management structure. The degree of the Water Authority's participation is a matter of mutual consent among the participants and the consideration as to whether or not to participate is processed through the Water Authority's standing committees and Board of Directors.

Another implementation approach is one in which the Water Authority identifies an opportunity to expand a project's potential and then approaches proponents and prospective participants to develop the partnerships necessary to expand the then existing scope of the project. The significant difference between this approach and the former is that these types of projects are governed from within the Water Authority under what are called Activity Agreements. Activity Agreements are customized documents that address the specific needs and participation of any given activity. The participants within an activity develop recommendations that steer implementation, which are then processed through the Water Authority's standing committees and Board of Directors, with whom the ultimate decisional authority lies. The Water Authority currently implements 14 activities under this institutional structure.

The third approach involves the Water Authority as a facilitator between dissenting parties. Under these circumstances, parties at odds request the Water Authority mediate development of a solution to resolve an existing conflict. If so engaged, the Water Authority plays no decisional role in the development and implementation of a solution, it merely guides the parties toward resolution. Implementation of an agreement is decided upon by the parties and would generally utilized one of the two approaches previously described. The decision to act as facilitator is processed through the Water Authority's standing committees and Board of Directors.

Common to all approaches is the regular reporting of implementation progress to a project's appropriate governing body. Each project is composed of different strategies necessary to achieve the desired outcome(s); therefore, each project is responsible for developing its own criteria from which to measure implementation progress. With regard to the Water Authority, reports are routinely provided to the appropriate standing committees and Board of Directors, whom, when necessary, provide feedback either directly, in the case of Activity Agreements, or indirectly when participating as a stakeholder in an externally governed process.

Unexpected circumstances do impede project implementation and these matters are addressed by the appropriate governing body, which can result in changing tactics, strategies, or both. Depending upon the complexity of the institutional support structure behind a given project, multiple meetings may have to occur prior to altering a project's implementation plan. Due to the variety of objectives sought in this Plan and the number of employed strategies, no single metric can be used to measure the Plan's status other than project implementation.

G.1.2 Project Interdependency

Projects selected for inclusion in the Plan are interrelated because each provides some incremental measure of progress toward realization of the Regional objectives; however, the Plan deliberately avoids creating hard linkages or interdependencies between the implementation of projects. As previously stated, not all projects enjoy developmental parity. While the interdependency of strategies within a project may be essential to the successful implementation of that project, such linkages between projects as indispensable elements of the Plan's implementation unnecessarily creates a situation wherein the success of the Plan, and even individual projects, is jeopardized by the unforeseen inability of a specific project to advance. Rather than creating such a dynamic, the Plan focuses on nurturing implementation of stand-alone projects that individually add value to the Regional.

The successful implementation of each project thus becomes a single step in the successful execution of the Plan.

Interdependency, however, at a sub-project level does exist and can be critical to the successful implementation of the strategies necessary to ensure completion of a project. As explained in Section E.2.1, integration of strategies is important but interdependency can be essential. Often, the employment of one strategy within a project cannot be fully realized without the concomitant implementation of another. Furthermore, interdependency, as it extends into the funding and political realms, is arguably more critical in that here lays the foundation for vital stakeholder support, which in turn can foster other opportunities. Thus, the interdependency of strategies at the sub-project level can promote the integration of stakeholder efforts at the Plan level and beyond.

G.2.0 PROJECT SPECIFIC IMPLEMENTATION INFORMATION

Below is a brief implementation description for selected Projects at an appropriate stage of development. Each project described also illustrates a respective institutional support strategy for project implementation.

G.2.1 San Luis Reservoir Low-Point Improvement Project

The Water Authority, SCVWD, and USBR are preparing to initiate the feasibility study phase of this project. This phase is expected to continue for two to three years during which project alternatives and strategies will be identified, analyzed, and determined. The tentative project development schedule is as follows:

Federal Appraisal Report	May 2006
Federal Plan of Study	May 2006
Federal Feasibility Study	October 2006 – October 2009
Administrative Draft EIR/EIS	October 2008
Final EIS/EIR	October 2009
Solution Implementation	> 2009

G.2.2 West Side Regional Drainage Plan

Various aspects of this project have already been implemented on a smaller scale or on more targeted problems. The WRDP as described in this document contemplates expanding the sets of strategies utilized, the objectives achieved, and the integration of Regional participation. In moving into this next phase, the WRDP accomplishes what could not be achieved through individual effort or singular implementation of strategies. Following is a description of project accomplishments to date and future implementation schedule.

G.2.2.1 WRDP Activities Completed or Underway as of May 1, 2007

The implementation of a drainage solution for the Grassland Drainage Area dates back to September 1996, before the inception of the Grassland Bypass Project. Many of the activities and projects undertaken previously provided the basis for the WRDP. Actions that have been implemented are outlined below.

- District infrastructure improvement Projects: Since 2000, FCWD has lined or piped more than 12 miles of irrigation canals and laterals, at a total cost of $3,575,000.
- Irrigation improvements: Since 2002, almost 15,000 acres of improved irrigation systems, including drip and mirco-sprinkler systems, have been installed within Panoche and Pacheco Water Districts. An additional 3,000 acres were installed in the Firebaugh Canal Water District. The Districts' within the solution area have provided financial assistance in the form of grants and loans, but much of cost of these systems has been borne directly by the area farmers.
- The San Joaquin River Improvement Project. In June 1998, as part of Grassland Drainage Area farmers' efforts to meet selenium discharge load targets, Panoche Drainage District began applying drainage water to pasture and alfalfa fields. In January 2001, with $17,500,000 in funding from the State of California Proposition 13, Phase I of the SJRIP was implemented. This effort included the purchase of approximately 4,000 acres of farmland for development of the current reuse area. Beginning with the 2001 irrigation season, sub-surface drain water from the solution area was used to irrigate halophytic crops (Figure G-1), displacing more than 2,800 acre feet otherwise destined for the San Joaquin River.

Figure G-1

Asparagus and Alfalfa grown with blended drain water in the current reuse area. Other crops in the reuse area include Jose Tall Wheatgrass, Bermuda, Fescue, Paspalum Grass, Sun Flowers, Desert Palms, and Pistachios.

Table G-2 shows the volume of drain water and associated constituents reused on the PDD Drainage Reuse Project and SJRIP since 1998.

Table G-2

Water Year	Reused Drain Water	Displaced Selenium	Displaced Boron	Displaced Salt
	(acre-feet)	(pounds)	(pounds)	(tons)
1998[¥]	1,211	329	NA	4,608
1999[¥]	2,612	321	NA	10,230
2000[¥]	2,020	423	NA	7,699
2001	2,850	1,025	61,847	14,491
2002	3,711	1,119	77,134	17,715
2003	5,376	1,626	141,299	27,728
2004	7,890	2,417	193,956	41,444
2005	8,143	2,150	210,627	40,492

NA = Not Available
[¥] PDD drainage reuse project prior to SJRIP

- In 2002, the Grassland Integrated Drainage Management Project (GIDMP) was implemented. The GIDMP installed subsurface drainage systems on approximately 500 acres of the reuse area and planted that acreage with a number of salt tolerant crops including Jose Tall Wheatgrass, Bermuda and Fescue pasture, Pistachio trees, and Alfalfa. The $1,234,000 cost for the GIDMP came from Proposition 13 and district match funding. In 2003, the USBR, with some district funding, provided $305,000 to install drainage systems, construct an irrigation system, and plant halophytes on additional 153 acres of the reuse area. By spring 2005, this action was completed. Reclamation has also provided more than $3.4 million for additional development of the reuse area and other drainage management activities.

- Development of the Westside Regional Drainage Plan. Building upon the prior successes, in May 2003, the WRDP was conceived by the San Joaquin River Exchange Contractors, Broadview Water District, Panoche Water District, Westlands Water District, and the Water Authority. The WRDP expands upon the practical approaches to managing drainage within the solution area and identifies feasible projects that will eliminate subsurface tile drainage discharges to the San Joaquin River, except during rare, uncontrollable high runoff storm events during which assimilative capacity in the SJR is high. The WRDP is designed both to eliminate saline discharges to the SJR from the solution area and to provide drainage service to land presently served by the Grassland Bypass Project. By providing long-term assurance that sub-surface drainage in the area can be controlled, the plan will resolve participants' concerns arising from lack of a master drain and resolve disputes as to impacts from the lack of adequate drainage. It includes components to produce groundwater for both saline groundwater management and water supply and exchange purposes.

- The CEQA process is being completed for the various project strategies. Since individual agencies are implementing several of the components and the actions have independent utility, CEQA is being provided for the lead agency for each project.

Reuse Areas – In September 2000, Panoche Drainage District adopted a Negative Declaration for the purchase and management of the San Joaquin River Water Quality Improvement Project (SJRIP) as a drainage reuse project. In October 2005, Panoche Drainage District retained URS, Inc. to develop an initial study to identify alternatives for an expanded reuse project and to determine whether or not such a project would result in adverse environmental effects requiring preparation of an Environmental Impact Report. As of May 2006, this document was not yet complete; however a draft is expected by July 2006. It is anticipated that the Initial Study will lead to a negative declaration or mitigated negative declaration for the reuse expansion and development project and this process will be completed before May 2007.

Groundwater Pumping – Central California Irrigation District and Firebaugh Canal Water District are preparing initial studies for installation of the groundwater wells. A CEQA negative declaration or mitigated negative declaration and an environmental assessment under NEPA are expected by August 2006.

Irrigation Improvements – To the extent these improvements are performed by private landowners on farm, they require no discretionary permits and thus are statutorily exempt from CEQA. District programs to fund improved irrigation efficiency within district boundaries will be reviewed pursuant to CEQA and are expected to be found Categorically Exempt from CEQA.

Infrastructure Improvements – Canal lining or piping is expected to receive CEQA categorical exemptions as "Minor alterations of existing facilities with no expansion in use" The only exception could be the Panoche WD Spill Recovery Project, which will require an initial study likely resulting in a Negative Declaration that will be processed by Panoche WD by December 2006.

Pilot Treatment Studies and Projects – During the summer of 2005, Firebaugh Canal Water District partnered with Panoche Drainage District and USDesal, Inc. to develop a treatment process for subsurface drainage. The process uses a combination of nano-filtration, reverse osmosis treatment, and brine crystallization to treat the drainage. The filtering process separates the dissolved and suspended solids into concentrated brine, which will be dried to a solid during the crystallization process. Treated water will be redistributed for irrigation or other potential uses. The initial investigation into the technology has been very promising; however, there are still significant unknowns, including the cost of treatment. A final report is expected in May, 2006, which will include a pilot treatment plant design. The total cost of this investigation was $305,452.

G.2.2.2 WRDP Implementation Schedule >2007

The chart below shows the estimated schedule for implementation of the Westside Regional Drainage Plan strategies associated with this project. The schedule indicates the start date and completion date for each of the strategies. The assumed date of funding through this grant project is May 1, 2007; however, it is understood that some work would begin on certain projects prior to that date, as indicated in the schedule.

Westside Regional Drainage Plan Project Schedule

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project 1: Reuse Land Purchase																				
Project 2: Reuse Development																				
Project 3: Irrigation Imprv.																				
Project 4: Infrastructure Imprv.																				
Project 5: GW Pumping Project																				
Project 6: Salt Disposal Dev. Proj.																				

Action 1: Reuse Land Purchase

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CEQA Compliance																				
PAEP/QAPP/MP	Not Applicable																			
Planning/Design																				
Implementation																				

Notes:

- CEQA Compliance is currently in progress and will be completed prior to purchase.
- Planning and Design includes the purchase agreement and price negotiation, and preliminary feasibility review
- Implementation includes the purchase of the property and transfer of title.

Action 2: Reuse Development Project

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CEQA Compliance																				
PAEP/QAPP/MP																				
Planning/Design																				
Implementation																				

Notes:

- CEQA Compliance is currently in progress and will be completed prior to implementation
- A PAEP, QAPP, and Monitoring Plan will be completed prior to any project monitoring
- Planning and Design will include project planning and facilities design on both the existing reuse area (SJRIP) and the newly purchased reuse area (Project 1)

Action 3: Irrigation Improvements

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CEQA Compliance	Not Applicable																			
PAEP/QAPP/MP																				
Planning/Design																				
Implementation																				

Notes:

- CEQA compliance is not applicable since these projects will be funded and installed by private landowners. District funded projects are expected to be categorically exempt.
- A PAEP and Monitoring Plan will be prepared to track improved irrigation system installations.
- Planning and Design work will be performed at the discretion of the landowner implementing the project
- Implementation of improved irrigation systems is currently on-going and expected to continue for a number of years.

Action 4: Infrastructure Improvements

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CEQA Compliance																				
PAEP/QAPP/MP																				
Planning/Design																				
Implementation																				
Final Testing																				
Final Report																				

Notes:

- CEQA compliance will be obtained prior to project construction. These projects are expected to be categorically exempt or require a negative declaration.
- A PAEP and Monitoring Plan will be developed prior to project impact monitoring.
- Planning and Design work will include design drawing and specifications of the project
- Implementation includes the construction of the improved facilities.
- Final testing will be performed to assess the impact of the improved facilities.
- This project is expected to be funded through Proposition 40 funds, and a final report is required. Other funding sources may include appropriations through the USBR and district funding.

Action 5: Groundwater Pumping Project

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CEQA Compliance																				
PAEP/QAPP/MP																				
Planning/Design																				
Implementation																				

Notes:

- CEQA Compliance is currently in progress. A Groundwater Management Plan is also being developed.
- A PAEP and Monitoring Plan will be developed to assess the impact of this project.
- Planning and Design is on-going.
- Implementation includes the installation of wells and conveyance facilities to transport the pumped water.

Action 6: Salt Disposal Development Project

	2007				2008				2009				2010				2011			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CEQA Compliance																				
PAEP/QAPP/MP																				
Planning/Design																				
Implementation																				

Notes:

- CEQA Compliance will include a negative declaration for the pilot project.
- A PAEP, QAPP, and Monitoring Plan will be developed to assess and monitor the project. These will be completed prior to project monitoring.
- Planning and Design will include design drawing and specifications to construct the pilot plant.
- Implementation will include the construction, start-up, and operation of the pilot plant.

G.2.3 Westside Surface Storage Reservoir Project

G.2.4 Implementation

A conceptual report was prepared by the District in 2002, followed by a feasibility study in 2003, and a pilot project constructed in March 2004 which continues to gather data after a progress report in April 2005. The District is now moving forward with a larger, Phase 2 pilot study with some additional soil testing and mapping. The Phase 2 pilot project will consist of constructing a 40 acre pilot basin within Block A of the proposed project. Pilot basin design will be complete in July 2005 by Provost & Pritchard. Soil mapping using Cone Penetrometer Testing (CPT) will be performed on a quarter-mile grid over Block A to identify those soils that may have higher infiltration rates. The mapping will be completed by July 2005. This will help determine a more accurate overall seepage loss rate.

Clay mineralogy testing will also be conducted to determine if amending the soil with soda ash would help seal the basin floor. Shallow groundwater modeling will also be performed and studied in greater detail by Geomatrix Consultants. Monitoring wells will be constructed to help determine how the groundwater mound develops and how quickly infiltrated water will move laterally through the soil, as well as allow for sampling of the shallow groundwater quality. The pilot basin construction bid proposal will take place in August 2005 and construction is planned to be complete by October 2005.

Stakeholder meetings with potential water transfer and exchange partners and the Bureau of Reclamation are in progress and will continue through the end of this year. Additional stakeholders potentially include Department of Fish and Game (DF&G) and Environmental Water Account (EWA). Test results from the pilot project will be shared with stakeholders in early 2006 and form the basis for beginning the Environmental Impact Study (EIS) and full project design. A full-size storage project would likely be phased, and would begin with Block A. Construction design of the full project is planned to begin in early 2006 concurrent with Environmental study with stakeholder participation. Full project construction could start before the end of 2006.

In general the project would consist of building levees to create above ground storage on the project site, building interconnections to tie the various portions of the reservoir together, adding inlet structures from existing District conveyance pipelines (Laterals 6 and 7) which are connected to the San Luis Canal (SLC) and the Mendota Pool (MP). Once in the MP, the water would either be exchanged with the Exchange Contractors or other CVP contractors, or pumped back to the San Luis Canal (SLC) via Laterals 6 and 7 for redistribution within the District through the District's delivery system.

G.2.5 Economic Feasibility

In order to assess the cost-effectiveness of the proposed project, reconnaissance level construction costs were developed. The construction costs assumed that the project would be filled over a two month period, and emptied over a two month period. Included in the construction costs are the major components of the work such as earthwork, major structures, utility relocation, and improvements to District facilities. In addition to the construction costs 10% was added for engineering, geotechnical, and administrative costs, as well as a 20% contingency. An analysis of the costs for construction of the full project is estimated at $28,813,000**.**

A brief cost analysis was performed on the full project to determine what loss rates would yield the same or lower water cost ($/AF) as the current practice of purchasing water on the spot market to replace the water lost to rescheduling. For this analysis the following assumptions were made:

- The current cost of CVP water paid by WWD is $65 per AF,
- In a normal year, 35,000 AF of rescheduled water is lost and paid for,

- WWD would purchase 35,000 AF of supplemental water on the spot market for $120 per AF,
- If built, the storage project costs would be recovered over a period of 30 years at a rate of 5.5%,
- Operations and maintenance costs of the storage project would be 5% of the annual capital recovery cost.

Based on the assumptions above, WWD ultimately pays approximately $185 per AF for the 35,000 AF purchased on the spot market. This is because the District must pay $65 per AF for the CVP water even though the water was not received, and must pay approximately $120 per AF to purchase water on the spot market to replace the water lost to rescheduling. The project water costs vary with the percent of water recovered from storage, and the amount of water delivered to the project. A sample calculation is provided to show the probable unit cost of water stored:

- *Preliminary Construction Cost Estimate = $28,813,000*
- *Capital Recovery Cost (30yrs @ 5.5%) = $1,982,000*
- *Operations and Maintenance Cost (5% of Capital Recovery) = $99,000*
- *Total Project Annual Cost = $2,081,000*
- *Assumed Deliveries to Project = 35,000 AF @ $65 / AF = $2,275,000*
- *Overall Loss Rate = 68%*
- *Assumed Annual Yield = (35,000 AF x 68%) = 23,800 AF*
- *Unit Cost of Stored Water = ($2,081,000 + $2,275,000) 23,800 AF =* ***$183 / AF***

This preliminary cost analysis indicates that for whichever portion of the project is built, if the entire capacity of the project is utilized every year, and roughly 68% of the water is recovered; the annual cost of the water is less than the current practice of losing the rescheduled water and purchasing supplemental water on the spot market. This does assume however, that the water can be exchanged in the MP.

SECTION H: IMPACTS AND BENEFITS

H.1 PROJECT IMPLEMENTATION PROCESS

The 2005 Westside Integrated Water Resources Management Plan is a Regional blueprint that guides resource management in the context of environmental and socioeconomic factors. As a planning document, it is not intended to provide the level of detail necessary to implement specific projects; rather, its purpose is to identify opportunities and facilitate Regional integration through development of partnerships. The specific impacts and benefits associated with each project will be identified in the detailed feasibility studies developed by stakeholders for use in project-specific environmental review and permitting processes. Additionally, some of the projects identified in this plan are already underway while others exist merely as concepts. Where available, a general description is provided for projects ready for implementation. Also provided in this Section is an economic analysis that predicts the gross value of each new acre-foot of water delivered to the Region.

H.2.1 GENERAL PROJECT IMPACTS AND BENEFITS

Following is a brief description of Projects at or near the implementation phase. Project specific information is attainable from Project proponents.

H.2.2 Pleasant Valley Groundwater Banking Project

H.2.2.1 Water Supply Reliability

Current CVP contract supplies for the cities are insufficient to meet their needs and PVWD has no long-term water supply. It is proposed that 5,000 acre-feet of CVP M&I or Irrigation contract water be purchased from willing sellers to improve water supply reliability. Depending on local conditions, imported surface water could be either used directly or recharged to the groundwater bank for conservation and future use by participating banking partners.

H.2.2.2 Habitat Protection and Improvement

A portion of water purchased from contract supplies will be allocated annually to support a number of environmental and habitat protection and improvement initiatives. For example, one-hundred twenty acres of wetted area within the infiltration basin complex will create a temporary wetlands and riparian habitat. The basins will be flooded for up to six months a year and possibly more in wet years, providing food, water, and habitat diversity for a variety of residential and migratory wildlife. Second, construction plans call for a setback of 100 feet from the Zapato Chino Creek banks to allow native and riparian habitat along the creek to flourish. The project will purchase this 19 acre conservation buffer zone measuring 200 feet wide and 4,100 feet long. Third, US Fish & Wildlife Service and CA Department of

Fish & Game are stakeholders interested in banking water in Pleasant Valley for habitat projects including the Turk Station project, a private reserve currently developing wetlands habitat in collaboration with these agencies.

H.2.2.3 Water Quality

Current groundwater quality in much of Pleasant Valley is of moderate to high salinity making it more costly for treatment for municipal use and having potentially negative impacts on local wildlife and irrigated land. This banking project will improve local water quality in two ways through the purchase of surface water. By banking higher quality surface water, and therefore mixing it with the native groundwater, the resulting groundwater extracted in the future will be of higher quality. Second, it will be possible at times to use surface water directly for wildlife habitat, municipal treatment, and irrigation thus providing an alternative to using lower quality groundwater. Extensive technical investigations have been conducted to characterize existing quality of various water sources utilized in this project as well as to estimate potential water quality improvements for its multiple end-uses.

H.2.2.4 Groundwater Management

PVWD’s water management planning seeks to correct groundwater overdraft in the underlying basin. One objective of this project when implemented in conjunction with PVWD’s Groundwater Management Plan is to provide sufficient groundwater recharge and conservation to reverse existing overdraft conditions. Surface water will be intentionally recharged in infiltration basins for extraction at a later date when it is needed by banking partners to supplement other supplies. Banked groundwater will be also be conserved as the Groundwater Management Plan limits future extraction to 85 percent of recharged water. Further, landowners will pump less groundwater in the future when surface water supplies are available for use directly for irrigation. PVWD’s hydrogeologist has estimated the total potential banking capacity in Pleasant Valley to be approximately 1,000,000 acre-feet.

H.2.3 Westside Regional Drainage Plan

The impacts and benefits from the West Side Regional Drainage Plan are local, Regional and statewide. At a local (multiple-district) level, the Plan will allow longstanding disputes over the effects of irrigated lands drainage between the San Luis Unit Contractors of the CVP and the San Joaquin River Exchange Contractor agencies to be settled in a way that irrigation and productive use of district lands may continue. This locally integrated solution also provides for increased water supplies for the region through sale and transfer, the proceeds of which will help support the operational costs associated with the Plan. At a Regional level, the Plan will provide a vast improvement in the water quality of the lower San Joaquin River, assuring the compliance with the state water quality objectives for salinity at Vernalis. This will improve water quality for irrigation and other beneficial purposes downstream on the lower San Joaquin River and Delta.

With the removal of some 27,000 acre-feet of remaining discharge of saline water to the River, a reduced need to dilute this water with releases from New Melones Reservoir on the Stanislaus River will occur, estimated by the San Joaquin River Water Quality Management Group to amount to 30,000 acre-feet per year of water savings in dry or critically dry years. This water would remain available in storage to meet other beneficial uses including accomplishment of other water quality objectives or to meet consumptive needs in the San Joaquin County area.

Reduction of saline drainage to the lower San Joaquin River and Delta will produce statewide benefits as well. Pursuit of the Delta Improvements Projects by CALFED agencies is linked to meeting the Vernalis salinity objective, which will be assured by this Plan. Additionally, reduction of saline drainage to the Delta via the lower San Joaquin River will provide improved export water quality for entities drawing water from the Delta for municipal purposes. This includes the Contra Costa Water District and members of the State Water Contractors including Santa Clara Valley Water District, Alameda County Water District and the Metropolitan Water District of Southern California, as well as others.

Achieving the West Side Regional Drainage Plan's objective of eliminating drainage from the Grasslands Area required a Regional approach among a host of water and drainage districts. Such an effort would prove impossible on an individual district level due to the scale of the efforts needed to capture, recirculate and reuse drain water, and ultimately provide treatment. It is neither cost-effective nor feasible to provide individual drainage collection, reuse, and treatment on a district-by-district basis.

Implementation of the West Side Regional Drainage Plan will allow over 90,000 acres of lands to remain in production, the source of employment for many economically disadvantaged persons in the San Joaquin Valley, and the primary industry in the region. Other environmental impacts of the Plan have been evaluated and have found not to be significant (Grassland Drainage Project EIS/EIR). The treatment process envisioned for the Plan involves using solar arrays and solar power storage (heat storage) as the primary source of power for brine evaporation, with natural gas backup. Groundwater wells will be either electric or low emission diesel technology, resulting in minimal air pollutant emissions. Overall, the proposed Plan results in fewer environmental impacts than either a no-project solution, which would necessitate eventual abandonment of 90,000 acres of productive farmland, and resulting secondary impacts, or providing a drain to the San Joaquin River Delta or other location, further impacting a sensitive resource.

H.2.4 Westside Surface Storage Reservoir Project

The proposed surface storage project would use land that was previously drained, has now been retired, and has been in the public eye for many years. The project would be located south of the City of Mendota. A conceptual report was prepared by the District in 2002, followed by a feasibility study in 2003, and a pilot project constructed in March 2004 which continues to gather data after a progress report in April 2005.

In general the project would consist of building levees to create above ground storage on the project site, building interconnections to tie the various portions of the reservoir together, adding inlet structures from Laterals 6 and 7, and building a channel to take water from the project outlet to the Mendota Pool (MP). Once in the MP, the water would either be exchanged with the Exchange Contractors or other CVP contractors, or pumped back to the SLC via Laterals 6 and 7 for redistribution within the District through the District's delivery system. In utilizing this storage project Westlands frees capacity in the SLC, San Luis Reservoir, DMC, and Tracy Pumping Plant for utilization by other Regional agencies.

The project would be utilized to store water from a variety of sources, including CVP contract water, rescheduled water, surplus water, and water from other sources including San Joaquin River and Kings River flood flows, refuges, and other CVP contractors.

H.3.1 ECONOMIC ACTIVITY ASSOCIATED WITH WESTSIDE WATER SUPPLY

To understand how the Westside economy might respond to increased water supply, information was compiled describing the Westside economy and economic impact associated with CVP water use in the region. The analysis was formulated to address the following questions:

1) What are the economic characteristics of the Westside region related to CVP water use?
2) How much economic activity and value are attributable to Westside CVP agricultural and M&I water supplies?
3) How much economic activity and value might be attributable to more CVP supply?

This analysis focuses on the economic effect associated with agricultural and M&I water use. No attempt was made to quantify the economic effect associated with water supply for refuges and wildlife areas. While it is acknowledged there would be an economic effect with more water supplies, most other analyses have described these benefits in qualitative terms.

H.3.2 Economic Activity and Value from Westside CVP Agricultural and M&I Water Supplies

This section addresses the question of how much economic activity and value can be attributed to Westside agriculture and CVP water supplies. The amount and value of agricultural production, employment, and income produced with CVP agricultural water supplies is estimated and reported. Also, the amount of forward linked activity (sales of products that require farm products) and backward linked economic activity (sales to farms), that are related to irrigated acreage that uses CVP supplies are reported. An estimate of economic activity related to CVP M&I supplies is also provided.

For agriculture, the amount and value of irrigated production resulting from CVP water supplies is reported. However, it is not correct to attribute agricultural production to water supply alone because agricultural production would also be lost if any critical factor of production such as soils, labor, capital, or management skill was eliminated. There is some ability to acquire and use alternative water supplies, so some of the production would continue even without CVP supplies. On the other hand, agricultural users have limited ability and willingness to pay for alternative supplies.

The same types of concerns apply for CVP M&I water supplies. Industrial and commercial production require water supplies and residential living requires water supply, but M&I water users have a greater ability and willingness to substitute other supplies for CVP water. This is especially true in the South Bay where CVP water is not a large share of all water use and water supply infrastructure has been developed to allow for substitution among supplies if there is conveyance capacity available.

This Westside economic analysis encountered data limitations. Many data sources are available for counties, but the Westside region defined in this report includes not one entire county and parts of five counties. For Westside M&I water use, data on the economic conditions in the individual urban service areas, being small towns and cities, are not available. For the South Bay and Central Coast, the portion of Santa Clara County that is served with CVP water cannot be readily identified; therefore, this economic analysis must rely on estimates of shares of agricultural production value and population to interpolate from county data sources.

H.3.3 Economic Activity and Value of Westside Agriculture from CVP Water Supply

Table H-1 shows acreage and value data from County Agricultural Commissioners (CAC) for each county within the Westside, an estimate of the amount and share of the irrigated land that is within the Westside, and an estimate of value of production of agricultural commodities from the Westside. For Fresno County, the Westside economic values are based on Westside crop mix and CAC value per acre for each crop type. The inclusion of additional detail is justified by the large share of Westside acreage in Fresno County.

The total value of irrigated production from the Westside in 1999 was about $1.42 billion. Of the $1.42 billion, about $174 million represents production in the South Bay and Central Coast region. With other farm products such as livestock, dairy and apiary (honeybee) production included, total farm value was $2.1 billion. Value of crop production was $1,697 per irrigated acre. Value of crops, livestock and all other farm products per irrigated acre was $2,518.

Listed below are some points for consideration regarding the value of Westside agriculture.

- About 28 percent of available water supply in 1999 was not CVP agricultural service contract water. (From the agricultural gap analysis in Section 3, a 70 percent contract allocation in 1999 would have provided 1.256 out of 1.737 MAF of supplies.)
- The agriculture product results with livestock and dairy double-counts some value in that some of the irrigated product is used to produce the livestock and dairy.
- Some of the livestock and dairy production uses feed from outside of the Westside, so this production should not be “attributed” to Westside irrigation.

TABLE H-1
Estimated Value of Farm Production from Irrigated Land in the Westside Analysis, from Total County Data, 1999

	Total County Data				Westside Estimates			
County	**County Harvested Acres**	**County Value of Harvested Product (Million $)**	**County Value of Other Ag Product (Million $)**	**County Total Agriculture Product (Million $)**	**1999 Westside Harvested Acres [1]**	**Westside Share of County Acreage**	**Westside Value of Harvested Product (Million $)**	**Westside Total Agriculture Product (Million $)**
Fresno	1,265,444	2,596	964	3,560	601,616	47.5%	1,049	1,438
Kings	582,070	431	442	873	54,585	9.4%	40	82
Merced	589,062	642	892	1,534	43,935	7.5%	48	114
San Joaquin	588,100	952	400	1,353	29,877	5.1%	48	69
Stanislaus	454,538	482	728	1,210	53,128	11.7%	56	141
San Benito	57,029	132	48	180	25,317	44.4%	59	80
Santa Clara	24,963	115	61	176	25,769	100.0%	115	176
Total	**3,561,206**	**5,351**	**3,535**	**8,886**	**834,227**		**1,416**	**2,101**

[1] 834,227 acres equals 848,997 less acreage for which no cropping data are available (11,988 acres in SCVWD + 2,782 acres available for irrigation by SCVWD, Pajaro Valley WMA or Westlands WD).

Next, the amount of on-farm employment, wages and salaries, and total farm income are estimated. This estimate was completed for only Fresno County because Westside irrigated acreage accounts for a relatively large share (47.5 percent) of Fresno County acreage. For the other counties, Westside acreage is a small share of the county total and it is more likely that Westside acreage shares could misrepresent Westside economic shares. Also, about 74 percent (1,049/1,416) of Westside value of production is in Fresno County. Relationships between value of production and the other on-farm measures from the Fresno County analysis will be used to extrapolate to the remaining 26 percent of the Westside.

IMPLAN is an economic database and modeling tool that provides estimates of agricultural income and employment by county. With estimates of Westside crop value share by crop type, the IMPLAN data can be used to estimate the share of Fresno County agricultural income and employment attributable to Westside agriculture.

Table H-2 shows the CAC data on total value of agricultural production for Fresno County broken down by Standard Industrial Classification (SIC) groupings, estimated value of crop production for Westside acreage in Fresno County, and the resulting Westside share of Fresno County value of production. From Table H-2, 40.39 percent of Fresno County agricultural value (1,438/3,560) was attributed to the Westside. This estimate is used in Table H-3 to estimate Westside shares of IMPLAN dairy and all other livestock and poultry.

These shares are then used to estimate the Westside share of the IMPLAN agricultural value of output, employment, employee compensation (wages and salaries), and proprietor's and property income. The IMPLAN county value of output estimate is less than the CAC numbers, possibly because IMPLAN does not double count value of production of products resold within the county. On-farm value of output, measured by the IMPLAN conventions, is $1.16 billion. Total on-farm employment attributable to the Westside in Fresno County is 11,119 persons and total farm income attributable to the Westside is about $439 million (146 + 161 + 132).

From Table H-2, the Fresno County Westside accounts for about 74 percent of the total Westside region, so the total economic effects of the Westside should be about 35 percent [(1/.74) – 1] larger than the Fresno County Westside alone. Assuming this share, total economic effects of Westside agriculture are shown in the last row of Table H-2.

TABLE H-2
Economic Value by Crop Type for Fresno County, Westside Share of Fresno County and Westside On-farm Employment and Agricultural Income, Million $ unless noted

				Westside Share of IMPLAN Estimates					
Farm Sectors	**Fresno Output Value from CAC**	**Estimated Westside Value**	**Westside Shares of County, %**	**Value of Output**	**Employ-ment, jobs**	**Employee Compen-sation**	**Pro-prietor's Income**	**Other Property Income**	**Total Farm Income**
Cotton	331.6	256.1	77.3%	174	1,210	20	23	21	70
Fruits	1,051.8	53.6	5.1%	61	842	12	3	4	20
Nuts	136.3	74.5	54.6%	65	746	13	7	7	29
Vegetables	902.4	569.2	63.1%	564	4,592	87	75	80	254
Hay and Pasture	70.7	13.3	18.8%	7	306	0	2	1	4
Greenhouse, Nursery & Forest	32.8		0.0%	0	0	0	0	0	0
All Other Crops	110.0	82.6	75.1%	37	1,428	1	9	9	21
Dairy	222.8	90.0	40.4%	94	534	6	23	4	34
All Other Livestock, Poultry	740.8	299.2	40.4%	165	1,568	9	21	7	39
Total Fresno Co.	3,559	1,438		1,167	11,227	147	162	133	470
Total Westside	**8,886**	**2,088**	**23.5%**	**1,575**	**15,156**	**198**	**219**	**180**	**634**

The economic activity caused by agriculture is much more than the farm output, income, and employment alone. The estimates in Table H-2 and H-3 do not account for all economic activity created in marketing, transporting, and processing Westside products. These forward linked economic activities occur after the product leaves the farm. IMPLAN data for some industries that include some forward processing activities are provided in Table H-3.

The IMPLAN data for some forward linked processing sectors suggest that there is additional and substantial economic value created in forward processing industries. However, some of these forward processing values might be enabled by raw farm products imported from out of the county and some of the forward processing industries may be located in Fresno County for reasons other than the availability of raw products. On the other hand, forward linked value of output in some marketing and transportation industries is not included in Table H-4 Without the pertinent information about product movements and import patterns, it would not be appropriate to quantify a share of the forward processing value to attribute to Fresno County or Westside agriculture.

TABLE H-3
Economic Value in Agricultural Forward Processing Sectors, Fresno County, Million $ unless noted

IMPLAN Forward Processing Sectors	IMPLAN Value of Output	Employ-ment, jobs	Employee Compen-sation	Pro-prietor's Income	Other Property Income	Total Value Added
Meat Packing and Processing	682.6	4,100	107	4	20	136
Dairy Products	192.4	521	21	1	10	33
Canned Fruits and Vegs	314.3	1,498	50	1	47	100
Frozen and Dehydrated Product	500.9	2,797	89	2	62	157
Wine, Brandy and Soft Drinks	326.5	994	45	1	34	113
All Other Food Processing	516.1	2,129	70	2	59	136
Total	**2,533**	**12,039**	**383**	**12**	**231**	**676**

Finally, the additional economic activity created in backward linked industries should be included. Backward linked economic activities occur before the product leaves the farm. The sales of backward linked industries are the sales of farm inputs to farms, plus the additional sales generated by trade with farm input providers. This economic activity can be estimated using IMPLAN economic multipliers for Fresno County with the estimated Westside production values from Table H-3. Results are provided in Table H-4. Estimates for the entire Westside in the last row are calculated as the Fresno County numbers multiplied by 1.35. This accounts for the share of the Westside in other counties.

TABLE H-4
Economic Multipliers and Total Economic Impacts of Westside Farm Production Through Backward Economic Linkages

	IMPLAN Multipliers, Dollars per Dollar of Direct Output Unless Noted				Westside Total Impacts With Backward Linkages, Million $ Unless Noted		
Crop	**Total Output**	**Employee Compens.**	**Employ-ment (Jobs/Mil$)**	**Westside Value of Output**	**Total Value of Output**	**Em-ployee Comp**	**Employ-ment (Jobs)**
Dairy Farm Products	1.52	0.22	15.3	94	142	21	1,434
Poultry And Eggs	1.53	0.21	16.1	58	89	12	931
Ranch Fed Cattle	1.63	0.19	26.5	26	42	5	680
Range Fed Cattle	1.83	0.21	32.6	31	57	6	1,010
Cattle Feedlots	1.63	0.19	14.9	44	72	8	659
Sheep, Lambs And Goats	1.63	0.19	99.1	1	1	0	75
Misc. Livestock and Meat Products	1.51	0.24	45.6	4	6	1	187
Cotton	1.72	0.32	20.3	174	299	56	3,534
Food Grains	1.67	0.19	32.0	6	11	1	206
Feed Grains	1.55	0.17	23.7	2	3	0	53
Hay And Pasture	1.56	0.18	54.9	7	11	1	402
Grass Seed	1.48	0.15	81.2	14	20	2	1,112
Fruits	1.78	0.44	29.2	61	108	27	1,778
Tree Nuts	1.74	0.43	25.6	65	114	28	1,673
Vegetables	1.76	0.38	24.2	564	992	215	13,625
Sugar Crops	1.59	0.18	24.8	14	22	2	338
Miscellaneous Crops	1.82	0.31	46.9	0	0	0	11
Oil Bearing Crops	1.56	0.22	27.3	0	1	0	13
Total				1,167	1,993	389	27,752
Total Westside				**1,575**	**2,691**	**525**	**37,465**

The direct and indirect effects of Westside agriculture in Fresno County in 1999 were about $1.99 billion of output, $389 million of employee compensation, and about 27,752 jobs. The direct and indirect effects of all Westside agriculture in 1999 were about $2.69 billion of output, $525 million of employee compensation, and about 37,465 jobs. These conclusions include the direct, on-farm effects, but not the forward linkage effects.

In summary, Fresno County Westside agriculture directly contributed about $1.44 billion to the Fresno County economy in 1999 of which $1.05 billion was crop value. Direct agricultural employment was about 11,227 jobs paying $147 million in employee compensation, $162 million in proprietor's incomes, and $133 million in other property income were earned. Through backward economic linkages, an additional $0.826 billion in output (1.993-1.167) and $242 million in employee compensation (389-147) were generated. Additional proprietor's and property incomes were generated, but the share of these incomes paid to Fresno County residents is unclear.

A total of 27,752 jobs were created by Fresno County Westside agriculture. In addition, the Westside was responsible for an unknown share of 12,000 jobs in forward processing in Fresno County. Additional value of output from marketing, transportation, and forward processing in other counties has not been counted.

Assuming that the Fresno county Westside accounts for 74 percent of total Westside economic value, the annual economic contribution of Westside agriculture is listed below.

- Direct crop value: $1.42 billion
- Direct crop value, IMPLAN counting conventions: $1.25 billion
- Total on-farm value: $2.1 billion
- Total on-farm value, IMPLAN counting conventions: $1.575 billion
- Direct employment: 15,156 persons
- Direct wages and salaries: $198 million
- Direct wages and salaries, proprietor's and property incomes: $634 million

Total annual economic effects of Westside agriculture including both on-farm and backward linkages are summarized below. All forward linkage effects are not included.

- Total on-farm and indirect value of output effects: $2.69 billion
- Total on-farm and indirect wages and salaries: $525 million
- Total on-farm and indirect employment: 37,465

H.3.4 Economic Activity and Value from CVP M&I Water Supplies

This section estimates the baseline amount of economic activity that is related to CVP M&I contract supplies. Issues involving the relationship between water supply and economic activity and data problems involving the distribution of CVP water supply within counties cannot be resolved. A simple approach is used that, at best, provides an indicator for economic activity related to CVP supply.

Economic data for counties from the Regional Economic Information System are measures of economic activity that could be affected by CVP M&I water use. These data are adjusted according to the product of (1) the share of county population living in the CVP service area and (2) the share of water supplies in the service area that are CVP contract supplies. Table H-5 shows the results. This gross methodology assumes that all water supplies within a service area are available for all uses. It does not take into account that CVP water may constitute the major or only source of supply for treated water or other key uses within the service area, nor does it take into account variation by hydrologic year. For example, in Santa Clara County, when local surface water is not available in dry years, reliance on CVP water to meet treatment plant demands increases dramatically, and imported water can account for up to 90 percent of the County's water needs.

TABLE H-5
Level of Economic Activity Associated with CVP M&I Water Supplies Based on County Economic Data, Share of County
Population in CVP Service Area and Share of Service Area Supplies that are CVP

	Percent Shares of County Population, CVP Supply Share and Economic Activity Share			Shares of Population and Economic Activity Associated with CVP M&I Supplies		
Urban Area	**Service Area Share of County Population**	**CVP Share of Service Area M&I Supplies**	**CVP Economic Activity Share**	**Mil $ Personal Income**	**Popu-lation**	**Employ-ment**
Avenal, Kings Co.	11.4%	100.0%	11.4%	$190	14,751	5,449
Tracy, San Joaquin Co.	12.4%	61.0%	7.6%	$820	42,595	17,644
Coalinga, Fresno Co.	1.7%	100.0%	1.7%	$239	13,247	6,478
Huron, Fresno Co.	1.6%	100.0%	1.6%	$236	13,105	6,408
San Benito County	99.5%	6.9%	6.9%	$62	3,197	1,327
Santa Clara County	100.0%	24.3%	24.3%	$14,914	393,961	286,660
Total				**$16,461**	**480,855**	**323,967**

CVP M&I contract supplies are associated with about $16.5 billion of personal income, 481,000 persons living in CVP service areas and 324,000 full and part-time jobs. The M&I water supplies appear to be associated with much more income and employment than the agricultural water supplies.

H.4.1 ECONOMIC ACTIVITY AND VALUE ATTRIBUTABLE TO MORE CVP SUPPLY

The last question to consider is the economic effects of incremental changes in CVP water supply. This issue has been studied extensively within several economic studies as part of environmental documentation for implementation of the CVPIA.

For Westside agriculture, the effects of an increase in water supplies are:

1) Decreased use and costs for alternative supplies, including groundwater and water transfers.
2) Decreased costs for conservation, including capital and labor costs.
3) Crop switching to crops that use more water per acre.
4) To the extent that it is not economical to reduce use of alternative supplies, reduce conservation, or switch crops, then less land is idled and agricultural production is increased.

All of these actions increase farm profits, which increase local spending on investment and discretionary items. To the extent that agricultural production is increased, Regional economic spending is increased through farm spending and forward economic linkages.

The CVPIA PEIS conducted detailed economic modeling of these types of economic effects. It is possible to use these results to infer the economic effects of Westside water supply increases. Changes in output, employment and income per AF of water supply are shown in Table H-6. These impacts include effects from eliminating CVPIA restoration fund payments.

TABLE H-6
Regional Economic Effects of PEIS Alternative 1, per AF of Supply

	Output $/AF		Employment per 1000 AF		Income $/AF	
	Direct	**Total**	**Direct**	**Total**	**Direct**	**Total**
Output Effect	$147.50	$333.44	1.5	4.7	$36.88	$136.25
Total Effect	$244.06	$502.81	3.0	7.4	$90.31	$232.50

Without CVPIA implementation effects, water supply increases and reduced water costs would result in $161 million of output, $74 million of personal income and 2,370 jobs in the San Joaquin Valley.

The Westside of the San Joaquin Valley supports a high percentage of disadvantaged individuals and families. Overall, three of the five counties that contain the West San Joaquin Valley region have median household incomes that are less than 80% of the statewide average of $49,493 in 2000.

The area is also home to a high Hispanic or Latino population, which is greatly dependent upon agricultural production as a source of employment. Where countywide, the percentage of Hispanic population to the total runs from a low of 30.5% in San Joaquin County to 45.3% in Merced County, Hispanic populations in the Westside of the Valley are usually the majority in a given area and run as high as nearly 94% of the population.

Improving the water supply reliability and otherwise enhancing the conditions for production agriculture in this region will expand source of employment opportunities for these disadvantaged populations.

For Westside M&I water users, the effects of an increase in water supplies are summarized below:

1) Decreased use and costs for alternative supplies, including groundwater, water transfers, and capital and O&M costs of local or statewide water development.

2) Decreased costs for conservation improvements, including capital and labor costs.

3) Decreased costs of shortage in some dry years. These costs include net revenue losses for M&I water providers and consumer surplus losses for water customers. For industrial and commercial users, these consumer losses are lost net revenues from reduced production or increased costs.

4) Regional economic spending increases because decreased water costs increase the discretionary incomes of M&I water users.

Results from the PEIS can be used to infer that, without CVPIA implementation effects, employment would be increased in the Bay Area by 100 persons and in the San Joaquin Valley, by 100 persons. Value of output in these regions would increase by $13.4 million and income would increase by $7.6 million. These conclusions include effects from eliminating CVPIA restoration payments and decreased conservation and metering costs.

<u>SECTION I: TECHNICAL ANALYSIS AND PLAN PERFORMANCE</u>

I.1 Technical Analysis and Plan Performance

The Plan serves as a guide to illustrate the alternatives and opportunities that have been developed Regionally to promote progress toward the identified objectives through project implementation to improve resource management and integration. The Plan is not intended to be an action document, thus technical analysis of it is neither required nor beneficial. Projects within the Plan however do require such consideration and that information is provided when available. Most of the projects identified by the Plan are in the feasibility stage of planning. Upon determination of potential solution strategies, technical analyses will be performed to inform the selection of preferred approaches and the Plan will be updated as necessary to reflect new information.

Plan performance is measured by the successful implementation of individual projects. The projects are intended to provide progress toward the Regional objectives as reflected in the following table:

Comparison of Stategies Employed and Outcomes Achieved to Miminum Standards

Water Management Strategies Employed and Objectives Achieved	Water Management Projects											
	APFCP	APGWBP	Refuge Water Supply Diversificatio	LBCCUP	PVGBP	SJR-DMCPC	SLDMWA/SREC Transfers	SLRLPP	SSCRDMP	WSRDP	WSSRP	WSFCP
Supply reliability/supplementation		■	■	■	■	■	■	■	■	■	■	■
Groundwater management		■	■	■	■	■	■			■	■	■
Water quality protection/improv.			■	■	■	■	■	■	■	■		
Water recycling									■	■		
Water conservation	■	■		■	■	■	■	■	■	■		■
Storm water management	■	■		■	■	■					■	■
Flood management	■								■			■
Recreation and public access			■					■			■	■
Ecosystem restoration		■		■	■		■	■	■	■	■	
Wetlands enhancement		■	■	■	■		■	■			■	■
Env. habitat protection/imp.	■	■	■	■	■		■	■	■	■	■	■
Land Use Management		■		■			■			■		
Water transfers		■		■	■		■			■	■	
Operational flexibility		■	■	■	■		■	■				
Surface storage									■		■	■
Conveyance improvements								■		■		
Hydropower generation								■				■

The mix of strategies and intended outcomes produced through project implementation makes it difficult to produce a Regional performance metric. As projects transition from feasibility and planning to design and implementation, future iterations of the Plan will include comparative summary information displaying project performance relative to the desired outcome.

I.2 Project Performance Monitoring and Technical Analysis

The following technical analysis and plan performance descriptions are only provided for projects previously identified in Section G as being ready for implementation. No description is offered for projects either underway or in the concept phase of development.

I.2.1 Level 2 & Level 4 Refuge Water Supply Diversification Program

Technical analysis of the RWSDP has focused on determining suitable locations for drilling test holes, conducting electric logging, analyzing drill cuttings, analyzing groundwater quality and production potential, and developing geologic logs and well specifications for the pilot program.

Initiation of the two-year RWSDP pilot project is anticipated to occur by October 2006. Project performance will be measure through the production of water for Level 2 and Level 4 purposes. Project monitoring will track the quantity and quality of water produced, effects on the aquifer, and air quality and noise impacts resulting from operation of the pilot program's diesel power units. If the pilot program proves successful, it is anticipated the diesel units will be converted to electric.

I.2.2 Pleasant Valley Groundwater Banking Project

In 2003, PVWD in collaboration with DWR completed a 2-year feasibility study on the groundwater banking project that was funded by a $500,000 Proposition 13 grant. This study included analysis of hydrogeology, geology, local support, permitting, regulations, right-of-ways, biological surveys, water supply, banking partners, constructability, and economics.

The following is a summary of specific methods used as part of the technical analysis. A 0.2-acre pilot basin was operated for 84 days resulting in an average infiltration rate of 4.5 feet/day which demonstrates the recharge potential of the site. The location of the infiltration basins was determined by an Integrated Storage Investigation (ISI) Program whereby 24 holes were drilled to depths of 50-100 feet in the project area. A subsequent pump test provided information on transmissivity, storage coefficient, and specific yield and indicated the number and spacing of extraction wells. Groundwater banking was simulated using different operational scenarios over a 50-year period to estimate operations. It was found that an average of 13,580 acre-feet could be stored annually when available and 35,000 acre-feet per year could be extracted in a dry or critically dry year, with average annual extractions of 11,500 acre-feet. A groundwater mounding evaluation was done based on the longest duration of recharge indicated. A literature review was conducted to incorporate findings from previous geology and hydrogeology reports prepared for Pleasant Valley.

PVWD will evaluate project performance through a network of proposed monitoring and production wells. Analyses will be performed annually to determine and balance inputs to the bank, diversions from the bank, and changes in storage. A groundwater quality monitoring plan is being updated and includes a regular sampling program, sampling specifications, protocols, procedures and quality assurance, data management and reporting, provisions for making modifications. Wetland habitat will be monitored by a plan addressing water supply, water quality and waterfowl species and population.

Project operations will be adapted to performance data through the recommendations of a Monitoring Committee made up of local landowners, agency stakeholders, and District representatives based on evaluation of operational data obtained. Critical information, if not initially being collected, will be added to the monitoring program. Monthly inspection of delivery infrastructure and infiltration basin complex will be made for control of weeds, insects, dust and silt.

I.2.3 Water Authority & SJRECWA Water Transfer Program

Technical analysis of the project has included water conservation potential, water quality, and anticipated environmental impacts of project implementation. Project performance is measured by the quantity of water conserved and subsequently made available for transfer. Revenue from the transfer is utilized to fund further water conservation efforts. Project monitoring includes conservation activities, quantity of conserved water, water quality, and ecosystem effects.

I.2.4 West Side Regional Drainage Plan

The WRDP includes an extensive monitoring program that includes flow, water quality (particularly selenium, boron, and electrical conductivity), chronic toxicity (three species), and biota and fish tissue monitoring. In addition to the WRDP efforts, the districts within the solution area have implemented intensive internal monitoring programs that measure flow and water quality at almost all of the tile sumps, project drains, diversions to the reuse area, and recirculation systems. Within the reuse area, monitoring also includes a biological program that surveys bird populations, nests, and eggs.

Applied water quality for the current 4,000 acres of land is monitored as it is diverted onto the reuse area for irrigation. In addition, subsurface drainage water quality and discharge is monitored on a monthly basis. These records are kept by PDD and used to estimate the project's effectiveness as a drainage management tool. A groundwater monitoring program and soil quality program are in the process of being developed, with some data going back as far as 2001. This monitoring network will be expanded with additional reuse lands. Initially with purchase of the additional 2,000 acres of drainage lands and diversion of drainage waters to those lands, discharge to the SJR of subsurface irrigation drainage will cease. This will be verified after purchase and improvement of the additional drainage lands.

In addition to environmental monitoring, implementation of the WRDP will primarily be measured through the amounts of new drainage reuse lands purchased and brought into production, acres of irrigation improvements, miles of canals lined or piped, number of wells and acre-feet of groundwater produced and most importantly, the quantity of drainage discharge and discharge quality to the lower San Joaquin River.

Ultimately, to maintain the productivity of reuse lands, the treatment plant will be required to handle brine discharges, assuring continued elimination of river discharges. Plant parameters such as influent amounts and salinity and volumes of reclaimed water and solid salt products will be measured as well.

SECTION J: DATA MANAGEMENT

J.1 Plan Data Management

The Plan's role as a guiding document means there is no data to manage relative to the Plan other than the progress of individual project implementation. Most projects contained in the Plan are in feasibility or planning stages and so there is little data, if any, available relative to project implementation. As projects transition out of the developmental stages, the Plan will incorporate summary information reflecting comparative implementation status at a project level.

J.2 Project Data Management

Data at a project level is essential to the successful development and implementation of that project. Few projects contained in the Plan have progressed sufficiently as to begin gathering and managing data. Of those few, the data gathered relative to the project is generally collected and managed by the lead implementing entity. A wealth of project specific data is available, though not readily, from web sites, published reports, implementing entities, and governmental agencies. The Water Authority is considering developing web space to provide a single access point for current and future project data. The costs and complexity of collecting and homogenizing the multitudes of data will be explored and a decision made as to how to best proceed in the future.

The following data management descriptions are only provided for projects previously identified in Section G as being ready for implementation. No description is offered for projects either underway or in the concept phase of development.

J.2.1 Level 2 & Level 4 Refuge Water Supply Diversification Program

Information will be gathered from the pilot project by the Water Authority and maintained by USBR. Data gaps will be addressed as identified. Information will be available to interested parties as part of the CVP operations data already collected and disseminated.

J.2.2 Pleasant Valley Groundwater Banking Project

PVWD will manage and disseminate data to stakeholders and the public through regular water district meetings, stakeholder meetings, Basin Advisory Panel meetings, press releases, and published progress reports. Data collection will support statewide data needs by implementing a modified version of DWR's groundwater database Data Management System (DMS). The database is a comprehensive groundwater management tool providing analysis, GIS, mapping capabilities, improved data accessibility, and facilitates data sharing with other agencies.

PVWD has identified the need for improved groundwater quality monitoring and is currently updating its groundwater management plan through a Groundwater Quality Monitoring Program grant. The plan will include a regular sampling program, data management, and reporting. Groundwater levels were recently investigated during the groundwater banking feasibility study. More regular water supply monitoring will be required with the implementation of this project by metering flows at pump stations and determining groundwater levels by a network of monitoring wells.

J.2.3 Water Authority & SJRECWA Water Transfer Program

Data regarding water conservation efforts, quantities, and quality is collected and maintained by the SJRECWA. Data pertaining to transfers and deliveries is collected by the Water Authority and maintained by Reclamation. No know data gaps exist but will be addressed if identified. Information is available to interested parties as part of the CVP operations data already collected and disseminated and the publication of an annual report by the SJRWAEC.

J.2.4 West Side Regional Drainage Plan

The proposed WRDPJPA will produce an annual report of project activities and accomplishments. This will catalogue the various statistical parameters of the project and provide annual benchmarks of performance. The annual report will be made available to WRDPJPA members, interested parties, and state water quality regulatory entities.

<u>SECTION K: FINANCING</u>

K.1 GENERAL FINANCING ALTERNATIVES

The Westside Integrated Water Resources Plan itself has no financial requirement. On the other hand, the mix of projects represented by this Plan reflect a broad range of interests and benefits and, as such, funding for projects is anticipated to be as diverse. To implement the projects that comprise the Plan, funding will be sought from local, Regional, State, and federal interests. Each project will have unique requirements so funding will be sought from one to all of the aforementioned sources as appropriate. Lastly, the source of funding for a particular project does not always correspond with whom ultimately pays the cost; this is particularly true with respect to the projects with federal interest.

K.2. PROJECT FUNDING

K.2.1 ARROYO PASAJERO FLOOD CONTROL PROJECT

Phase I of this project is essentially complete. Following is a synopsis of the Phase I costs and accomplishments:

<u>West Side Detention Basin Improvements</u>

- Construction Cost to Date **$6,319,000 (Dec 31, 05);**
- Total Project Cost to Date **$9,977,000 (Dec 31, 05);**
- Draft agreement and feasibility report on the armoring of the railroad embankment is ready for signature by DWR & RailAmerica;
- New actuators and stems are installed at Gale Avenue Drain Inlets. Drain Inlet gates were exercised on November 4, 2005;
- Rubber dam is fenced and control house is built, equipment is installed. Rubber Dam was successfully tested on October 20, 2005;
- Overall, Phase I construction work is nearing 98% completion.
- Phase 2 work is underway with a reconnaissance level study being formulated with consideration of new alternatives.

Funding to date has come from the DWR, USBR, and Proposition 13 with respective shares at approximately 35%, 29%, and 36%. The cost split between DWR and USBR is related to their 1971 Supplemental Agreement for the Operation of the San Luis Unit, which established cost sharing criteria for the joint-use facility. DWR and USBR project costs, as well as O&M costs, are recovered from their contractors under agency specific established procedures.

K.2.2 ARROYO PASAJERO GROUNDWATER BANKING PROJECT

WWD is working cooperatively with State and other local interests to identify and evaluate locations for a groundwater recharge facility on the west side of the San Joaquin Valley. WWD envisions that the facility would be used for banking water to meet local agriculture supply needs by utilizing unused rescheduled Central Valley Project water. WWD estimates that up to 50 thousand acre-feet per year could be recharged in the Arroyo Pasajero Fan for short-term storage. It is estimated that there is up to 1 million acre-feet of storage capacity.

K.2.2.1 Cost Allocation and Funding

Efforts to date have been primarily investigational. The project, if proven feasible, could provide Regional benefit in two ways. First, utilizing rescheduled CVP water for recharge increases the storage capacity for rescheduled CVP water in the San Luis Reservoir by 50 TAF, which would most likely benefit the EWA and wildlife management agencies due to the established rescheduling capacity priorities. Second, the availability of water stored in the project would decrease demand for water from the transfer market thereby increasing water availability for other market participants while decreasing pricing pressure. Full implementation funding and cost allocations are yet to be decided.

K.2.2.2 Feasibility Study

In 2001, Westlands submitted a grant application to DWR, who manages funds available under AB303. The grant application was for an investigation to identify a site that would be suitable to recharge surface water into the groundwater aquifer for later extraction to supplement shortfalls in surface water supply. The grant application initially described two areas within the District (Cantua Creek and Arroyo Pasajero) that would be studied to determine their geologic capabilities for supporting conjunctive use and water banking projects.

Subsequent investigations by Westlands in conjunction with DWR, through their Planning and Local Assistance program, suggested that the Arroyo Pasajero area would be more promising as a recharge site based on its geologic characteristics. Westlands, with the concurrence of DWR, modified its original scope of work under the AB303 grant application to focus the study on an area just south of Arroyo Pasajero. The purpose of the modified investigation is to evaluate the suitability of the study area for use as a groundwater recharge facility. The scope of the investigation included:

- Evaluation of existing soils, geologic, and hydrologic publications and data for the area;
- installation of shallow soil borings to evaluate the percolation potential of the uppermost sediments; and
- evaluation of data from deep soil borings (installed by DWR under their ISI program) to evaluate the storage, water quality, and extraction potential of the water table aquifer.

The site evaluation was carried out under two DWR-administered programs; the shallow site investigation and report were conducted by Geomatrix under the Local Groundwater Management Assistance Act of 2000 (AB303). The grant funding equaled $72,900 and the deep site investigation was conducted by the DWR under their Integrated Storage Investigations program.

K.2.2.3 Project Implementation

WWD submitted an application under Prop 13 for a Groundwater Storage Program Construction Grant. The application proposed to develop the groundwater banking project through land purchases and infrastructure improvements capable of recharging up to 50 TAF annually. Additionally, construction of an additional pipeline or canal from the Coalinga Canal to the project site and the development or rehabilitation of 36 wells to recover the stored water would be required.

In the application, the groundwater banking project was estimated to cost approximately $9,600,000, of which WWD proposed to fund $3,500,000. In addition to the aforementioned applicant funding, WWD stated it would fully finance the construction and well development or rehabilitation activities estimated to cost $17,000,000. WWD also assumed complete responsibility for the subsequent operations and maintenance obligations associated with the project, the projected costs of which were identified in the application.

The Prop 13 grant funding proposal was not accepted. Currently WWD is considering other alternatives for project funding. Funding and cost allocation agreements will be developed once project participants are identified.

K.2.3 LEVEL 2 & LEVEL 4 REFUGE WATER SUPPLY DIVERSIFICATION PROGRAM

The RWSDP is intended to enhance and diversify water supplies for private and publicly managed wetlands within the Region. Participants in the development and management of this program include the USBR, USFWS, CDFG, Water Authority, Central California Irrigation District, Grassland Water District, and Ducks Unlimited. Direct beneficiaries of the program include the United States, State of California, CVP contractors, and the south-of-Delta managed wildlife refuges7.

K.2.3.1 Cost allocations & funding

The allocation of costs associated with actions relative to the development and conveyance of Level 2 and Level 4 water supplies is directed by the CVPIA8. Generally speaking, the CVPIA states that costs associated with Level 2 actions are to be repaid by CVP contractors; whereas costs associated with Level 4 actions are the sole responsibility of state and federal governments. Costs for these actions undertaken by Reclamation are allocated as prescribed irrespective of the source of project funding or the relative ratio of program benefit. To illustrate the latter, costs associated with the development of conveyance facilities to delivery Level 2 water to a specific refuge will be repaid by CVP contractors despite the fact that the direct beneficiary of the conveyance feature(s) is the specific public or private refuge that will receive its service. On the former, if funding for a hypothetical Level 4 project is provided entirely by CVP contractor contributions, the ultimate costs of the action will still be allocated to the state and federal governments with the CVP contractors receiving a credit of sorts for the funding provided to be applied toward other CVPIA actions. These examples are simplistic but serve to provide a sense of the complexities and distinctions between funding and allocating costs for federally implemented projects.

The RWSDP will divide all water developed equally between Level 2 and Level 4 supplies; therefore, fifty percent of the program's development and O&M costs will be repaid by CVP contractors and fifty percent will be the responsibility of the state and federal governments. Funding of the program will change depending upon the stage of development, production potential, and federal, state, and local fiscal circumstances. The nature of the RWSDP is such that the program can evolve as sponsors become available.

K.2.3.2 Feasibility Study

RWSDP funding to date has come exclusively from the Water Authority to support the feasibility studies conducted in 2005. Costs incurred equal a little more than $38,000. Of this amount, approximately $1,800 is related to permitting and electric service applications, $6,000 in professional fees to determine suitable locations for drilling test holes, conducting

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7 China Island Unit, East Bear Creek Unit, Freitas Unit, Grassland Water District, Kern NWR, Kesterson Unit, Los Banos WMA, Mendota WMA, Salt Slough Unit, San Luis Unit, Volta WMA, West Bear Creek Unit

8 CVPIA §3406(d)(3): All costs associated with implementation of paragraph (1) [Level 2] of this subsection shall be reimbursable pursuant to existing law. Incremental costs associated with implementation of paragraph (2) [Level 4] of this subsection shall be fully allocated in accordance with the following formula: 75 percent shall be deemed a nonreimbursable Federal expenditure; and 25 percent shall be allocated to the State of California for recovery through direct reimbursements or through equivalent in-kind contributions.

electric logging, analyzing drill cuttings, analyzing groundwater quality and production potential, and developing geologic logs and well specifications for the pilot program. The remaining balance of just over $32,000 was spent drilling the test holes.

K.2.3.3 Pilot Project

Initiation of the two-year RWSDP pilot project is anticipated to occur in 2006 with funding provided by Reclamation. The cost allocation process would remain unchanged. The project has two categories of associated cost: 1) the capital cost, which is expected to be approximately $310,000, is largely for well drilling, and 2) the O&M costs, which is expected to be approximately $100,000 annually, is primarily for energy costs.

K.2.3.4 Program Implementation

Providing the pilot project demonstrates sufficient feasibility and interest it may be converted into a permanent and formal CVP feature. The implications of this to the pilot program are minor with the only likely result being the conversion of temporary diesel power units to electric. The ability to expand the program beyond the two pilot wells will be governed by the availability of safe groundwater yield of suitable quality and program sponsors. Future funding sources could include any combination of federal, state, Regional, or local funding sources and mechanisms. Barring amendment to CVPIA, the cost allocation requirements would remain unchanged.

K.2.3.5 Operation & Maintenance

The Water Authority is under contract with Reclamation to provide O&M service to virtually all south-of-Delta federal facilities. Under this contract, the Water Authority would provide the O&M service for the pilot program and beyond, if realized. Under existing protocols, the Water Authority would establish O&M rates based upon projected costs and deliveries. Reclamation would pay the Water Authority O&M rate for each acre-foot delivered from the RWSDP and then allocate the costs according to the previously described requirements. Final costs would be determined by dividing actual costs by actual deliveries, which could result in issuing subsequent invoices or credits.

K.2.4 Los Banos Creek Conjunctive Use Project

The Central California Irrigation District, San Luis Water District, and City of Los Banos have collaborated on development of the Los Banos Creek Conjunctive Use Project. The concept is to utilize the stream bed and abandoned gravel mining pits along the creek, west of the City of Los Banos, to store temporarily surplus or conserved water from federal and exchange contract water rights holders. Water would be banked in years of surplus for extraction in years of shortage. The project would also provide the City of Los Banos a groundwater recharge program.

K.2.4.1 Cost Allocations & Funding

The Los Banos Creek Conjunctive Use Project is in formative stages. To date, only studies have been undertaken, the costs of which have been funded entirely by the project proponents. The project is not subject to any legislatively mandated cost allocation methods. As the project advances formal cost sharing agreements for project funding, cost recovery, and operations & maintenance will need to be negotiated between interested proponents.

K.2.4.2 Preliminary Investigations

The San Luis Water District financed an examination of potential aquifer storage and recovery sites within the district. The cost of the study was $7,000. The findings of the study fostered a partnership with the Central California Irrigation District on a second study examining the water yield potential of the Los Banos Creek Reservoir under various operating scenarios. The cost of this study was approximately $20,000 funded equally by the districts.

The information developed in these reports demonstrates potential. Discussions between the districts and City of Los Banos will attempt to further the project. Future efforts and funding mechanisms will be determined as the project advances.

K.2.5 San Luis Reservoir Low-Point Improvement Project

The SLRLPIP is one of seven activities authorized to receive a share of up to $184 million in federal funding through the California Water Security and Environmental Enhancement Act, 2004. This federal funding builds upon the $14 million Proposition 13 grant awarded to SCVWD by the California Department of Water Resources to study solutions to address the low-point problem. Federal appropriations of approximately $2 million per year will support the soon anticipated feasibility study. The Water Authority and SCVWD may provide additional funding or in-kind services. The total project cost will not be known until a preferred solution is selected; however, as is common within federal projects, the total project cost will likely be recovered from CVP contractors through established cost allocation processes.

K.2.6 Pleasant Valley Groundwater Banking Project

Pleasant Valley Water District (PVWD) serves as a lead agency of a Regional Water Management Group for developing and implementing the Pleasant Valley IRWM Plan and Groundwater Banking Project. The Group unsuccessfully applied for a Prop 50 Chapter 8 IRWM Grant to fund implementation of the Project. The PVWD and the City of Coalinga committed to contribute ten percent of the Project as a cost share including the donation of land for the Groundwater Banking Project. Future support and financing alternatives for the Project continue to be explored by PVWD.

K.2.7 Water Authority and SJRECWA Water Transfer Program

The WTP has been historically managed as an annual program. In 2006, the WTP evolved into a 5 year program under a negotiated agreement intended to provide water for Regional managed wetlands (Incremental Level 4 under CVPIA[9]) and transfers and exchanges of CVP water to and between other CVP contractors. The Exchange Contractors, through implementation of water conservation, source control, recirculation, land use management, and ground water management strategies can make available for transfer and exchange up to 80,000 acre-feet per year of their CVP water supply.

K.2.7.1 WTP Cost Allocation & Funding Overview

The long-term WTP was implemented, in large part, to eliminate price volatility and consequential funding instability inherent in the annual program. Participants in the development and management of the 5 year program include the USBR, USFWS, CDFG, Water Authority, SJRECWA, Madera Irrigation District, and the Grassland Water District.

9 §3406(d)(2): Not later than ten years after enactment of this title, the quantity and delivery schedules of water measured at the boundaries of each wetland habitat area described in this paragraph shall be in accordance with level 4 of the "Dependable Water Supply Needs" table for those habitat areas as set forth in the Refuge Water Supply Report and the full water supply needed for full habitat development for those habitat areas identified in the San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan Report prepared by the Bureau of Reclamation. The quantities of water required to supplement the quantities provided under paragraph (1) of this subsection shall be acquired by the Secretary in cooperation with the State of California and in consultation with the Central Valley Habitat Joint Venture and other interests in cumulating increments of not less than ten percent per annum through voluntary measures which include water conservation, conjunctive use, purchase, lease, donations, or similar activities, or a combination of such activities which do not require involuntary reallocations of project yield.

Direct beneficiaries of the program include the United States, State of California, participating Member Agencies, the Madera Irrigation District, and the south-of-Delta managed wetlands10.

Program funding and cost allocations will vary by year depending upon hydrologic year-type and federal allocations of irrigation water to south-of-Delta CVP agricultural service contractors. A water allocation and pricing matrix was developed as part of the long-term agreement. Generally speaking, more water is made available to south-of-Delta CVP contractors in dry years in recognition of the greater supply reliability enjoyed by the managed wetlands. In wet years, more water is made available to the managed wetlands. In addition, up to 5,000 acre-feet is made available annually to participating Member Agencies M&I contractors on an “on call” basis; any portion of which not purchased is subsequently reallocated between the wetlands and irrigators under the aforementioned parameters. The WTP also allows for the redistribution of water among program participants in order to address circumstances in which individual participants may find no immediate need for the supply.

As a result of the varying availability and distribution of water among program participants in any given year, a precise description of a program cost allocation cannot be given; however, the overarching principle is that the recipient of the water is responsible for paying their consequential share of the cost. Within the participants, the sub-allocation of cost is handled differently by the individual participants based upon their specific policies or legislative mandates.

K.2.7.2 WTP Cost Allocation

In the case of the managed wetlands, the allocation of costs associated with the availability and conveyance of Level 4 water supplies is directed by the CVPIA11. Generally speaking, the CVPIA states that costs associated with Level 4 actions are the sole responsibility of state and federal governments, each maintaining a 25% and 75% obligation, respectively. The allocation of cost among the Member Agencies is generally managed in one of two ways: 1) some districts manage their supplemental water programs on a subscription basis under which water users commit to the terms and condition inherent in each program therefore becoming directly responsible for the costs incurred, and 2) other districts manage their supplemental water programs in the aggregate making supply available “as needed” and at a melded price.

Program administrative costs are delineated and assigned to the SJRECWA and Water Authority. The Water Authority recovers all costs associated with the WTP only from the participating Member Agencies. All recipients of WTP supply are responsible for paying

10 China Island Unit, East Bear Creek Unit, Freitas Unit, Grassland Water District, Kern NWR, Kesterson Unit, Los Banos WMA, Mendota WMA, Salt Slough Unit, San Luis Unit, Volta WMA, West Bear Creek Unit

11 CVPIA §3406(d)(3): All costs associated with implementation of paragraph (1) [Level 2] of this subsection shall be reimbursable pursuant to existing law. Incremental costs associated with implementation of paragraph (2) [Level 4] of this subsection shall be fully allocated in accordance with the following formula: 75 percent shall be deemed a nonreimbursable Federal expenditure; and 25 percent shall be allocated to the State of California for recovery through direct reimbursements or through equivalent in-kind contributions.

conveyance O&M cost and capital, if incurred, to the appropriate operating entities. Costs associated with the implementation of the water conservation and management programs from which the WTP supply is generated are managed by the SJRECWA and its members.

K.2.7.3 WTP Funding

WTP financing is a mix of public and private funds. In theory, the three sources of funding should be federal, state, and local; however, federal and state fiscal circumstances affect the predictability of future funding such that in order to provide for their participation in a long-term program the local participants agreed to underwrite their involvement in the WTP. The net effect of this approach is that, while future federal and state funding is anticipated, the entire financial burden of the program could fall to the local participants if unrealized.

K.2.8 Westside Regional Drainage Plan

The Westside Regional Drainage Plan anticipates requiring and additional $61 million to fully implement the no discharge solution. To date, approximately $66 million has been spent on the Plan with a funding ratio of about one-third State and federal grants and two-thirds local investment. Of the future funding needs, it is anticipated the additional costs will be funded approximately sixty percent federal, thirty percent State, and ten percent local monies. The total Project funding ratio is expected to be forty percent federal, thirty percent State, and thirty percent local. The local cost-share does not include annual reimbursable CVP O&M and Capital costs associated with the San Luis Drain for which some WRDP participants are responsible.

Table K-1 summarizes the budget for the WRDP. This summary was generated though budget estimates for each of the strategies employed by the project. Descriptions of each budget category are included in the budget summary for individual actions.

Table K-1: Project Summary Budget

Westside Regional Drainage Plan						
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin	$0	$148,400	$392,000	$540,400	
(b)	Land Purchase/Easement	$0	$1,650,000	$6,350,000	$8,000,000	
(c)	Planning/Design/Engineering/ Environmental	$0	$903,600	$622,000	$1,525,600	
(d)	Construction/Implementation	$5,000,000	$25,756,100	$13,460,000	$44,216,100	
(e)	Env. Compliance/Mitigation	$0	$0	$0	$0	
(f)	Construction Admin	$0	$250,000	$536,000	$786,000	
(g)	Other Costs	$0	$0	$0	$0	
(h)	Construction Contingency	$0	$1,888,000	$3,640,000	$5,528,000	
(i)	Grand Total	$5,000,000	$30,596,100	$25,000,000	**$60,596,100**	
(j)	Calculation of Project Match					50%
Source of Non-State Share or other State Share		Other State Funds were estimated from an assumed Proposition 40 Grant Proposal award of $5,000,000. The subject proposal has not been awarded, however the implementation of this project is not dependant on the award of the Proposition 40 Grant Proposal. Non-State Share funds will come from Federal appropriations through the US Bureau of Reclamation and individual District Funding. District funding may be generated through budget allocations, assessments, or the sale of water.				

K.2.8.1 WRDP Strategy Specific Budgets

Action 1 Budget: Reuse Land Purchase

Reuse Land Purchase						
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin			$10,000.00	$10,000.00	
(b)	Land Purchase/Easement		$1,650,000.00	$6,350,000.00	$8,000,000.00	
(c)	Planning/Design/Engineering/ Environmental			$10,000.00	$10,000.00	
(d)	Construction/Implementation				$0.00	
(e)	Env. Compliance/Mitigation				$0.00	
(f)	Construction Admin				$0.00	
(g)	Other Costs				$0.00	
(h)	Construction Contingency			$1,200,000.00	$1,200,000.00	
(i)	Grand Total	$0.00	$1,650,000.00	$7,570,000.00	**$9,220,000.00**	
(j)	Calculation of Project Match					18%
Source of Non-State Share or other State Share		Federal appropriation through the US Bureau of Reclamation (Funding Assistance Agreement Currently under review.				

Direct Project Administration: This includes to the cost to negotiate the purchase agreement and price, administer the land purchase, track the project progress and paperwork, compile and file the appropriate reports. The assumed effort includes approximately 40 hours of engineering time ($4000), 40 hours of district manager time ($4000), 40 hours of administrative assistant time ($1200) 11 hours of office staff time ($275) and 15 hours of office accountant time ($525).

Land Purchase: This includes the cost to purchase the land, currently assumed at $4,000 per acre for 2,000 acres. The final price and actual acreage has not been fully determined.

Planning/Design/Engineering/Environmental: This includes the cost to perform field reviews and feasibility studies for drainage reuse ability.

Construction Contingency: The final acreage and purchase price have not been negotiated so 15% was added to the project to cover potential contingencies. This would cover a $600 per acre increase in cost or 300 acre increase in purchased land.

Action 2 Budget: Reuse Development Project

Reuse Development Project						
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin			$187,000	$187,000	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental			$317,000	$317,000	
(d)	Construction/Implementation		$2,871,100	$5,500,000	$8,361,100	
(e)	Env. Compliance/Mitigation				$0	
(f)	Construction Admin			$56,000	$56,000	
(g)	Other Costs				$0	
(h)	Construction Contingency			$1,068,000	$1,068,000	
(i)	Grand Total	$0.00	$2,861,100	$7,128,000	**$9,989,100**	
(j)	Calculation of Project Match					29%
Source of Non-State Share or other State Share		Federal funds through USBR appropriations and local district funds and in-kind services. Funding Assistance Agreement Nos. 04FC203073 ($907,000) and 04FG203055 ($585,000 for Reuse Development). District funding provided through Panoche Drainage District SJRIP Budget for Drainage Years 2003 through 2005.				

Direct Project Administration: This includes to the cost to oversee and administer the construction of subsurface drainage systems, drainage conveyance systems (pump stations and pipelines), and cultivation and planting over the course of the project. The value was calculated based on 2.5% of the project construction costs, based on previous experience with the SJRIP.

Planning, Design, Engineering, and Environmental: This includes the cost to develop design drawings and specifications for pump stations, pipelines, and drainage systems. It also includes the cost to develop various maps to facilitate operation and planning for the reuse areas (including crop maps, infrastructure maps, and drainage maps). This category also includes the development of the PAEP and Monitoring Plan. This value was calculated as approximately 4% of the project construction costs, which is based on previous experience with the SJRIP.

Construction Implementation: This is the cost to install the pump stations, pipelines, drainage systems, perform ground work, and plant and cultivate the salt tolerant crops on the reuse areas.

Construction Admin: This covers the cost to advertise and bid the project components and to make field reviews to track project progress. This estimate is based on previous project experience in the administration of the SJRIP.

Construction Contingency: This cost is estimated at 15% (based on previous experience) and is intended to cover increases in material and fuel costs as well as other unforeseen costs.

Action 3 Budget: Irrigation Improvements

Irrigation Improvements							
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin		$20,000		$20,000	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental				$0	
(d)	Construction/Implementation		$18,000,000		$18,000,000	
(e)	Env. Compliance/Mitigation				$0	
(f)	Construction Admin				$0	
(g)	Other Costs				$0	
(h)	Construction Contingency				$0	
(i)	Grand Total	$0	$18,020,000	$0	**$18,020,000**	
(j)	Calculation of Project Match					100%
Source of Non-State Share or other State Share		Private land owner funding and district funds.				

Direct Project Administration: This includes the cost to track the installation of improved irrigation systems by each participating district, and compile this information in a usable format. This cost is not related to the cost of the installed systems, but is part of the day-to-day district oversight. It is estimated to require approximately 165 hours to track and map the irrigation improvements by administrative assistants at an average estimated wage of 30$/hour. This value was calculated over four years.

Construction Implementation: This project will be implemented by individual growers within the drainage area and will be funded by the growers with assistance from district funding programs in some cases. The Construct Implementation amount is based on the estimated amount of high efficiency irrigation systems that will likely be installed over the next four years. This estimate is based on conversations with district growers and recent trends in irrigation system installations.

Action 4 Budget: Infrastructure Improvements

Infrastructure Improvements						
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin		$128,400		$128,400	
(b)	Land Purchase/Easement				$0	
(c)	Planning/Design/Engineering/ Environmental		$588,600		$588,600	
(d)	Construction/Implementation	$5,000,000	$4,735,000		$9,735,000	
(e)	Env. Compliance/Mitigation				$0	
(f)	Construction Admin		$250,000		$250,000	
(g)	Other Costs				$0	
(h)	Construction Contingency		$1,888,000		$1,888,000	
(i)	Grand Total	$5,000,000	$7,590,000	$0	**$12,590,000**	
(j)	Calculation of Project Match					60%
Source of Non-State Share or other State Share		Other State Share funding is being applied for through a Proposition 40 grant proposal. Other funding will come from Federal (USBR) appropriations and district funding.				

Direct Project Administration: This includes the cost to monitor construction progress, billing, contract issues, and compile progress reports. The value is calculated at 1% of the total project cost based on experience with other similar projects.

Planning, Design, Engineering, and Environmental: This includes the cost to develop design drawings and specifications for the new facilities. This category also includes the development of a PAEP and Monitoring Plan. It is calculated as 5% of the overall project cost, based on experience with similar projects.

Construction Implementation: This is the cost to construct the improved facilities. These estimates are based on costs from other similar projects and conversations with contractors familiar with the region and experienced with the appropriate kind of work.

Construction Admin: This covers the cost to advertise and bid the project components, to make field reviews to track project progress, and perform the necessary inspection and testing. The cost was calculated at 2% of the construction costs based on experience with similar projects.

Construction Contingency: This cost is estimated at 15% (based on previous experience) and is intended to cover increases in material and fuel costs as well as other unforeseen costs.

Action 5 Budget: Deep Groundwater Pumping Project

Deep Groundwater Pumping Project						
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin			$105,000	$105,000	
(b)	Land Purchase/Easement			$0	$0	
(c)	Planning/Design/Engineering/ Environmental			$80,000	$80,000	
(d)	Construction/Implementation		$150,000.00	$4,640,000	$4,790,000	
(e)	Env. Compliance/Mitigation			$0	$0	
(f)	Construction Admin			$240,000	$240,000	
(g)	Other Costs			$0	$0	
(h)	Construction Contingency			$637,000	$637,000	
(i)	Grand Total	$0.00	$150,000.00	$5,702,000	**$5,852,000**	
(j)	Calculation of Project Match					3%
Source of Non-State Share or other State Share		Non-State funding match provided by District funding and Federal appropriations through the US Bureau of Reclamation.				

Direct Project Administration: This includes the cost to monitor construction progress, billing, contract issues, and compile progress reports. This category also includes the development of a PAEP and Monitoring Plan. The value is calculated at 1.8% of the total project cost based on experience with other similar projects.

Planning, Design, Engineering, and Environmental: This includes the cost to develop design drawings and specifications for the new facilities. It is calculated as 1.4% of the overall project cost. This value is less than the typical cost for engineering design because much of the design data has already been generated and many of the well designs will be identical, or near identical, thus the design costs can be greatly reduced.

Construction Implementation: This is the cost to construct the improved facilities. These estimates are based on costs from other similar projects and conversations with contractors familiar with the region and experienced with the appropriate kind of work.

Construction Admin: This covers the cost to advertise and bid the project components, to make field reviews to track project progress, and perform the necessary inspection and testing. The cost was calculated at 4% of the project cost based on experience with similar projects.

Construction Contingency: This cost is estimated at 11% and is intended to cover increases in material and fuel costs as well as other unforeseen costs. Three wells have been installed and the costs associated with those installations have been defined. This allowed for some reduction in contingency costs compared to other similar project estimates.

Action 6 Budget: Salt Disposal Development Project

	Salt Disposal Development Project					
	Budget Category	Other State Funds	Non-State Share	Requested Grant Funding	Total	%Match
(a)	Direct Project Admin			$90,000	$90,000	
(b)	Land Purchase/Easement			$0	$0	
(c)	Planning/Design/Engineering/ Environmental		$315,000	$215,000	$530,000	
(d)	Construction/Implementation			$3,320,000	$3,320,000	
(e)	Env. Compliance/Mitigation			$0	$0	
(f)	Construction Admin			$240,000	$240,000	
(g)	Other Costs			$0	$0	
(h)	Construction Contingency			$735,000	$735,000	
(i)	Grand Total	$0.00	$315,000	$4,600,000	**$4,915,000**	
(j)	Calculation of Project Match					6%
	Source of Non-State Share or other State Share	Non-State funding match provided by District funding and Federal appropriations through the US Bureau of Reclamation (Funding Assistance Agreement No. 05FG203055). $305,000 was provided in the Fall of 2005 and Winter of 2006 for an engineering evaluation of water treatment.				

Direct Project Administration: This includes the cost to monitor construction progress, billing, contract issues, and compile progress reports. This is calculated as 2% of the total project cost based on experience with similar projects.

Planning, Design, Engineering, and Environmental: This includes the cost to develop design drawing and specifications the new facilities. This value was based on engineering work already completed and an estimate of the remaining work necessary to finish the design. This category also includes the development of a PAEP and Monitoring Plan. The calculated amount is 11% of the total project cost, which is typical for pilot scale projects of this type.

Construction Implementation: This is the cost to construct and operate the pilot plant. It includes site work, materials, construction, start up, operations costs, monitoring and analysis of operations, and reporting of finding with recommendations. The project also includes a preliminary design of a full-scale system. This estimate is based on proposals and conversations from the project lead companies.

Construction Admin: This covers the cost to make field reviews to track project progress, and perform the necessary inspection and testing. The cost was calculated at 5% of the project cost, which is typical for this type of project.

Construction Contingency: This cost is estimated at 15% and is intended to cover increases in material and fuel costs as well as other unforeseen costs.

K.2.9 Westside Surface Storage Reservoir Project

It is likely the Water Authority or WWD will be the lead agency on the Project and thus will be responsible for all costs including design, construction, and operation. These agencies will also be responsible for funding all project costs and then would rely upon partners to use and pay for a prorated share of the project.

SECTION L: STATEWIDE PRIORITIES

L.1 STATE PRIORITIES

The priorities of the State as they pertain to water management are articulated in numerous ways, with few having more prominence than the California Water Plan Bulletin 160 or CALFED Record of Decision. A comparison of these documents finds the 2005 Westside Integrated Water Resources Plan to be consistent with and complementary to both the broad objectives and specific strategies defined therein. In fact, the central theme of all three of these documents is the importance of applying integrated regional water management approaches to address water supply, water quality, and environmental issues.

In addition to the resource management objectives described in the above referenced documents, State regulatory agencies have established standards and priorities to address specific concerns in particular regions. Our Region is affected by many of these standards including water and air quality regulations. Furthermore, the fact is there are layers of regulatory standards and resource management objectives that extend from local or regional regulatory and planning agencies through the State and federal levels. It is therefore incumbent upon this Region to develop solutions capable of achieving multiple objectives simultaneously.

Implementation of this Plan will, while addressing State and Regional requirements, achieve various federal objectives as exemplified in such legislation as the CVPIA and the more recent California Water Security and Environmental Enhancement Act. Examples of these objectives include developing Level 4 water supply, diversifying Level 2 water supply, expanding surface storage, improving the operational flexibility of the San Luis Reservoir, and improving water quality on the lower San Joaquin River. Many of the objectives identified in the above legislation are also priorities of the State either through mutual interest or federal mandate.

The Plan, besides attending to the multiple layers of goals and requirements just discussed, will also meet a wide array of Regional concerns in a manner that resolves many specific and long-standing conflicts. The strength of this Plan lies in the locally driven project development approach whereby the problems and conflicts of a specific area can be addressed through the development of partnerships to create opportunities of Regional significance.

L.2.1 RELATIONSHIPS BETWEEN PROJECTS AND STATEWIDE, FEDERAL, AND REGIONAL OBJECTIVES

To provide one a sense of correlation between the multitude of governmental regulatory and resource management goals and the solutions presented in this Plan, this Section provides examples of objectives and Project specific remedies.

L.2.2 Reduce Conflicts Between Water Users

This is an objective broadly sought by governmental agencies at all levels and stakeholders alike. An example solution is the West Side Regional Drainage Plan where, at a local (multiple-district) level, the Plan will allow longstanding disputes between the San Luis Unit Contractors of the CVP and the San Joaquin River Exchange Contractor agencies over the effects of irrigated lands' drainage to be settled in a way that allows irrigation and productive use of district lands to continue. It also provides the USBR an opportunity to address some portion of its drainage service obligation by supporting this in-Valley solution. This well integrated solution also provides increased water supplies to the region through sale and transfer, the proceeds of which will help support the operational costs associated with the Plan.

L.2.3 Environmental Justice

While often though of in the contest of inner-city effects, the fact of the matter is that the majority of peoples impacted by the regulatory constraints causing the chronic water supply shortages experienced in the Region live in rural disadvantage communities. As demonstrated previously, the expansion of water supply in the Region through improved conveyance, operational flexibility, and supply will provide these communities access to thousands of jobs, which would generate hundreds of millions of dollars of economic benefit throughout the social strata. The Plan includes a multitude of projects capable of providing water supply reliability include the Pleasant Valley Groundwater Banking Program, San Joaquin River – DMC Pipeline Connection, San Luis Reservoir Low-Point Improvement Project, and the Westside Surface Storage Reservoir Project.

L.2.4 Water Quality Improvements

This objective is being pursued through the entire spectrum of governmental agencies and water users. Actions have been identified in federal legislation (PL 108-361 §103(d)(8), State and federal cooperative agreements (CALFED ROD), and promulgated regional standards such as TMDL's recently adopted by the San Joaquin Valley Regional Water Quality Control Board. The West Side Regional Drainage Plan has the ability to address all of the aforementioned objectives by eliminating the discharge of agricultural drainage from the 90,000 acre solution area thereby eliminating the introduction of salt, boron, selenium, and other constituents of concern to the benefit of the ecological and drinking water quality uses of the lower San Joaquin River and Delta.

L.2.5 Goals of the CALFED Bay-Delta Program

The CALFED Program is generally a sweeping effort to enhance the ecosystem, flood control, water quality and water supply reliability in the Program area. All of the Projects contained in this Plan are capable of achieving numerous CALFED objectives and some are specifically or generally cited in CALFED guiding documents or authorizations such as the

San Luis Reservoir Low-Point Project, which is specifically identified in the ROD, and the Westside Regional Drainage Plan, which meets prerequisites to implementation of the Delta Improvements Package and address mandates articulated in the California Water Security and Environmental Enhancement Act.

SECTION M: RELATIONSHIP TO LOCAL PLANNING

M.1 GENERAL DESCRIPTION

The Member Agencies of the Water Authority in general do not have land use planning authority. As such, Regional stakeholders have had to reach out and educate local land use planners and decision makers on the relationship between their legal authority to affect land use and the subsequent impacts upon water resource management. Many of these efforts are recent and resultant of the rapid development to meet housing demand throughout the Region. More developed and detailed efforts have occurred with respect to regional conservation plans, which will be described later on a county basis.

M.2 LAND USE PLANNING

Land use decisions made by local governments affect many aspects of our Member Agencies' management and regulatory compliance responsibilities, including conveyance capacity, drainage, flood control, operational flexibility, water quality, and water supply. For decades, City and County land use decisions have been made in isolation from the resource considerations of local water agencies. Over these years however, local water agencies enjoyed far greater water supply reliability and operational flexibility and thus could content with the then slow pace of growth. However, within the last several years, as the rate of development has increased inversely to the abilities of local water agencies, conflicts have arisen and the need for education and collaboration has become evident. In response, local water agencies and governments have initiated discussions to identify resource management issues related to growth and are beginning to develop formal cooperative processes to ensure mutually acceptable outcomes. As many of these planning efforts are in their infancy, detailed descriptions are not provided but will be included in future iterations of this Plan.

M.3.0 CONSERVATION PLANNING

M.3.1.0 DELTA DIVISION

Following are summaries of County specific conservation plans and efforts developed with input from some Delta Division Member Agencies.

M.3.1.1 Current General Plan Protective and Management Measures

Measures to mitigate or offset impacts to sensitive species and communities have been developed and implemented by the cities and counties in the Delta Division as part of their general plans. Some of these goals and policies are currently being reviewed and modified by city and county agencies as part of the general plan environmental impact report process. The most current measures for the affected cities and counties in the project area are described below.

M.3.1.2 Stanislaus County

Documentation supporting the Conservation and Open Space Element of the Stanislaus County General Plan emphasizes the conservation and management of economically productive natural resources and conservation of open space lands (any parcel or area of land or water that is essentially unimproved). The element (1) promotes the protection, maintenance, and use of the county's natural resources, with special emphasis on scarce resources and those that require special control and management; (2) prevents wasteful exploitation, destruction, and neglect of natural resources; (3) recognizes the need for natural resources to be maintained for their ecological values as well as for their direct benefit to people; (4) preserves open space lands for outdoor recreation including scenic, historic, and cultural areas; and (5) preserves open space for public health and safety, including areas subject to landslides, flooding, and high fire risk, and areas required for the protection of water and air quality.

Goal One encourages the protection and preservation of natural and scenic areas throughout the county by:

- Maintaining the natural environment in areas dedicated as parks and open space.
- Ensuring compatibility between natural areas and development.
- Protecting from development areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways, and other waterfowl habitats) including those habitats and plant species listed in the General Plan Support Documentation or by state or federal agencies.
- Protecting and enhancing oak woodlands and other native hardwood habitat.

M.3.1.3 San Joaquin County

Implementing the Natural Resources Regulations as identified in the Draft General Plan 2010 would protect important biotic resources within San Joaquin County. The county's policies and implementation measures related to the protection and management of biological resources include special-status species, sensitive natural communities, and fisheries.

The final environmental impact report on the San Joaquin County Comprehensive Planning Program (Baseline Environmental Consulting 1992) recommends that the county (1) develop an integrated vegetation management program for properties owned and maintained by the county and (2) protect habitat areas large enough to be minimally affected by urban development including maintaining connection of habitat and restoring and enhancing degraded ecosystems such as historic salmon runs on the Mokelumne and Calaveras Rivers.

M.3.1.4 City of Tracy

The City of Tracy plans to conserve natural resources through the protection and enhancement of permanently preserved open space. For actions associated with the policies listed below, refer to *City of Tracy General Plan: An Urban Management Plan* (City of Tracy and the Planning Center 1993).

The City of Tracy will minimize impacts of development on waterways, riparian corridors, and adjacent buffer areas and will seek opportunities to preserve or establish wildlife habitat, in conjunction with other uses and developments within the Tracy Urban Management Plan Area.

M.3.1.5 Fresno County

Policies in the Fresno County General Plan seek to protect riparian and wetland habitats while allowing compatible uses where appropriate. Objectives include:

- To conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions positively affects aesthetics, water quality, floodplain management, ecological function, recreation, and tourism. Policies in this section seek to protect natural areas and to preserve the diversity of habitat in the county. Related policies are included in Water Resources, Forest Resources, Wetland and Riparian Areas, Vegetation, and River Influence Areas elements.
- To help protect, restore, and enhance habitats in Fresno County that support fish and wildlife species so that populations are maintained at viable levels. Policies in this section seek to protect native vegetation resources primarily on private land within the county.
- To preserve and protect the valuable vegetation resources of Fresno County.

For more detailed information on the direction of the goals listed below, refer to the Fresno County General Plan Background Report (County of Fresno 2000a).

M.3.1.6 Merced County

Merced County has the following goals and objectives regarding conservation of natural resources:

- Habitats that support rare, endangered, or threatened species are not substantially degraded. Rare and endangered species are protected from urban development and are recognized in rural areas.
- Local, state, and federal managed lands are recognized.

For more information on the policies developed for these goals and objectives, refer to the Merced County Year 2000 General Plan (Merced County 1990).

M.3.2.0 San Felipe Division

M.3.2.1 Habitat Conservation Plans

Both San Benito and Santa Clara counties have initiated preparation of habitat conservation plans.

M.3.2.2 San Benito County

San Benito County has initiated development of a Multi-Species Habitat Conservation Plan (MSHCP) to obtain an incidental take permit under Section 10 of the ESA. The MSHCP will address San Joaquin kit fox, blunt-nosed leopard lizard, giant kangaroo rat, vernal pool tadpole shrimp, and related habitats. Activities anticipated to be covered by the MSHCP include on-going agricultural activities, conversion of native habitat to agricultural uses, and residential and commercial development. San Benito County is in the initial planning and data collection stages of MSHCP development. The MSHCP is being prepared in cooperation with San Benito County Water District and California Department Fish and Game and will also address requirements of a Natural Community Conservation Plan.

M.3.2.3 Santa Clara County

In Santa Clara County, efforts are underway to begin a multi-agency, conservation planning process for the entire county. The Service and the Army Corps of Engineers recently completed formal section 7 consultation on 5 major projects in Santa Clara County and the Service issued on biological opinion (dated July 31, 2001) for the consultation. As part of that consultation, the County of Santa Clara, Santa Clara Valley Water District, and City of San Jose agreed to address the growth facilitating impacts of the projects through the section 10 process and by developing an HCP/NCCP. In response to several highway projects proposed by the Santa Clara Valley Transportation Authority and the potential need for the Service to consult on the long-term renewal of Santa Clara Valley Water District's Federal CVP Water Contracts, the Service requested that a Habitat Conservation Plan (HCP), meeting federal standards, be prepared to address potential direct and indirect impacts to federally listed species and their habitat in Santa Clara County from anticipated development in the City and County. The County of Santa Clara, the City of San Jose, and the Santa Clara Valley Water District have each submitted letters indicating their respective commitment to work cooperatively towards the development of a multi-species HCP. The Santa Clara Valley Water District and the Service will carryout the commitments stated in Tony Estremera, Chairperson, Board of Directors, Santa Clara Valley Water District letter dated June 27, 2001, including:

- The Santa Clara Valley Water District will agree to cooperate with other agencies in the preparation of a County wide multi-species HCP/NCCP with the goal of completing the Public Draft HCP/NCCP by 2004 (three years from date of Estremera letter). If required, the Santa Clara Valley Water District will negotiate and enter into a formal Planning Agreement prior to commencement of development of the HCP/NCCP.
- Funding of approximately $1,000,000.00 assumed to be required to support preparation of the HCP/NCCP will be jointly funded between the agencies and projects which will benefit. Santa Clara Valley Water District agrees to contribute a proportionate share of the cost, commensurate with the District's interests, provided that other consultations with the Service are complete.
- Santa Clara Valley Water District agrees to develop an interim process in coordination with the Service to keep conservation and recovery options open for affected species, and to ensure Santa Clara Valley Water District compliance with the ESA with regard to the issuance of discretionary permits where federal jurisdiction applies during the period prior to a decision on the HCP/NCCP, and issuance of incidental take permits.

M.3.3.0 San Luis Unit

Following are summaries of County specific conservation plans and efforts developed with input from San Luis Unit CVP contractors.

M.3.3.1 Existing General Plan Protective and Management Measures

In addition to the measures required under the ESA to protect listed and proposed species, other measures to mitigate or offset impacts to sensitive and listed species have been developed and implemented by the counties in the San Luis Unit as part of their general plans. Some of these goals and policies are currently being reviewed and modified by county agencies as part of the general plan environmental impact report process. The most current measures for the affected counties in the area are described below.

M.3.3.2 Fresno County

The Land Use and Open Space and Conservation Elements in the Fresno County Draft General Plan Policy Document set goals, policies, and implementation measures for biological resources (Fresno County 2000b). These goals and objectives include the following:

- To conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions positively affects aesthetics, water quality, floodplain management, ecological function, recreation, and tourism. Policies in this section seek to protect natural areas and to preserve the diversity of habitat in the county. Related policies are included in the Water Resources, Forest Resources, Wetland and Riparian Areas, Vegetation, and River Influence Areas elements.

- To help protect, restore, and enhance habitats in Fresno County that support fish and wildlife species so that populations are maintained at viable levels. Policies in this section seek to protect native vegetation resources primarily on private land within the county.
- To preserve and protect the valuable vegetation resources of Fresno County.

For more detailed information on the direction of the goals listed below, refer to the Fresno County General Plan Background Report (Fresno County 2000a).

M.3.3.3 Merced County

Merced County has the following goals and objectives stated in the Open Space and Conservation chapter of its General Plan regarding conservation of natural resources:

- Goal 1. Habitats that support rare, endangered, or threatened species are not substantially degraded.
- Objective 1.A. Rare and endangered species are protected from urban development and are recognized in rural areas.
- Objective 1.B. Local, state, and federal managed lands are recognized.

For more information on the policies developed for these goals and objectives, refer to the Merced County Year 2000 General Plan (Merced County 1990).

M.3.3.4 Kings County

Kings County has the following goals stated in the Resource Conservation Element of its General Plan (Kings County Planning Department 1993):

- Goal 16. Preserve land that contains important natural plant and animal habitats.
- Goal 17. Maintain the quality of natural wetland areas identified by the CDFG and the USFWS.
- Goal 18. Protect and manage riparian environments as valuable resources
- Goal 19. Balance the protection of the county's diverse plant and animal communities with its economic needs.
- Goal 20. Manage natural stream environments to provide protection for fish habitat.

For more information on the policies developed for these goals and objectives, refer to the Kings County Year General Plan (Kings County Planning Department 1993).

M.4.0 INTEGRATED ECONOMIC DEVELOPMENT

M.4.1 Interstate 5 Business Development Corridor General Summary

The I-5 BDC regional plan integrates economic development with land use and natural resource management. The communities in the region have relied primarily on agriculture for the economic engine and the retirement of broad contiguous tracts of agricultural areas has further depressed related regional economic activity already seriously stress by implementation of regulatory actions that have severely curtailed water supply over the last fifteen years.

The region needs to diversify the portfolio of economic opportunities but each economic development alternative has either land use or natural resource consequences. In addition, each development alternative has natural resource and infrastructure needs. For example, the City of Mendota needs resolution to the flooding from Panoche-Silver Creek or portions of the community will continue to be bifurcated and isolated with property damage and business disruption. The direction of land use changes and growth necessary to diversify the local economy is therefore limited to areas not affected by the flooding problem. Since flooding is indiscriminate and likely to move in directions not anticipated, hardly any planning can be relied on with this lingering threat.

Lands that Westlands has acquired and fallowed for the interim, which are within the same area of lands that would be targeted for Land Retirement as identified in Reclamation's Drainage Report and the Westside Regional Drainage Plan, offer the opportunity to develop an integrated solution that directs and controls the flooding in a way that preserves all the land use planning options for the sphere around the City of Mendota. However, also implicit in the planning process is the natural resource and infrastructure needs. A firm, high quality water supply is necessary to meet the needs of a growing community as well as the physical facilities to capture and deliver the water. The integrated planning tool brings the community's attention to the fact that the water supply is subject to various forces including competing users and lack of the ability to reliably predict the long-term viability of the source. Only by actively participating in regional management strategies for ground and surface water can the City guarantee they will have the capability to have adequate water resources available for future domestic and industrial use. Strategies such as participating in regional monitoring of supply availability and quality trends or joining in active replacement or recharge programs will become necessary. The entire I-5 region must think in these same regional terms and portray alternate land use, economic development and resource management strategies against each other to determine the optimum sustainable economy.

The most significant variable in all the alternate planning strategies is the capability of the regional population to sustain mobility. If growth in all of the communities is fueled by the ability of people to travel substantial distances to jobs outside of the region, a different planning picture will emerge than if mobility is deterred by costs that exceed the benefits of the travel. As a result, transportation is logically a separate strategic element for the regional plan.

SECTION N: STAKEHOLDER INVOLVEMENT

N.1 STAKEHOLDER PARTICIPATION

The Westside Integrated Water Resources Plan is a guiding document intended to present opportunities that could result in enhanced Regional resource management; it is not an action document. The opportunities are presented in the form of the projects that compose the Plan. At the project level, interests have or could come together to craft strategies capable of meeting a variety of outcomes. The development of these strategies provides the basis from which stakeholder groups are formed. Successful implementation of the projects requires robust discourse to create meaningful stakeholder commitments and support from interested parties.

Stakeholder participation in all aspects of the Plan occurs at multiple levels and intensities. The Plan itself is directed by a narrow set of stakeholders that in the classic sense of the word are entrusted with the conveyance of interests not necessarily their own. In other words, decisions regarding the Plan itself do not influence the outcome of its projects; the Plan merely reflects them in a way as to provide a vision of alternatives capable of enhancing the Regional circumstance. This stakeholder role is fulfilled by the nineteen individuals that serve as the Water Authority's Board of Directors (Appendix C), which is supported by several standing committees. Their function is to be the final arbitrator of the debate over inclusion in the Plan of such things as Regional objectives and the mix of projects in a manner that represents the views of their districts or divisions.

At the project level we find stakeholder participation more in the modern connotation whereby persons or groups are conveying their interests in the hopes of affecting a desired outcome. Stakeholders at this level can be self identified or solicited. Generally, the more complex the project, the more intricate the relationship between stakeholders, the more vital efforts to reach out to interested parties, and the more vigorous communication must be.

In either circumstance, the flow of information is bidirectional between the stakeholders and their constituencies and multilateral among the stakeholders, stakeholder groups, and other organizations with which either may be affiliated. Stakeholder participation in a multitude of organizations promotes the concentric growth of relationships around a project proportional to the relative level of interest and benefit in the endeavor. While the informal flow of information predominates, it is the genesis for more formal communication, such as presentations and meeting, or project participation.

N.1.1 PLAN DEVELOPMENT STAKEHOLDERS

The Water Authority serves the representation needs of our 32 Member Agencies (Appendix A-1), in part, by developing or conveying information concerning a variety of issues that serve the common interest of our membership, such as: Sacramento and San Joaquin Delta exports, water supply, water quality, water development, conservation, distribution, drainage, contractual rights, surface and groundwater management. The Westside Integrated Water Resources Plan is a typical example of our role and effort. At the behest of our members, the Water Authority has developed this Plan as a collective of locally developed projects capable of providing incremental progress toward the identified Regional objectives. This initiative is required due to the nature of our membership, which is predominantly agricultural and largely neglected by traditional governmental planning efforts. The Plan, therefore, is the sum of multiple visions combined to generate added value in order to provide the broadest possible benefit to our membership, which in turn become the Plan's stakeholders.

Stakeholders interact on at least a monthly basis with the administration of the Plan through the Water Authority's administrative mechanisms, which includes an O&M Technical Committee, the policy oriented Water Resources Committee, and the Finance & Administration Committee. These institutions evaluate and synthesize information and offer recommendations to the Board of Directors, which is the ultimate decisional authority, when action is warranted. In addition, ad-hoc working groups and steering committees are formed as necessary to focus on matters of particular expertise, such as development of this Plan. Board action is not only informed by the Water Authority's standing committees but also by the institutions the directors represent.

Participation on the Board and standing committees is divided among five formal Divisions (Appendix A-1) that compose the entirety of the Water Authority's membership Members of these institutional bodies are generally directors, managers, or staff of the Member Agencies that express a particular interest or provide a particular skill relative to the body's area of concern (i.e. resource policy, O&M, finance, etc). Extensive participation by Member Agencies not only informs the Water Authority's actions but provides a feedback loop through which ideas, such as the PLAN, may be vetted. Additionally, many of these individuals also participate in groups outside the realm of water such as commodity bargaining associations, governmental associations, redevelopment agencies, planning commissions, and non-profit organizations. Participation in this breadth of organizations provides stakeholders, and thus the Plan, great perspective about and understanding of imbricate interests that contribute to the Plan's scope and potential to provide direct and ancillary benefit to the Region and beyond through stakeholder selection of its objectives and projects.

Fully exercising the opportunities to inform and vet the Plan cannot always result in consensus. Stakeholders in any process are routinely confronted with the necessity to make decisions that provide the greatest collective benefit at the exclusion or minimization of a sub-group's interest. These occasions do not necessarily indicate conflict within the larger group but are often more indicative of the sub-group's particular circumstance. In such instances, the acuteness of need can override the sub-group's actions in spite of their support for the larger effort. When such divergence occurs, vigorous multilateral communication is essential to maintaining the effort's full support. The Plan has strived to foster broad, interlaced relationships committed to its progress and resolved to communicate through differences and inevitable periods of strife.

As discussed previously, the Water Authority and all of its Member Agencies are legal entities established under some aspect of California law. As such, all Board and standing committee meetings are noticed, agendas and minutes are produced and readily available, and public comment periods are offered at meetings. Thus, any interested individual or group wishing to comment on the Plan outside of the established institutional circuits is offered that opportunity.

N.1.2 PROJECT DEVELOPMENT STAKEHOLDERS

Stakeholder participation at the project level, which can be complex and interdependent, is essential to the successful implementation of a Regionally beneficial project. Stakeholder groups influencing the projects identified in this Plan are both formal and ad-hoc, generally in relation to the project’s desired outcome or level of development. There is no single approach in identifying or soliciting a project’s stakeholders. Outreach approaches range from one-on-one communication, conducting project scoping meetings, giving presentations, attending or holding public meetings, and forming formal stakeholder organizations to formalize governance and communication strategies. Regardless of the approach, the need is the same and requires significant understanding and commitment. The following section provides some specific detail of approaches utilized by various projects.

N.2 STAKEHOLDER PARTICIPATION IN PROJECT DEVELOPMENT & IMPLEMENTATION

N.2.1.1 San Luis Reservoir Low-Point Improvement Project

In late August 2002, SCVWD, in cooperaton with the USBR, held two public scoping meetings for the San Luis Reservoir Low Point Improvement Project. The August 26 meeting was held in the boardroom at the district's headquarters in San Jose and the August 27 meeting was held at the Romero Visitors' Center at San Luis Reservoir. The goals of the meetings were to:

- provide the public with information regarding the low point problem and potential solutions, the environmental planning process, and opportunities for public involvement; and
- solicit public input on areas of concern to be addressed in the Environmental Impact Report/Environmental Impact Statement in preparation for the SLRLPIP.

At both meetings, the district recorded many concerns, suggestions, and comments ranging from the need for water conservation to impacts to habitat, residents and property owners. Comments were collected verbally at information stations, through survey forms, and by correspondence and in combination equaled over a one hundred, all of which were incorporated into Scoping Summary Report produced by Jones & Stokes. Information gathered at the scoping meeting has informed subsequent project development.

In 2003, a draft Alternative Screening Report was produced that, in part, describes the project's outreach activities. In general and in addition to the routine publicly noticed SCVWD meetings, those activities have included briefings to interested parties, dedication of web-server space, and establishment of a stakeholder committee and regulatory compliance workgroup. The purpose of the stakeholder committee is to form a close working relationship with key project stakeholders to ensure that their input and recommendations are included in the planning process. Stakeholder Committee members include:

- CALFED
- Central Valley Project Water Users Association
- Department of Water Resources
- Environmental Defense
- Pacheco Pass Water District
- Pajaro Valley Water Management Agency
- San Benito County Water District
- San Luis and Delta Mendota Water Authority
- Santa Clara County Farm Bureau
- Santa Clara Valley Audubon Society
- SCVWD Agricultural Water Advisory Committee
- SCVWD Water Retailers Committee
- Silicon Valley Chamber of Commerce
- State Water Contractors
- Streams for Tomorrow
- United States Bureau of Reclamation

The purpose of the regulatory compliance workgroup is to initiate early consultation with appropriate resource and regulatory agencies to facilitate development of a methodology to simplify and streamline the permitting process and to integrate the permitting process with NEPA/CEQA compliance. The regulatory compliance workgroup members include:

- California Department of Fish and Game
- California Department of Water Resources, Division of Safety of Dams
- Central Valley Regional Water Quality Control Board
- National Marine Fisheries Service

- San Francisco Bay Regional Water Quality Control Board
- State Water Resources Control Board
- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- U.S. Environmental Protection Agency, Region 9
- U.S. Fish and Wildlife Service

Stakeholder participation and feedback from outreach efforts will continue to inform development of the project as it moves through the federal feasibility study phase and into the resulting environmental documents. Multiple public comment periods will also occur prior to selection of the project's final implementation strategies.

N.2.1.2 Westside Regional Drainage Plan

Participation in the WRDP is complex and, at the direct stakeholder level, interdependent. Direct stakeholders in the project are primarily Water Authority members and include:

- Broadview Water District
- Camp 13 Drainage District
- Central California Irrigation District
- Charleston Drainage District
- Colombia Canal Company
- Eagle Field Water District
- Firebaugh Canal Water District
- Mercy Springs Water District
- Ora Loma Water District
- Pacheco Irrigation District
- Panoche Water District
- San Luis Canal Company
- San Luis Water District
- Westlands Water District
- Widren Water District

Long standing conflicts exist among the WRDP direct stakeholders that can be resolved through full implementation of the project. As such, participation in the solution becomes an interdependent relationship wherein withdrawal from the project by any direct stakeholder could result in the effort’s demise. In 2004, the direct stakeholders requested the Water Authority facilitate development of a solution to these long standing conflicts In this role, the Water Authority has collaborated with the direct stakeholders in the development of the WRDP, the hiring and management of consultants, identifying and securing necessary funding mechanisms, and promoting statewide outreach and support for the project. In the future, as the need for facilitation is overcome by project implementation, many of these efforts may be assumed by formation of a WRDPJPA.

WRDP outreach efforts have been extensive and productive, resulting in much strong collaboration in project development and stated support. These efforts have included one-on-one briefings, presentations, attending or holding public meetings, formation of common interest stakeholder groups, and interaction with Regional, state, and federal governmental institutions.

The WRPD has successfully developed relationships with the Merced County Association of Governments, San Joaquin River Water Quality Management Group, the California Bay-Delta Authority, Department of Water Resources, and United States Bureau of Reclamation. These relationships have expressed themselves differently in various state and federal forums but the message of support has been consistent.

The Merced County Association of Governments is comprised of community leaders from many disciplines from throughout Merced County. The MCAG identifies solutions to significant issues affecting the County and then advocates for them at the state and federal levels. The MCAG has promoted implementation of the WRDP through organization of delegations sent to Sacramento and Washington DC, the development of “fact sheets” briefing the WRDP, and support letters (Attachments D-1 & D-2).

The San Joaquin River Water Quality Management Group is a coalition of statewide organizations formed to develop solutions addressing water quality problems on the lower San Joaquin River. The SJRWQMG invested heavily in the development and analysis of solution alternatives to ameliorate water quality impacts on the lower San Joaquin River. This effort culminated in August 2005 with the issuance of a document entitled Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel (Attachment D-3). The number one recommendation of the report was the full implementation of the Westside Regional Drainage Plan. In February 2006, the SJRWQMG disbanded as their mission had been deemed complete and the effort’s emphasis shifted from solution identification to project implementation.

In picking up where the SJRWQMG left off, the San Joaquin River Quality Action Implementation Group, under the lead of DWR, was formed to implement the actions identified in the 2005 SJRWQMG report. The responsibility for implementing the individual actions identified in the 2005 SJRWQMG report lie with the specific agencies or parties that can take tangible action. The newly formed SJRQAIG is comprised of those agencies and parties and will rely upon the San Joaquin River Management Program to provide a transparent forum to keep stakeholders and interested parties involved, while offering a layer of support and linkage to other River users. Participants in the SJRQAIG are as follows:

- California Bay-Delta Authority
- California Department of Fish & Game
- California Regional Water Quality Control Board – Central Valley Region
- City & Port of Stockton
- Department of Water Resources
- National Marine Fisheries Service
- San Joaquin River Exchange Contractors Water Authority
- San Joaquin River Group Authority
- San Luis & Delta-Mendota Water Authority
- State Water Contractors12
- State Water Resources Control Board
- Stockton East Water District
- United States Bureau of Reclamation
- United States Environmental Protection Agency
- United States Fish & Wildlife Service

In April 2006, the SJRQAIG developed a draft mission statement (Appendix D-4), which, among other things, identifies implementation of the Westside Regional Drainage Plan as a priority.

In addition to participating in ancillary stakeholder groups, outreach by the WRDP direct stakeholders has taken the forms of direct communication and group presentations. Dialogs with state and federal agencies and environmental groups have produce several statements of support such as those offered by the Department of Water Resources (Appendix D-5), U.S. Bureau of Reclamation (Appendix D-6), and the Bay Institute (Appendix D-7). Presentations, such as that given at the UC Center for Water Resources 2006 Salinity and Drainage Conference (Attachment D-8), provide opportunity to expose large numbers of

12 Alameda County Flood Control and Water Conservation District, Zone 7, Alameda County Water District, Antelope Valley-East Kern Water Agency, Casitas Municipal Water District, Castaic Lake Water Agency, Central Coast Water Authority, City of Yuba City, Coachella Valley Water District, County of Kings, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, Dudley Ridge Water District, Empire-West Side Irrigation District, Kern County Water Agency, Littlerock Creek Irrigation District, Metropolitan Water District of Southern California, Mojave Water Agency, Napa County Flood Control and Water Conservation District, Oak Flat Water District, Palmdale Water District, San Bernardino Valley Municipal Water District, San Gabriel Valley Municipal Water District, San Gorgonio Pass Water Agency, San Luis Obispo County Flood Control and Water Conservation District, Santa Clara Valley Water District, Solano County Water Agency, Tulare Lake Basin Water Storage District

potentially interested parties to the project. While no approach to stakeholder involvement is perfect, the WRDP has done much to educate and foster support for the project.

N.3 FUTURE STAKEHOLDER PARTICIPATION IN PROJECT DEVELOPMENT & IMPLEMENTATION

In continuing to implement the various facets of the Plan, the Water Authority will continue to rely upon the well established and proven mechanisms utilized in forming the Plan and developing project support. As discussed earlier, all of the Plan's projects have been born locally and evolved to Regional prominence through the successful development of partnerships that have linked the solutions of one with the problems of another. The alliances formed in support of specific projects have all generally utilized policy groups to create the vision, technical groups to engineer the solutions, and stakeholder initiative to develop collaborative communication to foster the necessary support. As the Plan is intended to be responsive, the Water Authority will continue to evolve our stakeholder and outreach efforts.

N.4 POTENTIAL OBSTACLES TO PLAN IMPLEMENTATION

The Plan is an amalgamation of various projects and acts as a guide of alternatives for future investments; therefore, in and of itself, is not presented with particular implementation obstacles. The specific projects on the other hand may face any number of impediments. These difficulties range from the technical to the political and could result from factors that arise internally, externally, or both. Examples of technical barriers include engineering, environmental, financial, geographic, geologic, and technological. Political hurdles are far less foreseeable but could include strife within established partnerships, misalignment with Regional, state or federal priorities, or opposition from special interests. It is anticipated problems will arise during the implementation of projects identified within the Plan and it is assured that all reasonable efforts will be made to overcome these tribulations; however, not every problem will find an immediate solution. Regardless of the source of difficulty, perseverance is the key as technology, education, and outreach will provide future opportunities.

SECTION O: COORDINATION

O.1 GENERAL ACTIVITIES

The Water Authority has a long history of collaborative participation with State and Federal agencies in working through statewide and Regional water resource management issues. The Water Authority was a leader in the development of the Bay-Delta Accord, to which is was a signatory, as well as the Framework for Action, ROD, and creation of the Bay-Delta Authority, to which it offers direct input through participation on the Bay-Delta Public Advisory Committee.

Beyond being a participant in shaping the vision of resource management in the State, the Water Authority has worked cooperatively with federal and State regulatory agencies to develop policies, standards, and implementation guidelines on a myriad of legislated and regulated actions. These efforts have required our collaboration with DOI, USBR, USACE, FWS, NOAA, DWR, DF&G, SWRCB, SJVRWQCB, to name a few.

O.2 GOVERNMENTAL INVOLVEMENT WITH PLAN IMPLEMENTATION

As previously discussed, the Plan includes a variety of Projects in various stages of implementation ranging from early concept to fully underway. As a result, it is impossible to provide a complete inventory of governmental involvement for each project; rather, we offer a general description of how governmental participation may be of benefit and provide examples of coordination with a few Projects ready for implementation.

Generally speaking, all of the agencies cited above, as well as others, will likely play some role in Project implementation through one or all of the stages of development including feasibility studies, design, environmental review, funding, construction, and operation. The level of participation would be Project specific; however, a high degree of cooperation is generally necessary in order to ensure the success of any given effort. As plans develop, Project proponents and the Water Authority will seek input from and respond to the queries of governmental agencies relative to the effort.

Examples of past an ongoing collaborations include the efforts of Regional stakeholders, the Water Authority, USBR, FWS, DF&G, SWRCB, and SJVRWQCB in developing the San Luis Drain Use Agreement, which facilitated implementation of the Grasslands Bypass Project to reduce selenium discharges into local refuges and the San Joaquin River. The San Luis Reservoir Low-Point Improvement Project has benefited from the cooperation of Regional stakeholders, the Water Authority, SWC, USBR, DWR, and the CBDA. As illustrated, the mix of collaborators will change with the Project but the desire to develop successful partnerships of local, Regional, State, and federal entities will remain.

O.3.0 GOVERNMENTAL INVOLVEMENT WITH PROJECT IMPLEMENTATION

O.3.1 Pleasant Valley Groundwater Bank

Project proponents to date include FWS, DF&G, Fresno County, the Westside Resource Conservation District, City of Coalinga, Westlands Water District, I-5 Business Development Corridor, and PVWD. Future collaboration will likely include the aforementioned as well as USBR, DWR, and other local, Regional, or governmental entities as appropriate.

O.3.2 Westside Regional Drainage Plan

Project proponents to date include DOI, USBR, SJRWQG, SWRCB, SJVRWQCB, SJRECWA, Water Authority, Central California Irrigation District, Colombia Canal Company, Firebaugh Canal Water District, Panoche Water District, San Luis Water District, and Westlands Water District. Future collaboration will likely include the aforementioned as well as other local, Regional, or governmental entities as appropriate.

O.3.3 Westside Surface Storage Reservoir Project

Project proponents to date include WWD and Water Authority. Future collaboration will likely include the aforementioned as well as USBR, DWR, DF&G, FWS, SJRECWA, and other local, Regional, or governmental entities as appropriate.

APPENDIX A-1: WATER AUTHORITY MEMBER AGENCIES

Division 1: Delta Division – Upper DMC

1) Banta-Carbona Irrigation District
2) Byron-Bethany Irrigation District
3) Centinella Water District
4) City of Tracy
5) Del Puerto Water District
6) Patterson Irrigation District
7) Westside Irrigation District
8) West Stanislaus Irrigation District

Division 2: San Luis Unit – SLC

9) Panoche Water District
10) Pleasant Valley Water District
11) San Luis Water District
12) Westlands Water District

Division 3: Exchange Contractors and Refuges

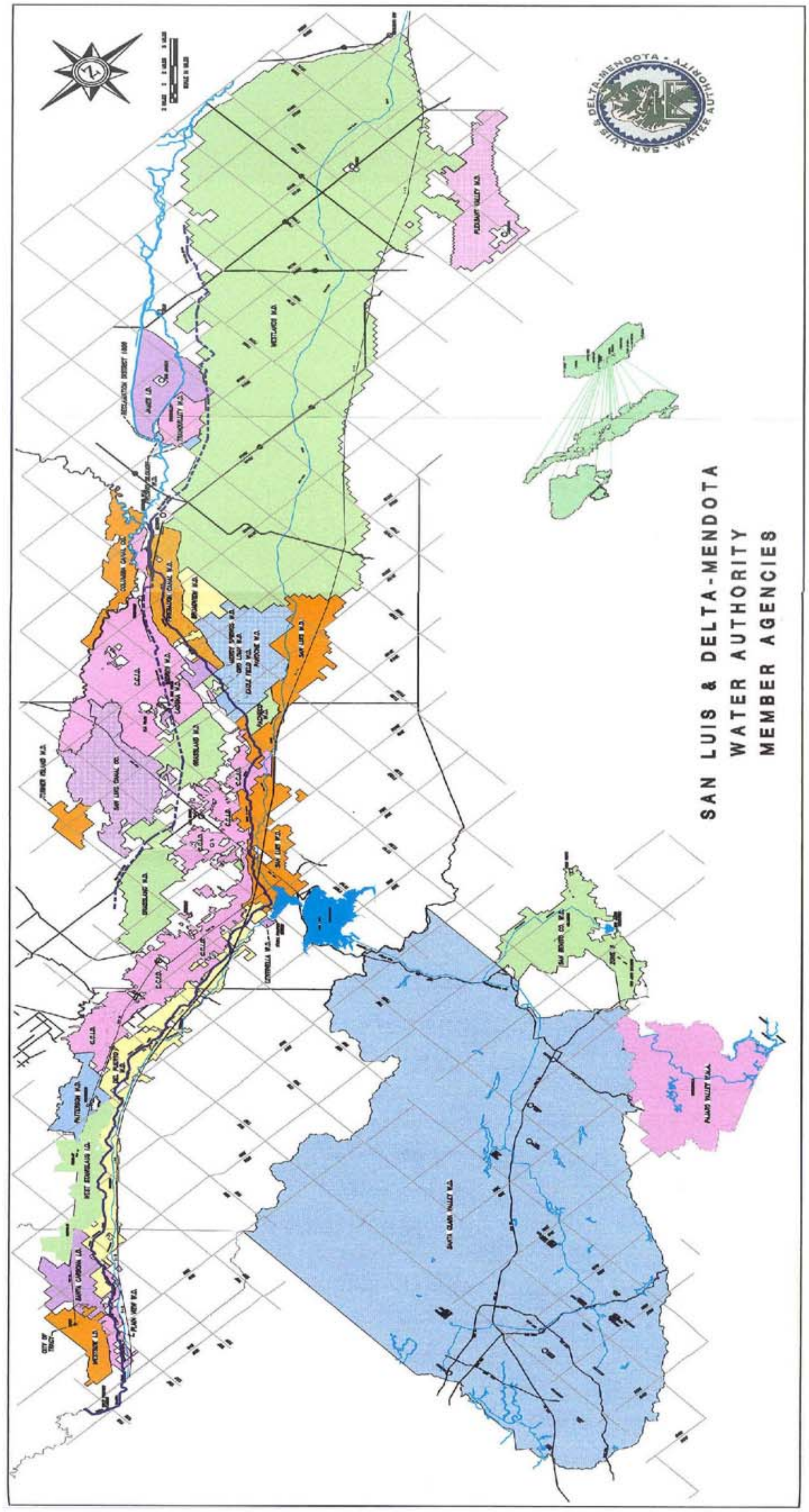
13) Central California Irrigation District
14) Columbia Canal Company
15) Firebaugh Canal Water District
16) Grassland Water District
17) San Luis Canal Company

Division 4: San Felipe Division

18) Pajaro Valley Water Management Agency
19) San Benito County Water District
20) Santa Clara Valley Water District

Division 5: Delta Division – Lower DMC & Mendota Pool

21) Broadview Water District
22) Eagle Field Water District
23) Fresno Slough Water District
24) James Irrigation District
25) Laguna Water District
26) Mercy Springs Water District
27) Oro Loma Water District
28) Pacheco Water District
29) Reclamation District 1606
30) Tranquillity Irrigation District
31) Turner Island Water District
32) Widren Water District


SAN LUIS & DELTA-MENDOTA
WATER AUTHORITY
MEMBER AGENCIES

APPENDIX A-2: SOLICITATIONS FOR PLANNING INVOLVEMENT

LETTER SENT VIA US POSTAL SERVICE ON WATER AUTHORITY LETTERHEAD

March 21, 2005

To: Member Agencies' Managers and Staff

Re: Updating Westside Integrated Resources Management Plan

Dear Madams or Sirs:

The Water Authority is in the process of updating the Westside Integrated Resources Management Plan (copy enclosed), which was last revised in October 2003. The purpose of this letter is to request your input and, to the degree practicable, solicit your participation in the Plan's revision.

Aside from the general desire to keep the plan current, this particular effort is focused on updating or incorporating activities that are in such form as to be implemented within the next two years for the purpose of preparing a Proposal Solicitation Package for an Integrated Regional Water Management grant under Proposition 50's Chapter 8. While we will continue to include conceptual projects in the Plan, our priority is to consider actions that are already well understood and, at a minimum, ready to enter the environmental assessment phase.

Our timeline is as follows:
- April 1: Receive suggestions for projects to be considered for the IRP.
- April 15: Receive detailed information on projects ready to implement.
- May 1: Finalize IRP.
- May 12: Submit IRWM Grant PSP.

Please forward your projects to me via e-mail at ara.azhderian@sldmwa.org. Receipt of your comments, suggestions, and concerns will be greatly appreciated. Please feel free to contact me if you should have any questions regarding this process.

Sincerely,

Ara Azhderian
Water Policy Administrator
San Luis & Delta-Mendota Water Authority

From: Ara Azhderian
Sent: Monday, February 28, 2005 3:25 PM
To: 'Barbara Kleinert (E-mail) (wsid1@inreach.com)'; Bettner, Thad; 'Bob Viets (itviets@thegrid.net)'; 'Charles McNiesh (mcniesh@pvwma.dst.ca.us)'; Chase Hurley (churley@slcc.net); 'Christopher White (ccidwhite@sbcglobal.net)'; 'Dan Nelson (Dan.Nelson@sldmwa.org)'; 'Dave McEuen (aquaman@cnetech.com)'; 'David Cone (bwd@inreach.com)'; 'David Weisenberger (bcid@inreach.com)'; 'Dennis Falaschi (dfalaschi@panochewd.org)'; 'Diane Rathmann (drathmann@aol.com)'; 'Don Marciochi (DonMarciochi@aol.com)'; Drew Guintini; 'Frances Mizuno (frances.mizuno@sldmwa.org)'; 'Gene Carson (gcarson@evansinet.com)'; Jean Sagouspe (jean@jpprop.org); 'Jeannie Fairless (jeannie@trqid.com)'; 'Jeff Bryant (jeff@firebaughcanal.com)'; 'Joan Maher (jmaher@valleywater.org)'; 'John Gregg (jgregg@sbcwd.com)'; 'John Mallyon (jmallyon@direcway.com)'; John Sweigard (pidgm@grni.com); 'Karen Gatzka (kgatzka@westlandswater.org)'; Marvin Meyers (marvin-mfi@sbcglobal.net); 'Molly Thacker'; Randy Houk (RGHCCC@SBCGlobal.net); 'Rick Gilmore (r.gilmore@bbid.org)'; 'Ron Roos (wsid@inreach.com)'; 'Sarge Green (sarge@trqid.com)'; 'Steve Bayley (steveb@ci.tracy.ca.us)'; 'Tom KMTG Birmingham'; 'Tom WWD Birmingham'; 'Veronica Woodruff (veronica@grasslandwetlands.com)'; 'William Harrison (wharrison@delpuertowd.org)'
Cc: Cheri Worthy; Susan Mussett; Buck, Byron
Subject: IRP / IRWM Grant Workshop

Greetings All,

We've been preparing to develop a grant application for the Prop 50, Chapter 8, Integrated Regional Water Management program. As part of that effort we have begun updating our Integrated Regional Plan to better conform to the CalFed standards. We will be holding a workshop after the March 10 SL&DMWA Board meeting to discuss inclusions/exclusions to the plan and assign tasks as appropriate to ensure projects are adequately described. Our emphasis is on projects at or very near the implementation phase. I have attached the October 2003 IRP for your review.

If you are interested in attending, please RSVP to Cheri Worthy so that we will know how many lunches to provide. Thank you for your time and consideration.

Be well,

Ara Azhderian
Water Policy Administrator
San Luis & Delta-Mendota Water Authority

From: Ara Azhderian
Sent: Thursday, September 30, 2004 10:12 AM
To: 'Anthea Hansen (ahansen@delpuertowd.org)'; 'Barbara Kleinert'; 'Bill Pucheu'; 'ccidrice@sbcglobal.net'; 'Charles McNiesh'; 'Chase Hurley'; 'Christopher White'; Cindy Kao; Dan Nelson; 'Dave McEuen'; 'David Ciapponi'; 'David Cone'; 'David Coxey'; 'David Weisenberger'; 'Dennis Falaschi'; 'Diane Rathmann'; 'Don Marciochi'; Frances Mizuno; 'Gene Carson'; 'Jean Sagouspe'; Jeanne Zolezzi; 'Jeannie Fairless'; 'Jeff Bryant'; 'Jim Snow (WWD)'; 'Joan Maher'; 'John Gregg'; 'John Mallyon'; 'Lynn Hurley'; 'Marcos Hedrick (mhedrick@panochewd.org)'; 'Molly Thacker'; 'nickp@ci.tracy.ca.us'; 'Randy Houk (E-mail)'; 'Rick Gilmore'; 'Ron Roos'; 'Sarge Green'; 'Scott Lower'; 'Steve Bayley'; 'Thad Bettner (tbettner@westlandswater.org)'; 'Tom Birmingham

(tbirmingham@westlandswater.org)'; 'Veronica Woodruff'; 'William Harrison'
Subject: Grant Funding

Hello All,

Last week a group of us met to brainstorm potential regional grant funded projects. In general it was decided that funding under the Agricultural Water Quality program would be left to the Drainage Authority and that potential projects under Water Use Efficiency and Integrated Regional Water Management would be explored by the Water Authority. Under those categories we are curious about your level of interest in the following:

Water Use Efficiency:
Funding for drip systems, tailwater recirculation systems, canal lining, pump efficiency testing, and system automation including automatic control gates and/or SCADA.

Integrated Regional Water Management:
Funding for implementation of the Westside Integrated Resources Management Plan developed in October 2003, CA/DMC Intertie, exploration of regional Groundwater Recharge/Conjunctive Use potential, Del Puerto reservoir feasibility study, San Joaquin River to DMC intertie.

If you have any further suggestions and/or preferences regarding these ideas, please forward them to me. Thank you for your consideration.

Be well,

Ara Azhderian
Water Policy Administrator
San Luis & Delta-Mendota Water Authority

From: Ara Azhderian
Sent: Wednesday, September 15, 2004 4:04 PM
To: David Weisenberger; John Sweigard; William Harrison; Thad Bettner; Ron Roos
Cc: Dan Nelson (office); Frances Mizuno
Subject: Potential Grant Projects

Howdy All,

You've been selected for a very important mission… and because you responded to our e-mails requesting suggestions for potential grant funded programs. Frances would like to meet the afternoon of Thursday 23rd, after the F&A Committee meeting to brainstorm potential projects. We can bring lunch in or reserve a table at the local taco shop. We would very much appreciate further input and can set up a dial-in if traveling/staying is not a possibility. Please let me know if you plan on participating in person or by phone and if you would like lunch. Thanks.

Be well,

Ara Azhderian
Water Policy Administrator
San Luis & Delta-Mendota Water Authority

APPENDIX B: WESTSIDE AGRICULTURAL CONTRACTOR DATA

TABLE A-1
Acreage and Water Supplies for Westside Agricultural Water Service Contractors

Service Contractors[1]						
Agricultural/M&I Contractors	**Contract No.**	**2025 Acres**	**1999 Acres**	**Local Surface Supply**	**Ground Water**	**Total Project Water Quantity**
Banta Carbona ID	4305A-LTR1	15,500	14,461	29,770	230	25,000
Broadview WD	8092IR3	8,163	8,960	0	0	26,980
Centinella WD	W0055IR8	940	460			2,500
Del Puerto WD	922-LTR1	44,750	38,422	0	3,000	140,198
Eagle Field WD	7754IR3	777	1,242			4,560
Laguna WD	W0266IR3	400	393			800
Mercy Springs WD – partial [3]	3365IR8A	2,223	1,580	0	0	7,040
Santa Clara Valley WD, Pajaro Valley WMA, & Westlands WD [3]	3365IR8B	0	0	0	0	6,260
Oro Loma WD	7823IR3	767	1,003			4,600
Pacheco WD – DMC & SLU	W0469	3,768	4,070	4,400	0	10,000
Panoche WD – DMC & SLU	7864A	37,361	36,197	0	0	93,900
Byron Bethany Irrigation District (CVP)	785IR10	2,961	4,523	0	0	20,180
San Benito County WC & FCD	W0130	25,700	25,317	0	4,000	35,550
San Luis WD – DMC & SLU	7773A	41,744	42,932	0	5,000	124,500
Santa Clara Valley WD [2]	W0023	26,177	37,757	34,350	35,675	33,100
The Westside ID	W0045-LT1	6,399	6,243	24,000	0	5,000
Westlands WD	495A & 106-E	606,100	545,847	0	175,000	1,143,695
West Stanislaus ID	1072-LTR1	25,600	26,493	45,000	5,000	50,000
Widren WD	8018IR3	835	423	0	0	2,990
Total		**850,165**	**796,323**	**137,520**	**227,905**	**1,736,853**

[1] Data from Stoddard and Associates.
[2] Agricultural water source is primarily groundwater. SCVWD augments natural recharge with a managed recharge program utilizing both local runoff and imported water supplied. Only 23,425 AF of groundwater and 22,271 AF of surface water are available in a Critical Dry year.
[3] Acres and local water supplies for SCVWD and WWD have already been included under Contracts W-0023 and 495A, respectively.

TABLE A-2
Acreage and Water Supplies for Westside Agricultural Water Rights Settlement Contractors

Water Rights Settlement Contractors[1]								
Contractor	**Contract No.**	**2025 Acres**	**1999 Acres**	**Local Surface Supply (AF)**	**Ground Water (AF)**	**Project Water (AF)**	**Water Rights (non-Project) (AF)**	**Total Water (AF)**
Coelho Family Trust – Partial	7859A	2,250	1,008			2,080	1,332	3,412
Dudley & Co. (Marchini Farms)	4448A					0	2,280	2,280
Fresno Slough WD	4019A	1,215	1,027			4,000	866	4,866
Hughes MD and M	3537A					70	93	163
James ID	700A	23,000	23,665	9,700	12,000	35,300	9,700	45,000
Patterson ID	3598AIR3	13,466	14,706	23,000	2,000	16,500	6,000	22,500
Recl. District No. 1606	3802A	170	120			228	342	570
Tranquillity ID	701ALTR1	9,270	9,366	20,200	2,000	13,800	20,200	34,000
Totals		**49,371**	**49,892**	**52,900**	**16,000**	**71,978**	**40,813**	**112,791**

[1] Agricultural water rights settlement contractors having both a project and non-project supply.

TABLE A-3
Westside Crop Mix by District and by Sub-region, 1999 Acreage

CVP Region / **Contractor**	**Hay and Pasture**	**Field Crops**	**Vegetables**	**Melons**	**Fruits**	**Sugar Beets or Cotton**	**Nuts**	**Sum**
San Luis Unit								
San Luis WD-DMC	2,216	5,306	5,261	4,858	3,855	12,061	9,375	42,932
Pacheco WD-DMC	279	90	1,101	1,240	0	1,360	0	4,070
Panoche WD-DMC	3,364	4,161	8,799	4,937	653	13,689	594	36,197
Westlands WD	15,250	91,967	158,809	17,944	17,982	210,752	33,143	545,847
San Luis Sub Total	21,109	101,524	173,970	28,979	22,490	237,862	43,112	629,046
Percent	3%	16%	28%	5%	4%	38%	7%	100%
Southern DMC								
Eagle Field WD	309	250	134	0	0	549	0	1,242
Laguna WD	76	0	0	0	0	317	0	393
Fresno Slough WD	0	688	13	0	0	326	0	1,027
Broadview WD	0	1,862	1,148	795	0	5,155	0	8,960
Widren WD	0	336	0	0	0	87	0	423
Oro Loma WD	0	839	0	0	0	164	0	1,003
Mercy Springs WD	786	374	0	0	0	420	0	1,580
James ID	131	9,329	1,481	140	382	11,433	769	23,665
Coelho Family Trust	0	0	0	0	310	698	0	1,008
Tranquillity ID	118	2,492	581	0	0	6,145	30	9,366
South DMC Sub Total	1,420	16,170	3,357	935	692	25,294	799	48,667
Percent	3%	33%	7%	2%	1%	52%	2%	100%
Northern DMC								
Banta-Carbona ID	1,953	2,969	3,669	366	1,217	302	3,985	14,461
Centinella WD	40	35	0	0	0	0	385	460
Del Puerto WD	3,526	3,754	8,855	1,380	5,398	80	15,429	38,422
Patterson WD	4,870	4,099	2,388	17	2,184	54	1,094	14,706
Byron Bethany Irrigation District (CVP)	2,990	445	472	122	377	0	117	4,523
Westside ID	3,676	1,006	806	0	20	669	66	6,243
West Stanislaus ID	1,798	5,010	12,368	767	3,183	0	3,367	26,493
North DMC total	18,853	17,318	28,558	2,652	12,379	1,105	24,443	105,308

TABLE A-3
Westside Crop Mix by District and by Sub-region, 1999 Acreage

CVP Region **Contractor**	**Hay and Pasture**	**Field Crops**	**Vegetables**	**Melons**	**Fruits**	**Sugar Beets or Cotton**	**Nuts**	**Sum**
Percent	18%	16%	27%	3%	12%	1%	23%	100%
San Felipe Unit								
Santa Clara Valley WD	8,100	453	12,052	0	4,639	0	525	25,769
San Benito County WD	0	0	0	0	0	0	0	25,317
San Felipe Sub Total (SCVWD Only)	8,100	453	12,052	0	4,639	0	525	25,769
Percent	31%	2%	47%	0%	18%	0%	2%	100%
Grand Total	49,482	135,465	217,937	32,566	40,200	264,261	68,879	808,790
Percent	6%	17%	27%	4%	5%	33%	9%	100%

Note: The acreage total in Tables A-1 and A-2 for 1999 (799,105 + 48,892 = 848,997), is used to calculate the agricultural potential water use shown in Table 3-2. The acreage in A-3 is 808,790 and does not include 25,317 acres (San Benito County WD), 120 acres (Reclamation District 1606), 11,988 acres (additional Santa Clara Valley WD acres) and 2,782 acres (Santa Clara Valley WD/Pajaro Valley WMA/Westlands WD). These acreages are not included in Table A-3 because crop mix data was not available. 808,790 + 25,317 + 120 + 11,988 + 2,782 = 848,997 acres total in the analysis.

APPENDIX C: San Luis & Delta-Mendota Board of Directors

SLDMWA BOARD OF DIRECTORS
as of 03/02/06

(A Bold/Italics@ indicate adjustments)

OFFICERS:	Action Required
Michael Stearns, Chairman	
Jean Sagouspe, Vice Chairman	
Tona Mederios, Treasurer/Auditor	
Daniel G. Nelson, Secretary	
Dennis Falaschi, Assistant Secretary	

DIVISION 1, EXISTING BOARD:	Action Required:
James McLeod, Director Banta-Carbona Irrigation District	
David Weisenberger, Alternate Banta-Carbona Irrigation District	
Eugene Carson, Director West Side Irrigation District	
John Sweigard, Alternate Patterson Irrigation District	
William Harrison, Director Del Puerto Water District	

Earl Perez, Alternate

Del Puerto Water District

Ron Roos, Director

West Stanislaus Irrigation District

Rick Gilmore, Alternate

Byron Bethany Irrigation District/CVPSA

DIVISION 2, EXISTING BOARD: Action Required:

Dan Errotabere, Director

Westlands Water District

Dave Ciapponi, Alternate

Westlands Water District

Jean Sagouspe, Director

Westlands Water District

Dave Ciapponi, Alternate

Westlands Water District

John Bennett, Director

Panoche Water District

Dennis Falaschi, Alternate

Panoche Water District

Marvin Meyers, Director

San Luis Water District

Martin McIntyre, Alternate

San Luis Water District

DIVISION 3, EXISTING BOARD: Action Required:

Michael Stearns, Director

Firebaugh Canal Water District

Jeff Bryant, Alternate

Firebaugh Canal Water District

Jim O'Banion, Director

Central California Irrigation District

Chris White, Alternate

Central California Irrigation District

Jack Threlkeld, Director

San Luis Canal Company

Randy Houk, Alternate

Columbia Canal Company

Don Marciochi, Director

Grassland Water District

Scott Lower, Alternate

Grassland Water District

DIVISION 4, EXISTING BOARD: Action Required:

Sig Sanchez, Director

Santa Clara Valley Water District

Lynn Hurley, Alternate

Santa Clara Valley Water District

Larry Wilson, Director

Santa Clara Valley Water District

Joan Maher, Alternate

Santa Clara Valley Water District

Ken Perry, Director

San Benito County Water District

John Gregg, Alternate

San Benito County Water District

John Tobias, Director

San Benito County Water District

John Gregg, Alternate

San Benito County Water District

DIVISION 5, EXISTING BOARD: Action Required:

Bill Pucheu, Director

Tranquillity Irrigation District

Berj Moosekian, Alternate

Pacheco Water District

Tom Birmingham, Director

Broadview Water District

Vacant, Alternate *Thad Bettner's resignation effective as of 6/1/06*

Broadview Water District

John Mallyon, Director

James Irrigation District

Thomas W. Chaney, Alternate

James Irrigation District

APPENDIX D-1: MCAG “Fact Sheet” for the Westside Regional Drainage Plan

Protecting agriculture and environment with the Grassland Drainage Project

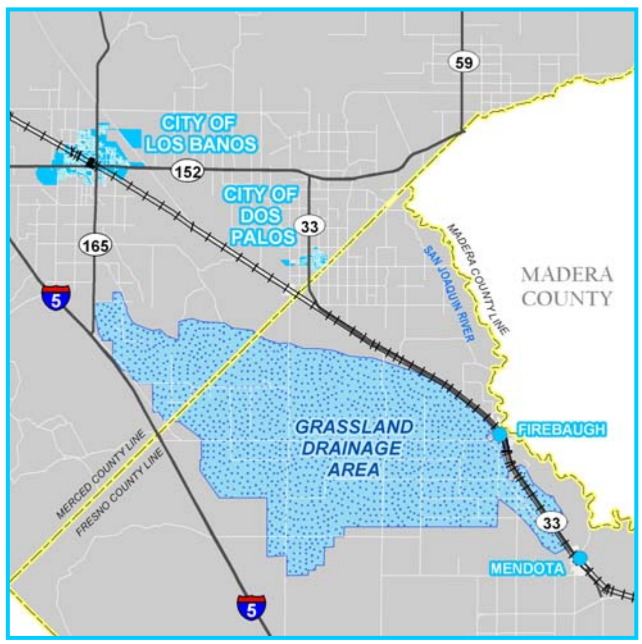
Request: (tbd)

Goal:

The Grassland Drainage Area In-valley Drainage Solution Projects would preserve productivity of 100,000+ acres of farmland by keeping the perched water table out of the root zone, where it would flood roots, causing crops to die.

Description:

This project provides an In-valley drainage solution instead of discharging into the sub-surface drainwater to the San Joaquin River. The drainwater will go to reuse areas, where the salty water will be taken and applied to salt tolerant crops in specific areas. The project will also pump shallow ground water to minimize the perched water table, implement irrigation improvements to reduce subsurface drainage water, line canals and improve conveyance facilities so water doesn’t seep out, and provide a final step of treatment and disposal of brine water.



Necessity:

- The current drainage disposal solution, discharging the subsurface drainage water to the San Joaquin River through the Grassland Bypass Project ends in 2010.
- Problems are snowballing because of delays in implementing a solution. It’s a potential economic disaster.
- Without a drainage solution, agricultural lands will not continue to be productive.
- The project solves ongoing legal issues within the area and assists the US Bureau of Reclamation in providing promised drainage service.

Beneficiaries:

- Significant environmental benefits as drainage water is removed from conveyance channels, allowing for delivery of fresh water to wetland areas, and from the San Joaquin River, helping to meet water quality goals.
- Drainage load, including selenium, salt, and boron will be removed from the San Joaquin River.
- California residents, as saving water will result in more efficient use of dwindling supplies.
- Farmers, by protecting agricultural lands.
- Local economy by providing certainty of viable agriculture.

Recipients:

Farmers in Panoche Water District,
Firebaugh Canal Water District,
Central California Irrigation District,
and Westlands Water District

Contact:

Steve Chedester

(209) 827-8616
schedester@sbcglobal.net

APPENDIX D-2: MCAG Support Letter for the Westside Regional Drainage Plan

February 28, 2005

To Whom It May Concern:

Merced County Association of Governments has convened a committee of public and private interests in developing a "One Voice" Legislative Platform and we need your help. The county has 15% unemployment and a median income level well below the rest of California. In one recent report, Merced County was compared to Appalachia in terms of poverty and lack of economic development. Yet, as part of California's Central Valley, the county will be expected to absorb most of the state's housing growth over the next 30 years.

As part of a group of concerned citizens, elected officials, and business owners and managers, I want to state my strong support for the One Voice list of priority projects that Merced County needs to help us with growth and to attract the jobs that we need now. The One Voice priorities are:

Transportation

- Build the Campus Parkway to provide a link to the new UC campus and to serve as one leg of a beltway around the City of Merced
- Construct a bypass around Los Banos to reroute Highway 152 commute traffic from the center of town
- Develop an Interchange on Highway 99 at Hilmar to provide a safe and efficient goods movement route
- Construct the Castle Expressway to provide a goods movement route for businesses interested in locating at the Castle Airport economic hub
- Purchase CNG buses to serve UC Merced, and build a CNG refueling station

Economic Development

- Build regional utilities infrastructure (wastewater treatment and power generation) so that economic development can continue
- Develop a shovel ready business park location in Los Banos to for economic opportunity availability
- Invest in a program to develop skills for small business owners

Water

- Support the Grasslands Drainage [*Ed: evolved into WRDP*] project to prevent 100,000 acres of prime farmland from being taken out of production
- Upper San Joaquin River storage site to enhance water supply/quality for urban and agriculture, and to provide flood protection

These projects are necessary to bring economic development and the jobs we need. I support the Merced County Association of Government's One Voice project priorities and I hope you will support them as well.

Sincerely,

APPENDIX D-3: San Joaquin River Water Quality Management Group Statement of Support for the Westside Regional Drainage Plan

Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel

San Joaquin River Water Quality Management Group

August 2005

Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel

1. Introduction and Summary Recommendations

The purpose of this paper is to summarize the work of the San Joaquin River Water Quality Management Group during the period from May, 2004 to June, 2005. The ideas, information and concepts contained in this paper will be used to assist policy makers in deciding what actions will be implemented to meet water quality objectives in the San Joaquin River, specifically the salinity objective at Vernalis and the dissolved oxygen objective (DO) in the Stockton Deep Water Ship Channel. Once agreement among policymakers has been reached regarding what action(s) will be taken to meet the objectives it is anticipated that an agreement and appropriate environmental review will occur. It is expected that the recommendations, ideas and data herein will be utilized by the United States Bureau of Reclamation and the Director of the State Department of Water Resources to help meet the requirements of HR 2828 and SB 1155. Relative to the recommendations herein, a final report of the San Joaquin River Water Quality Management Group will be prepared detailing its investigations, data developed and modeling that was done supporting these summary recommendations.

The San Joaquin River Water Quality Management Group evaluated a host of flow and load management measures seeking to achieve salinity and DO objectives. Its summary recommendations appear below in Table 1.

2. Primary Objective of the San Joaquin River Water Quality Management Group

The lower San Joaquin River (LSJR), from Mendota Pool to Vernalis, is listed on the Federal Clean Water Act's 303(d) list of impaired water bodies for salinity and boron. The Stockton Deep Water Ship Channel portion of the LSJR is on the 303 (d) list for DO. The 303(d) listings require the development of Total Maximum Daily Load targets (TMDLs) to provide a basis to regulate discharges of salinity, boron and oxygen-demanding substances. The Central Valley Regional Water Quality Control Board (CVRWQCB) has developed TMDLs for both salinity and boron and for DO depleting substances.[1] The CVRWQCB has adopted TMDLs and amendments to Water Quality Control Plan (Basin Plan) implementing the TMDLs for Salinity and Boron, and for

[1] See the CVRWQCB's website at http://www.swrcb.ca.gov/~CVRWQCB, Central Valley Region5/programs/tmdl for TMDL documents.

Table 1
Summary Recommendations

Salinity

1. Fully implement the West Side Regional Drainage Plan[2].

2. Further evaluate and pursue managed wetland drainage management actions to mitigate impacts of February through April drainage releases.

3. Develop a real-time water quality management coordination group involving LSJR tributaries, LSJR drainers and the DWR to coordinate reservoir release and SWP/CVP Project operations (head of Old River barrier and New Melones operations) to realize opportunities to improve water quality and increase the utility of stored water releases.

Dissolved Oxygen

4. Pursue additional use of the Head of Old River Barrier to augment flows in the LSJR and the Deep Water Ship Channel, consistent with the need to maintain adequate in-Delta water quality, water level and fishery protection.

5. Support for continued implementation of the City of Stockton's ammonia removal project at the Stockton WWTP.

6. Install the demonstration aeration project in the DWSC and continue the newly implemented upstream monitoring efforts to understand DO load producing discharges.

7. Evaluation of additional actions necessary for DO compliance at the DWSC following implementation and analysis of actions 1-5.

8. Establish a forum to evaluate ongoing changes in the water quality baseline and suggest further management actions to continue progress on water quality improvement.

[2] See Appendix A for description of the West Side Regional Drainage Plan

Dissolved Oxygen. These Basin Plan amendments are currently pending before the State Water Resources Control Board (SWRCB).

The water quality problems of the LSJR are complex. Due to the highly modified nature of the San Joaquin River, complete solutions to both salinity/boron and DO problems are not readily available by approaching the problem through a load reduction strategy alone. TMDLs adopted by the CVRWQCB for DO, and for salinity and boron indicated that load reduction alone will not meet the objectives. The CVRWQCB does not have the authority to regulate flow and thus its ability to effect solutions is limited to load-based solutions. Flow regulation is the domain of the SWRCB. Nor does the CVRWQCB have the authority to cause mitigation for facilities constructed and maintained by the federal government, specifically the Deep Water Ship Channel (DWSC). Recognizing that a load-based solution was practically limited and potentially counterproductive, a number of stakeholders interested in developing a feasible and integrated solution to LSJR water quality problems began to meet and then formed the San Joaquin River Water Quality Management Group (Group).

The Group is an informal group of stakeholders coming together to develop cooperative solutions to achieve the water quality objectives targeted by the TMDLs.[3] Participants within the Group have tools, management strategies and assets that can affect water quality in the River. These tools and assets include loading reductions but also include other alternatives that the CVRWQCB has no ability to implement or regulate.

The water quality objectives this plan intends to address are shown in Table 2.

Simply stated, the primary objective of the Group is to:

> ***Prepare and implement a plan to meet the water quality objectives for salt and boron at Vernalis and Dissolved Oxygen at the Stockton Deep Water Ship Channel in coordination with CALFED Stage I objectives***[4]

---

[3] Participants in the Group include: •U.S. Bureau of Reclamation •Department of Water Resources•Central California Irrigation District•Friant WaterUsers Authority•Grassland Water District•James Irrigation District•Merced Irrigation District•Modesto Irrigation District•Oakdale Irrigation District•San Luis Canal Company, Exchange Contractor•San Joaquin County and Delta Water Quality Coalition•San Joaquin County RCD•San Joaquin River Exchange Contractors Water Authority•San Joaquin Valley Drainage Authority•San Joaquin River Group•San Luis and Delta Mendota Water Authority•South San Joaquin Irrigation District• South Delta Water Agency •State Water Contractors• Stockton East Water District•Tranquility Irrigation District•Turlock Irrigation District•Venice Island RD 2023•California Farm Bureau•Western Growers

[4] This plan incorporates real-time management elements and other strategies contemplated in but not able to ordered under the CVRWQCB's TMDLs. It is consistent with the real time management strategy discussed in the salinity TMDL.

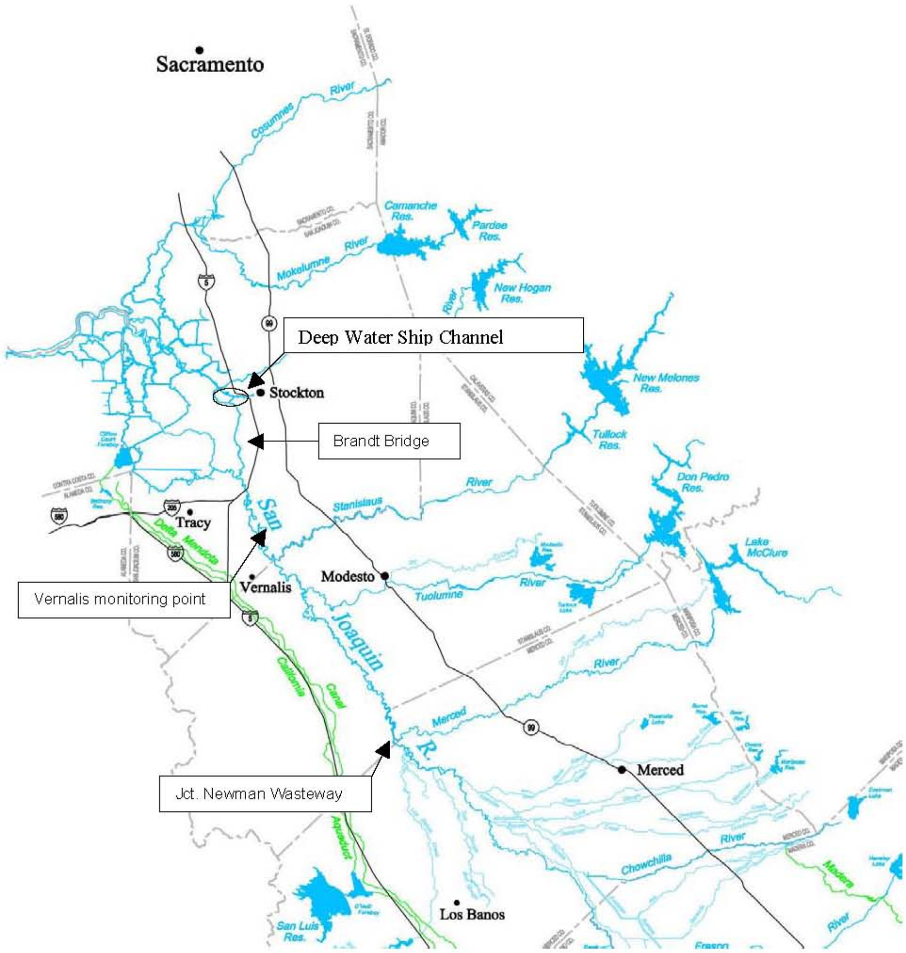
Table 2 Water Quality Objectives Addressed by the San Joaquin River Water Quality Management Plan	
Salinity and Boron : San Joaquin River at Airport Way Bridge, Vernalis, CA	Maximum 30 day running average of Electical Conductivity (EC) (*mmhos/cm*), all water year types: April-August 0.7 EC Sept.-March 1.0 EC
Dissolved Oxygen: San Joaquin River between Turner Cut and Stockton	Minimum DO (mg/l), all water years types, September-November – 6.0 mg/l, December-August 5.0 mg/l

3. Secondary Objectives of the San Joaquin River Water Quality Management Group:

Recognizing the interconnected nature of water quality, water supply, fish and wildlife and wildlife habitat protection issues, members of the Group also want to see the primary objective accomplished in ways compatible with the following secondary objectives. Each member of the Group does not necessarily share these secondary objectives, nor do they accept responsibility for their respective implementation. They are listed here to inform policy makers of the context of the proposed recommendations and the potential impacts these recommendations could have on other programs, projects and flow or quality in the SJR basin and southern Delta
The following list of secondary objectives is not in any priority nor is it necessarily all-inclusive.

a. Implement the Delta Improvements Package (DIP).
b. Minimize Delta water losses that impact CVP-SWP exports.
c. Maintain adequate flows and water levels in the San Joaquin River between Vernalis and the head of Old River to support diverters.
d. Maintain adequate water levels in the south Delta.
e. Improve Delta water quality for ecosystem and drinking water uses through DIP actions such as Franks Tract levee restoration .
f. Maintain viability of wildlife managed wetlands and irrigated agriculture.
g. Reduce demands on New Melones Reservoir to achieve water quality and flow objectives, including but not limited to Vernalis salinity and flow, and DO on the Stanislaus River.
h. Minimize re-directed impacts
i. Meet interior Delta salinity objectives.

Figure 1 Lower San Joaquin River



4. Summary Nature of the Salinity Problem

The spatial and temporal nature of the salinity problems in the LSJR at Vernalis and downstream are described in the CVRWQCB's TMDL reports. However, this description is out of date. It did not include recent flow information incorporating a reduction in agricultural drainage as a result of implementation of the Grasslands Bypass Project. It also did not incorporate increases in drainage flows from managed wetlands, brought about through implementation of the Central Valley Project Improvement Act and the newly available managed wetland water supplies. These changes are discussed further below in section 6.a. In brief, the salinity problem for the LSJR is relatively high loadings of agricultural and urban sources of dissolved solids during periods of low river flows. High salinity levels are believed to threaten beneficial use of water in the LSJR for agricultural uses during the growing season. Additionally, the secondary maximum contaminant level for drinking water beneficial uses is 900µS/cm EC. Achieving the agriculturally- based standards will also protect drinking water beneficial uses.

5. Summary Nature of the Dissolved Oxygen Problem

The DO problem in the Deep Water Ship channel is not well understood and its causes are a matter of ongoing controversy. The CVRWQCB's report on DO describes the problem as a three-way interaction of low river flows[5], the presence of an unnaturally deep channel structure (Stockton Deep Water Ship Channel) and loadings of oxygen demand substances from upstream urban and agricultural sources. These factors together create a slack-water zone with low light penetration and resulting anoxic conditions. Low DO is thought to be a problem for resident and anadromous fish migration.

6. Baseline Conditions

a. Salinity

San Joaquin River watershed hydrology and operations are derived from a preliminary baseline study that was developed as part of Reclamation's on-going CALSIM refinement effort. This on-going effort is updating a 1980s-vintage depiction of numerous San Joaquin watershed attributes, including:

- Land-use based diversion requirements for East-side tributary systems
- East-side tributary system and Friant Division operations

[5] Data developed in the process of this report show that more water currently passes Vernalis and the Head of Old River in dry and critically dry years in July-October, when the DO problem is predominant, than would have occurred under unimpaired flow conditions.

- West-side return flows, inclusive of current wildlife area water supplies and operations
- Current regulatory and institutional operational objectives
- Linked Node approach to water quality modeling (disaggregation of water quality elements)

The refined baseline is substantially different from the earlier baseline. In particular, the refined baseline shows a dramatic change in San Joaquin River water quality related to the new baseline of flows. The CALSIM model reflects flows that would occur under current hydrologic and water management conditions. The findings herein assume that the baseline is static moving out in time and the reader should recognize that changes in the baseline due to independent actions may occur. New Melones dilution requirements now occur during winter, spring and summer months, in contrast to the earlier baseline depiction that suggested that dilution requirements were generally limited to summer months. This paradigm shift results from tracking known flow sources and their associated water quality (based on recent records) as opposed to using flow-salinity relationships (based on older records). The summer dilution requirement is much lower in the refined baseline, apparently a reflection of changed conditions within the watershed.

The earlier baseline depicted a Vernalis salinity objective with a period of exceedences in approximately one-third of all years. The refined baseline characterizes Vernalis salinity exceedences as follows:

- 13 monthly exceedences occur over the 73-year period of analysis. These exceedences occur during 8 different water years. 8 of these monthly exceedences occur during 5 years of the 1987-92 drought. 6 of these monthly exceedences occur during summer months (July-September). Baseline Vernalis salinity exceedences were most severe in 1992, the final year of an extended 6-year drought. In 1992, the Vernalis salinity objective called for 58,000 acre-ft of dilution flow above the limit established by the New Melones Interim Operations Plan (IOP). The baseline study showed a deviation of 310 uS/cm (44%) above the salinity objective during the latter half of May 1992. In 1992 and other years, baseline June through August Vernalis salinity exceedences resulting from IOP limits were significantly dampened by New Melones releases for Stanislaus River DO. During the months of June through August, the maximum deviation above the salinity objective was 37 uS/cm (5%).

- While 1992 showed the most severe baseline conditions on an annual basis, February salinity exceedences tended to be the most severe on a monthly basis. Four of the 13 monthly exceedences over the 73-year simulation period occurred in February; these exceedences required an additional 10,000 to 22,000 acre-ft of dilution flow above the limit established by the

New Melones IOP. In the baseline study, the maximum deviation above the February salinity objective was 250 uS/cm (25%).

b. Dissolved Oxygen

Low DO generally occurs in the Stockton Deep Water Ship Channel downstream to about Turner Cut. The point of greatest DO depletion tends to shift downstream with increased flow rates. Low DO is rarely a problem when flows through the Deep Water Ship Channel exceed about 1,500 cfs. Worst months for DO tend to be June through October of dryer years with excursions about a third of the time during this period. Exceedences can also occur, however, in winter months of dryer years when flow is low.

Average DO concentrations have been compiled by the California Department of Water Resources since 1983 from a DO meter installed at the northern end of Rough & Ready Island. Table 4-1 from the CVRWQCB's DO-TMDL report illustrate the temporal distribution of the low DO impairment. Oxygen concentrations less than 5.0 mg/L have occurred during all months of the year. The frequency of exceedences are worse in dry years, like 1991 and 1992 and less frequent during wet years like 1998.

In preparing the DO TMDL report the CVRWQCB also correlated the daily minimum DO concentrations with the net daily flow rate taken on the same day. This information is presented in graphical form on Figure 4-3 of the report.

7. Solution Tools Evaluated

A variety of flow augmentation and pollution reduction tactics or tools were evaluated in the development of the San Joaquin River Water Quality Management Plan. Table 4 describes the results of individual analysis of each tool. Promising tools were combined and their effects modeled as described in the following sections.

8. SANMAN Model and Modeling

The SANMAN Model Detailed Assumptions Paper, May 24, 2005 summarizes the logic used in SANMAN to estimate water quality effects of the various San Joaquin River Salinity Management actions measured at Vernalis. While the main focus of SANMAN is flow and salinity at and above Vernalis, the model also estimates net flow at Stockton, which can be useful in addressing flow-related aspects of DO impairment.

a. Baseline CALSIM Studies

Because a CALSIM study with an updated San Joaquin River basin hydrology and operations fully integrated into a system-wide hydrology and operations is not currently available, two CALSIM studies were employed to characterize Delta and San Joaquin River baselines in SANMAN.

Hydrology and operations for the Delta and Sacramento River watershed are based on the final (Environmental Water Account) step of Reclamation's OCAP CALSIM Study #5 dated January 21, 2004. Assumptions include, among other things, a 2020 level of development, Banks Pumping Plant at a permitted capacity of 8500 cfs, Tracy Pumping Plant at a full permitted 4,600 cfs, a 400 cfs DMC-California Aqueduct intertie, SWP and CVP water transfers, EWA and JPOD actions, and Cross Valley Canal wheeling. The SANMAN period of analysis approximates the CALSIM 73-year hydrologic sequence, including the period March 1922 thru September 1994. The analysis uses a monthly time step except during the April-May period, when a split-month time step is used.

Integrated operations are included in the CALSIM modeling assumptions that includes the SWP conveying 100 TAF of Level 2 refuge water at the Banks Pumping Plant prior to September 1 of each year. In exchange, the CVP provides up to 75 TAF of its supplies to reduce the SWP's obligation to comply with Bay-Delta water quality flow requirements.

Hydrology and operations for the San Joaquin River watershed are derived from a preliminary baseline study developed as part of Reclamation's on-going CALSIM refinement effort. As noted above, the modeling assumes a static baseline moving forward in time. Other changes not modeled could affect the modeled outcomes. Refinement or revision of watershed attributes include East-side land-use and tributary operations, Friant Division operations, West-side return flows, current wildlife area supplies and operations, disaggregation of various water quality elements and current regulatory and institutional objectives.

b. Vernalis Salinity Objective

The baseline Vernalis salinity objective is in accordance with D-1641: 0.7 mS/cm during April thru August and 1.0 mS/cm during September thru March. To allow post-analysis of changing San Joaquin River conditions, SANMAN removes the baseline New Melones operation provided by CALSIM to determine the New Melones baseline releases that could be modified and re-operated in reaction to changed water quality conditions in the San Joaquin River, and to provide a "without New Melones water quality release" depiction of flow and quality at Vernalis. SANMAN then re-operates New Melones in accordance with the IOP to meet Vernalis water quality objectives with SANMAN computations of water quality mass balance.

Table 4. Solution Tools Evaluated

Tools	Evaluation Findings
Flow Tools	
Recirculation	Effective when capacity is available and Delta water quality is good to provide salinity reduction and improve river flows. Analyzed July- September.
Transfers	Up to 12,000AF of water upstream in San Joaquin River watershed may be available on an interim basis for strategic transfer and targeted salinity improvements needs.
HORB Operations	Planned HORB operations in conjunction with an SDIP will improve LSJR flows downstream of Old River. Expanded operation ability for the barrier should be sought to expand benefits during critical periods (e.g. July-Sept).
Tributary Reoperation	Real-time management opportunities exist in many years to coordinate planned releases for other purposes which can result in water quality improvement.
Load Reduction/Management	
West Side Regional Drainage Plan Actions	Execution alone against baseline will remove enough salts to assure salinity compliance at Vernalis and save water in New Melones; associated DO load reductions.
Interception of Saline Groundwater at River	Expensive relative to other load reduction techniques available.
Storage for Agricultural Discharges	Impractical relative to other load reduction techniques available. Attractive nuisance issues for waterfowl. Potential strategic application.
Re-management of Managed Wetland Discharges	Necessary to address critical spring periods in conjunction with upstream releases; more study needed.
Franks Tract Reconstruction	Promising long-term action to reduce load generation.
Urban recycling/exchanges for High quality river flows	Minimal potential.
Increased wastewater treatment	Adopted ammonia load reductions for Stockton WWTP will lower DO loading.
Other: DO Aerator	Demonstration Project Aerator should proceed and be studied in conjunction with other tools implemented.

c. Delta Conditions

Delta export water quality at Banks and Tracy is assumed to correlate with CALSIM-derived water quality at Rock Slough. Stockton flow, a surrogate measure of DO conditions, is estimated as a function of Vernalis flow, barrier operations at the Head of Old River, and San Joaquin River consumptive use between Vernalis and Stockton.

d. New Melones Interim Operations Plan

New Melones baseline water quality and DO releases[6] were removed and re-introduced in accordance with the IOP. Annual accounting of New Melones water quality releases follows a March through February water year and is linked to five water supply classifications.

e. Delta Pumping Capacity Availability for Recirculation

The following pumping capacity priorities were established for modeling purposes to arrive at the net capacity available for recirculation operations, based on a physical capacity at Banks of 8,500 cfs:

- The priority for Tracy pumping capacity is as follows: (1) CVP contract deliveries, (2) export of additional CVP stored water, (3) CVP water transfers, (4) SWP exports through JPOD, and (5) DMC re-circulation.
- The priority for Banks capacity is as follows: (1) SWP contract deliveries, including a July through September EWA reservation up to 500 cfs, (2) SWP water transfers, (3) additional EWA reservation and CVP export/refuge supplies through JPOD, and (4) recirculation.
- Availability of Delta pumping capacity at Banks and Tracy is constrained by the maximum export-to-inflow (E/I) ratio as specified in D-1641. SANMAN allows the user to define recirculation alternatives that "purchase" additional pumping capacity by releasing additional Delta inflow, thereby "paying" the E/I cost.

Other assumptions related to exports for contract deliveries, additional export of CVP stored water, water transfers, the Environmental Water Account, JPOD and "lumped" summer capacity are contained in the SANMAN Model Detailed Assumptions Paper, May 24, 2005.

9. Modeling Results and Preferred Alternative Recommendation

a. Modeling Results

Over forty modeling runs were made analyzing Group defined actions for evaluation, used alone and in conjunction with each other. Early on, the effects of the West Side Regional Drainage Plan (including the San Joaquin River Improvements Project – SJRIP) were shown to be the most powerful action among the alternatives in reducing salinity levels in the LSJR (See Appendix A for a summary description of the West Side Regional Drainage Plan). Summary

[6] DO objective on the Stanislaus River near Ripon

modeling results with 100% of the West Side Regional Drainage Plan implemented with varying levels of Managed Wetland management actions and upstream transfers are summarized in Appendix B

Full implementation of the West Side Regional Drainage Plan will take up to five years for all of the remaining agricultural irrigation subsurface drainage water from about 100,000 acres within the Grasslands Drainage Area, where the Plan is focused, to be permanently removed. With funding for additional land purchases of about 2,000 acres and improvements of lands to allow reuse of drain water, but prior to development of full treatment of residual drainage flow, discharge of salts will continue to trend downward as salts are temporarily stored in reuse lands until treatment is available near the end of the five year period.

The Group's recommendations to meet its primary objectives of achieving salinity objectives at Vernalis and to improve the ability to meet DO levels in the Stockton DWSC are as follows:

b. Preferred Alternative Recommendation

Salinity

1. Fully implement the West Side Regional Drainage Plan.

2. Further evaluate and pursue managed wetland drainage management actions to mitigate impacts of February through April drainage releases.

3. Develop a real-time water quality management coordination group involving LSJR tributaries, LSJR drainers and the DWR to coordinate reservoir release and SWP/CVP Project operations (head of Old River barrier and New Melones operations) to realize opportunities to improve water quality and increase the utility of stored water releases.

Dissolved Oxygen

4. Pursue additional use of the Head of Old River Barrier to augment flows in the LSJR and the Deep Water Ship Channel, consistent with the need to maintain adequate in-Delta water quality, water level and fishery protection.

5. Support for continued implementation of the City of Stockton's ammonia removal project at the Stockton WWTP.

6. Install the demonstration aeration project in the DWSC and continue the newly implemented upstream monitoring efforts to understand DO load producing discharges.

7. Evaluation of additional actions necessary for DO compliance at the DWSC following implementation and analysis of actions 1-5.

8. Establish a forum to evaluate ongoing changes in the water quality baseline and suggest further management actions to continue progress on water quality improvement.

The following summarizes the effects of the Preferred Alternative on Vernalis salinity and flow, effects on storage at New Melones Reservoir, and effects on the level of DO at the DWSC.

c. Vernalis Salinity

The Preferred Alternative meets the Vernalis salinity objective over the entire 73-year period of analysis without the need for upstream water transfers. Recall that the baseline shows exceedences in 13 months over the 73-year period of analysis.

Figure 2 compares critical year monthly average Vernalis salinity under the baseline and Preferred Alternative, both in absolute terms and in terms of percent reduction. Salinity reduction is most impressive in summer months, when the average reduction ranges between 25 and 35%. The figure shows that the Vernalis objective is met with a large factor of safety in most months of critical years. Critical year average salinity most closely approaches the Vernalis objective during February, March and the latter half of May.

d. Vernalis Flow

A consequence of the Preferred Alternative's drainage reduction action and (and associated smaller demand for New Melones dilution flow) is reduced flow at Vernalis. Figure 3 compares critical year monthly average Vernalis flow under the baseline and Preferred Alternative, both in absolute terms and in terms of reduction.

Flow reduction is greatest in the month of March. The average critical year March flow reduction of 270 cfs is due mainly to lower New Melones releases (220 cfs). Although of much smaller magnitude, the critical year flow reductions during summer months is of greater concern to downstream agricultural water users, as baseline flows of approximately 1000 cfs are considered by these users to be marginal. Critical year average flows in July are reduced from 920 cfs to 860 cfs. Most of the 60 cfs flow reduction (50 cfs) is a direct result of drainage reduction.

e. New Melones Storage

Due to the lower need for Vernalis dilution flow, additional water storage would remain available in New Melones Reservoir for other purposes in the amount of 23 TAF in a critical year and 8 TAF per year over the 73-year period of analysis. The additional water storage that results from lower dilution flow is offset somewhat by higher needs for Stanislaus River DO flow, otherwise now provided incidentally from the salinity flow. Additional water storage is greatest in dry and critical years, as dilution requirements are small in wetter years under baseline conditions.

Figure 4 compares annual dilution volumes from New Melones under the baseline and Preferred Alternative over the 73-year period of analysis. Under the baseline, New Melones releases are required in 34 of the 73 years, or just under half the time. The maximum dilution requirement under the baseline is 78 TAF. Under the Preferred Alternative, New Melones dilution flows are required in only 17 of the 73 years, with a maximum annual requirement of 25 TAF. The Preferred Alternative eliminates dilution needs in summer months. Nearly all the Preferred Alternative dilution requirement occurs in February and March. This results highlights the value of evaluating and pursuing actions to mitigate impacts of drainage releases from managed wetlands and other sources to the San Joaquin River during February and March.

Figure 5 compares annual dilution volumes by water year type. Average dilution requirements are reduced from 60 to 8 TAF in critical years and from 19 to 2 TAF over the 73-year period of analysis; the Preferred Alternative effectively eliminates dilution requirements in all but dry and critical water years.

Figure 6 illustrates how additional New Melones water storage that results from lower dilution flow is offset somewhat by higher needs for Stanislaus River DO flow. Adopting modeling assumptions from CALSIM, the SANMAN analysis assumes that a minimum annual flow volume of 60 TAF, distributed over the months of June through September, is required to meet DO requirements on the Stanislaus River. Average DO requirements are increased from 25 to 54 TAF in critical years and from 13 to 22 TAF over the 73-year period of analysis.

Figure 7 sums New Melones dilution and DO requirements and shows comparisons by water year type. As reported in a previous paragraph, the Preferred Alternative reduces New Melones demands by 23 TAF in critical years (from 85 to 62 TAF) and by 8 TAF per year (from 32 to 24 TAF) over the 73-year period of analysis.

Figure 2
Vernalis Salinity by Month: Critical Year Average

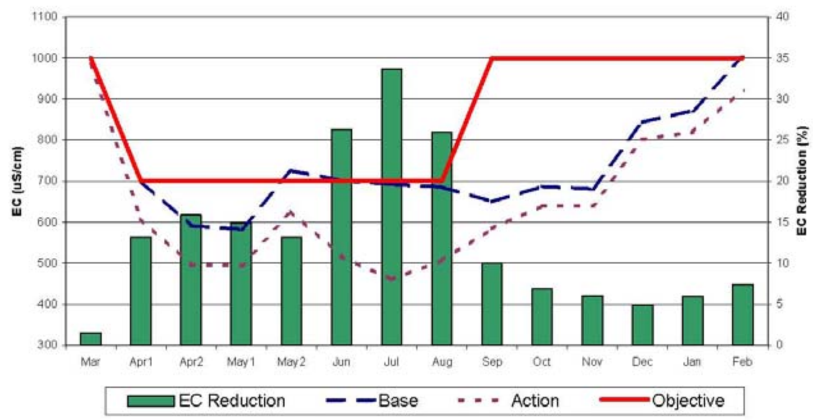


Figure 3
Vernalis Flow by Month: Critical Year Average

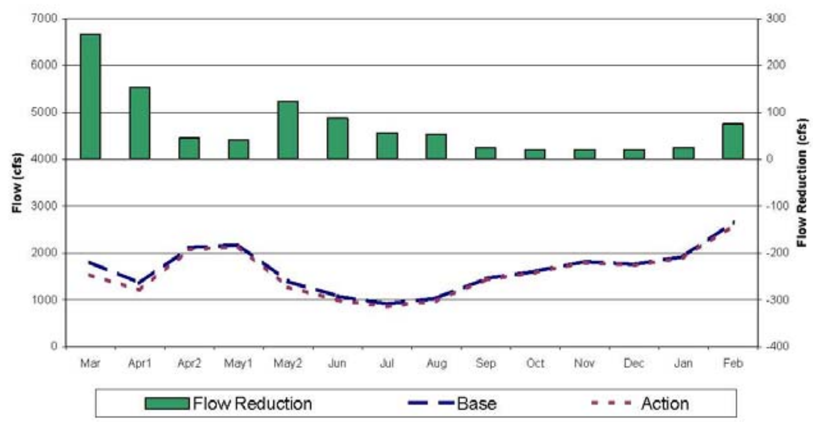


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Figure 4
New Melones Water Quality Releases: 1922-94

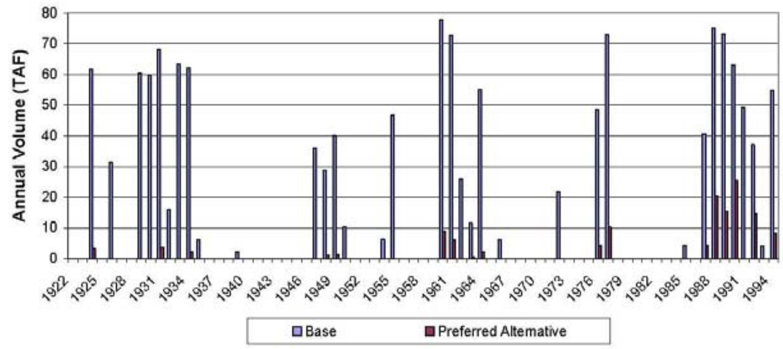


Figure 5
New Melones Water Quality Releases by SVI Water Year Type

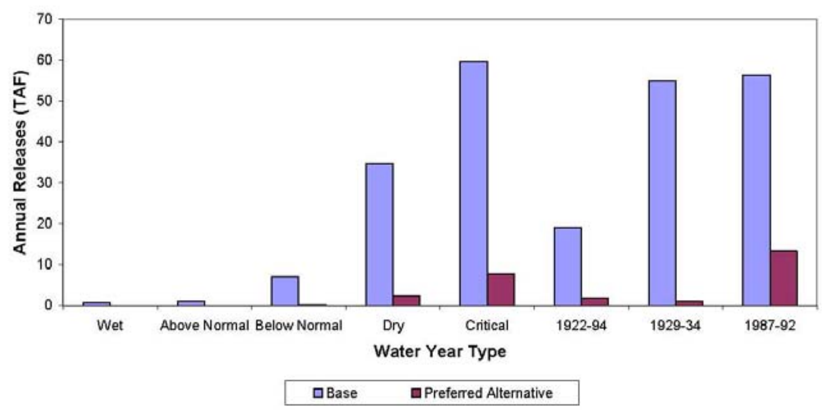


Figure 6
New Melones Stanislaus River Dissolved Oxygen Releases by SVI Water Year Type

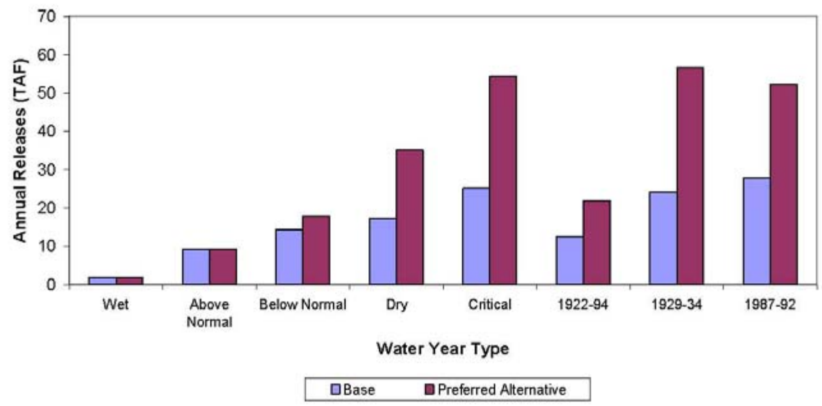
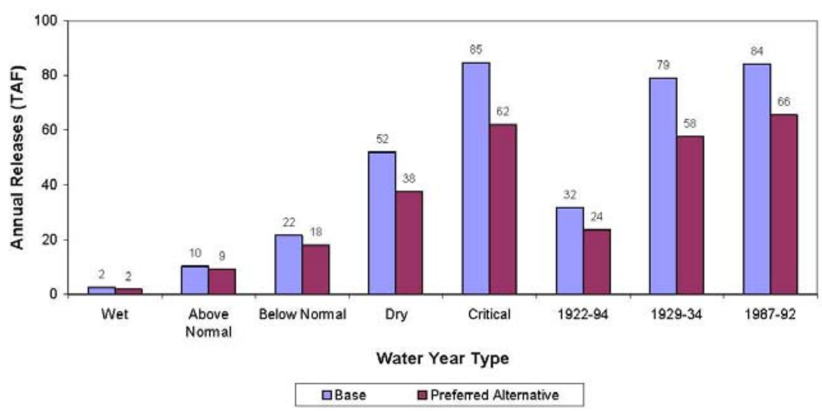


Figure 7
New Melones Salinity & Dissolved Oxygen Releases by SVI Water Year Type



f. Dissolved Oxygen

While elimination of episodes of low DO remains a primary objective of the plan, the need for and efficacy of the tools to address this problem can not be accurately predicted at this time due to the more dynamic nature of that problem and lack of reliable models which account for all the variables in play. However, an operable Head of Old River barrier will increase flows in the LSJR, as shown in Figures 8 and 9, cutting the frequency of flows below 500cfs in half as compared to the baseline in July and August. In September the efficacy of HORB operations is even greater, as shown in Figure 10. Coupled with the City of Stockton's ammonia removal project and provided the demonstration project aerator, which can artificially supplement channel oxygen levels, proves effective, it is believe that DO excursions can be significantly reduced. Operation of these tools on a real time basis will allow experience to be developed in refining how the tools can be applied over time given various circumstances in order to find the precise combination of actions that can achieve the objective. Further, as additional studies progress on upstream loads and flows, the collective understanding of this problem and the ability to solve it should improve with time.

As operational experience is gained combining HORB operations, reductions of salt and DO load and operation of a demonstration aerator occur, further analysis should be done to investigate any additional needed actions to fully resolve remaining DO issues at the Deep Water Ship Channel.

Figure 8 July Stockton Net Flow: Cumulative Frequency Distribution

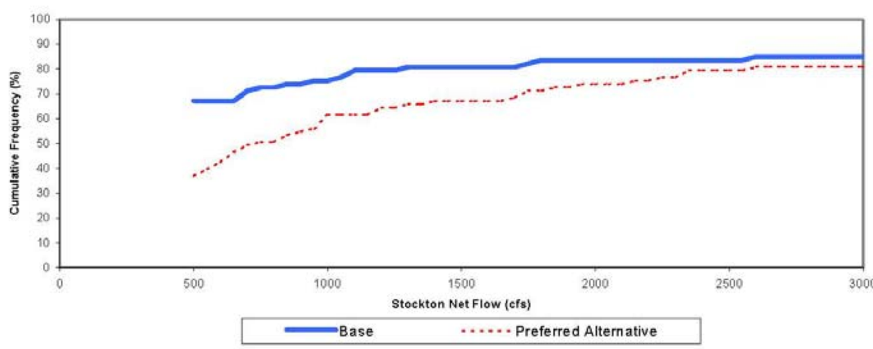


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Figure 9
August Stockton Net Flow: Cumulative Frequency Distribution

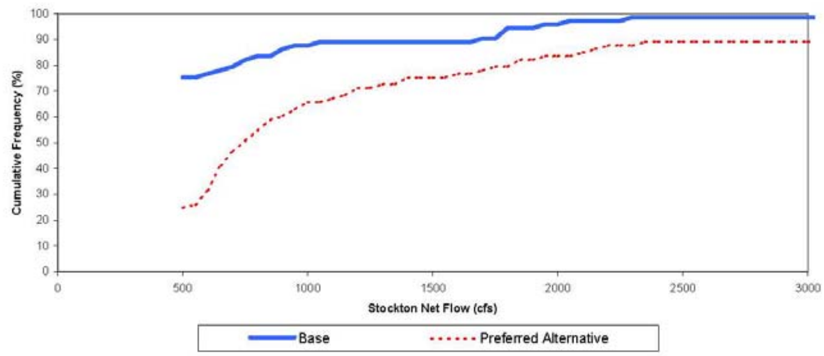
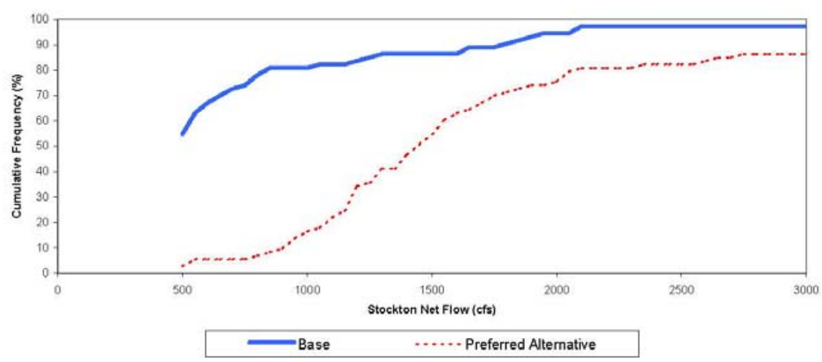


Figure 10
September Stockton Net Flow: Cumulative Frequency Distribution



10. The Evolving Baseline and Other River Changes

Due to this Group's efforts and the efforts of many others involved in addressing LSJR issues, it is widely recognized that factors affecting water quality on the San Joaquin River are dynamic and subject to change, often outside the reach of regulatory authority or control. Land uses in the watershed will convert from agricultural and other uses to urban uses. Cropping types and practices will evolve to meet market demands. Water conservation efforts will likely result in diminished return flows to the river and growing urban areas will return additional sewage treatment plant effluent. Additionally, potential regulatory changes on rivers upstream of the LSJR, such as a decision to move a compliance point for DO on the Stanislaus river from Ripon to Orange Blossom Bridge, will have secondary effects on flow on the LSJR. Both inevitable and discretionary changes should be evaluated for ultimate effects on continuing to achieve water quality improvement. Tools evaluated here such as recirculation, could be employed to offset some effects of these decisions or changes that otherwise cause lower river flows. For these reasons the Group recommends a forum be established to track these changes and evaluate and recommend necessary actions to continue water quality improvement.

11. Effects of Recommended Actions on Secondary Objectives

Appendix B details results of studies done utilizing the tools analyzed herein to meet primary and secondary objectives.

Lowered flows/flow maintenance on LSJR. Implementation of the West Side Drainage Plan and resulting lower reliance on New Melones releases for achievement of salinity objectives lowers flows on the LSJR during critical months as much as from 920 to 860cfs on average in July of critical water years, or just under a 7% flow reduction. Flows below 1,000 cfs are a potential problem for diverters on the LSJR, where the water level drops below pump intakes. Where lowering occurs in summer months of these year types, recirculation could be utilized to provide for additional flow to allow water surface levels to rise to meet pump intake levels.

(In-Delta) Brandt Bridge salinity objective. The recommended actions would improve salinity conditions at Brandt Bridge but water quality degradation below Vernalis causes salinity levels to rise in that stretch of the river between Vernalis and Brandt Bridge. Additional flow or load reduction would be needed to fully meet this objective.

Water Costs. The SANMAN model computes two water cost values: (1) "net" water cost that includes all Delta components and (2) "re-circulation" water cost, a subset of "net" water cost that is limited to re-circulation components (as shown in Appendix B). The reason for this distinction is that water costs other than those associated with "re-circulation" are operational actions of the SWP/CVP operating systems in response to the effects of implementing the San Joaquin River Salinity Management actions.

12. Next Steps

a. Funding Needed.

Table 5 indicates recommended actions, funding needed and recommended funding sources to implement the recommendations herein.

Table 5.
Funding Needs and Sources to Implement the Preferred Alternative

Recommendation	Funding Needed	Recommended Source
1. Implement Drainage Plan	$86 million, capital $3-5m annual operations	Federal/State bond/local Federal
2. Managed Wetlands Actions	$250,000 initial studies	All participants
3. Real Time Operations	Existing staff/stakeholders	Local
4. HORB operations	Existing funding/staff	State
5. Stockton WWTP	Funded	CALFED – capital; stakeholders agreement for operations
6. DO Aereator	Funded capital, $200,000 operations	
7. Continued DO evaluation	Unknown/nominal	CVRWQCB/stakeholders
8. Lower River Forum	Nominal	Agencies/stakeholders

b. CEQA/NEPA needs analysis.

Key aspects of the proposed recommendations are proceeding under separate planning functions, with appropriate environmental review, including the South Delta Improvements Project and the West Side Regional Drainage Plan and are expected to be complete by summer of 2006. An analysis any additional CEQA and NEPA documentation that would be necessary for the recommendations overall needs to be undertaken.

c. Agreement.

Some of the parties participating in this Group will need to enter into an MOU on implementation of the recommended actions.

Apendix A

Summary Description of the West Side Regional Drainage Plan

The West Side Regional Drainage Plan is an integrated plan to eliminate irrigated agricultural drainage water from and enhance water supply reliability for, about 100,000 acres in the Grasslands Drainage area as shown in Figure A-1. The Program began as a successful effort to reduce selenium discharges to the San Joaquin River. It is now been proposed for expansion to go beyond regulatory requirements and eliminate selenium and salt discharges to the River, while maintaining productivity of production agriculture in the region and enhancing water supplies to lands remaining in production. It also is key to solving disputes among neighboring water and drainage districts regarding localized impacts of agricultural drainage.

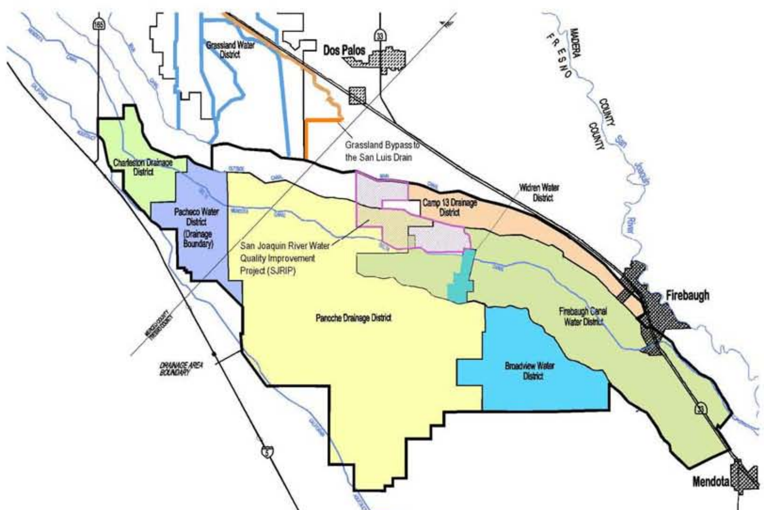
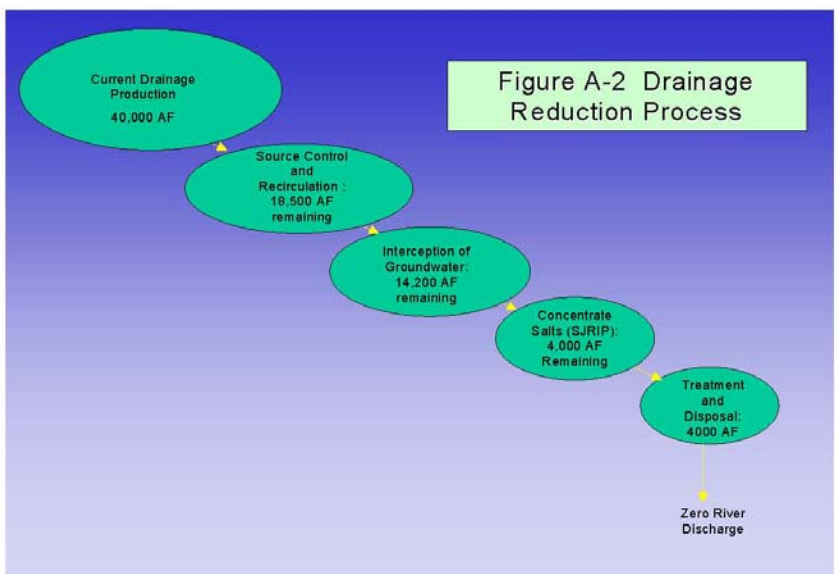


Figure A-1
West Side Drainage Plan Project Area and Districts

The Plan relies on four general tactics to reduce and then eliminate high salinity irrigation drainage from these lands:

1) Reduction of drainage volumes to be managed through source control/efficient water management techniques such as replacement of furrow irrigation with micro-irrigation technology, and lining of unlined delivery canals;
2) Recirculation of tailwater on primary irrigation lands;
3) Collection and reuse of tile drainage water on halophytic croplands in order to concentrate drainage'
4) Installation of groundwater wells to lower groundwater in strategic locations to eliminate groundwater infiltration into tile drains.
5) Treatment and disposal of remaining drainage water through reverse osmosis, evaporation and disposal or reuse of salts.

The use of these techniques and the consequent reduction in drain water is graphically displayed in Figure A-2



With about 4,000 acres of land currently being used as drainage water re-use area, reductions of salt discharges through the San Luis Drain and into Mud Slough then to the San Joaquin River have decreased. Further action on the Plan will eliminate the remaining discharge. An incidental benefit of this Plan that has been found through analysis by the San Joaquin River Water Quality Management Group is that it assures compliance with salinity objectives at

Vernalis and reduces the frequency in violations of objectives at Brandt Bridge by 71% over a 73-year hydrology.

About $66 million has been spent on the Plan thus far and another $86.5 million is necessary to complete the Plan's implementation over the next four years as shown in Table A-1.

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Table A-1
West Side Regional Drainage Plan Cost Summary

Solution Component	2005	2006	2007	2008	2009	2010	Total
Irrigation Improvements	**$4,720,000**	**$4,540,000**	**$4,540,000**	**$4,540,000**	**$2,300,000**		**$20,640,000**
-Panoche DD/Pacheco WD/Charleston DD	$3,714,000	$3,572,000	$3,572,000	$3,572,000	$1,810,000		$16,240,000
-Exchange Area	$526,000	$506,000	$506,000	$506,000	$256,000		$2,300,000
-Westlands WD	$480,000	$462,000	$462,000	$462,000	$234,000		$2,100,000
Distribution Facility Improvements	**$2,700,000**	**$5,400,000**	**$2,690,000**				**$10,790,000**
-Panoche DD	$956,000	$1,912,000	$952,000				$3,820,000
-Exchange Area	$1,744,000	$3,488,000	$1,738,000				$6,970,000
-Westlands WD	$0	$0	$0				
BVWD Reuse Project (Westlands WD)			$440,000	$880,000			**$1,320,000**
Westland W.D. Shallow Groundwater Pumping			$1,000,000	$1,000,000	$1,000,000		**$3,000,000**
Groundwater Management (Exchange Contractors)				$6,000,000	$6,000,000		**$12,000,000**
SJRIP Expansion and Development	$4,170,000	$4,170,000	$4,160,000	$4,160,000	$4,160,000		**$20,820,000**
Treatment Plant Development	$1,600,000	$3,280,000	$3,270,000	$3,200,000	$3,200,000	$3,200,000	**$17,750,000**
Total	**$20,610,000**	**$27,330,000**	**$23,330,000**	**$24,320,000**	**$18,960,000**	**$3,200,000**	**$86,320,000**

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Appendix B
SANMAN Modeling Results

Summary San Joaquin River Water Quality Action Alternatives: Critical Year Averages	Number of Exceedences			Delta Water Cost (taf/yr)	DMC Recirculation			New Melones Savings (taf/yr)	Transfers	
	Vernalis Salinity	Vernalis Flow	Brandt Bridge Salinity		Volume (taf/yr)	Energy Cost ($1000/yr)	Water Cost (taf/yr)		Max (taf)	Ave (taf/yr)
Interim Period (100% West Side Drainage Implementation & No Wetlands Mgt): Without Transfers										
1) Meet Vernalis Salinity	0	---	---	53	0	0	0	23	0	0
2) Study 1 + 1000 cfs @ Vernalis	0	11	---	56	19	230	3	23	0	0
3) Meet Brandt Bridge Salinity (0.7/1.0)	0	---	84	53	0	0	0	23	0	0
4) Study 3 + 1000 cfs @ Vernalis	0	11	84	56	19	230	3	23	0	0
5) Study 4 + 750 cfs @ Stockton July-Sept	0	11	84	67	85	1020	15	23	0	0
6) Meet Brandt Bridge Salinity (1.0)	0	---	43	53	0	0	0	23	0	0
7) Study 6 + 1000 cfs @ Vernalis	0	11	43	56	19	230	3	23	0	0
8) Study 7 + 750 cfs @ Stockton July-Sept	0	11	43	67	86	1030	15	23	0	0
Interim Period (100% West Side Drainage Implementation & No Wetlands Mgt): With Transfers										
9) Meet Vernalis Salinity	0	---	---	53	0	0	0	23	0	0
10) Study 9 + 1000 cfs @ Vernalis	0	0	---	47	19	230	3	23	34	9
11) Meet Brandt Bridge Salinity (0.7/1.0)	0	---	0	34	0	0	0	23	27	19
12) Study 11 + 1000 cfs @ Vernalis	0	0	0	29	19	230	3	23	54	27
13) Study 12 + 750 cfs @ Stockton July-Sept	0	0	0	40	85	1020	15	23	54	27
14) Meet Brandt Bridge Salinity (1.0)	0	---	0	37	0	0	0	23	23	16
15) Study 14 + 1000 cfs @ Vernalis	0	0	0	32	19	230	3	23	46	24
16) Study 15 + 750 cfs @ Stockton July-Sept	0	0	0	43	86	1030	15	23	46	24
Long Term (100% West Side Drainage Implementation & Wetlands Mgt): Without Transfers										
17) Meet Vernalis Salinity	0	---	---	58	0	0	0	28	0	0
18) Study 17 + 1000 cfs @ Vernalis	0	12	---	61	19	230	3	28	0	0
19) Meet Brandt Bridge Salinity (0.7/1.0)	0	---	49	58	0	0	0	27	0	0
20) Study 19 + 1000 cfs @ Vernalis	0	12	49	61	19	230	3	27	0	0
21) Study 20 + 750 cfs @ Stockton July-Sept	0	12	49	72	85	1020	15	27	0	0
22) Meet Brandt Bridge Salinity (1.0)	0	---	21	58	0	0	0	28	0	0
23) Study 22 + 1000 cfs @ Vernalis	0	12	21	61	19	230	3	28	0	0
24) Study 23 + 750 cfs @ Stockton July-Sept	0	12	21	73	86	1030	15	28	0	0
Long Term (100% West Side Drainage Implementation & Wetlands Mgt): With Transfers										
25) Meet Vernalis Salinity	0	---	---	58	0	0	0	28	0	0
26) Study 25 + 1000 cfs @ Vernalis	0	0	---	51	19	230	3	28	43	10
27) Meet Brandt Bridge Salinity (0.7/1.0)	0	---	0	47	0	0	0	27	24	11
28) Study 27 + 1000 cfs @ Vernalis	0	0	0	39	19	230	3	27	49	21
29) Study 28 + 750 cfs @ Stockton July-Sept	0	0	0	51	85	1020	15	27	49	21
30) Meet Brandt Bridge Salinity (1.0)	0	---	0	51	0	0	0	28	16	7
31) Study 30 + 1000 cfs @ Vernalis	0	0	0	43	19	230	3	28	46	18
32) Study 31 + 750 cfs @ Stockton July-Sept	0	0	0	55	86	1030	15	28	46	18

Assumptions:
current baseline New Melones IOP and Stanislaus dissolved oxygen requirements
additional HORB operations
high priority recirculation
dissolved oxygen aerator and Stockton NPDES actions

APPENDIX D-4: San Joaquin River Quality Action Implementation Group April 2006 Draft Mission Statement

Revised Draft Mission Statement for Joint Agency Task Force
Implementing Actions to Address Water Quality Impairment on the Lower San Joaquin River

Background

The lower San Joaquin River has historically had water quality impairment relative to salinity and boron, and for low dissolved oxygen at the Stockton Deep Water Ship Channel. Regulatory action in the form of adopted TMDLs has occurred. A coalition of interests on the lower River, known as the San Joaquin River Water Quality Management Group (Group) formed and evaluated a range of solutions to the water quality impairments. The Group has offered a set of actions which if implemented would allow for the achievement of salinity/boron objectives measured at Vernalis and improve low dissolved oxygen levels in the Deep Water Ship Channel.13 These actions involve joint responsibilities of local, state and federal agencies as noted below in the attached table.

Recommendation	Agency Role/Participant		
	Local	State	Federal
Salinity			
Implement Westside Drainage	Drainage	DWR/SWRCB	USBR
	agencies	SRWQCB	
Wetlands Drainage Management	Refuges	DFG/SWRCB	USBR
		SRWQCB	FWS
Real Time SJR Operations Coordination	Various	DWR (barriers)	USBR
Dissolved Oxygen			
HORB Use		DWR	USBR
		DFG	FWS/NMFS
Stockton Treatment Plant Upgrade	Stockton	SRWQCB	
Demonstration Aerator	Port	DWR; CALFED	
	others		
Future Actions Evaluation/Change Forum	Various	DWR	USBR
		SWRCB	FWS/NMFS
		DFG	

13 *See:* Summary Recommendations of the San Joaquin River Water Quality Management Group for Meeting the Water Quality Objectives for Salinity Measured at Vernalis and Dissolved Oxygen in the Stockton Deep Water Ship Channel, August, 2005

To further the implementation of these recommendations and evaluate and plan for future actions needed to continue to improve water quality on the River, coordination of the implementation of these actions is necessary. The California Department of Water Resources will lead a group of agencies implementing specific actions to improve water quality on the River or having the ability to assist in those implementing actions, including, but not limited to:

- United States Bureau of Reclamation
- United States Fish and Wildlife Service
- National Marine Fisheries Service
- California Department of Fish and Game
- State Water Resources Control Board
- Central Valley Regional Water Quality Control Board (providing oversight and evaluating consistency of actions with regulations)
- Port of Stockton
- City of Stockton
- Westside Drainage Group (Central California Irrigation District, Colombia Canal Company, Firebaugh Canal Water District, Panoche Water District, San Luis Canal Company, San Luis and Delta Mendota Water Authority, San Joaquin River Exchange Contractors, Westlands Water District)
- San Joaquin River Group Authority

The mission of the Coordinating Agencies is as follows:

Mission of the Lower San Joaquin River Water Quality Improvement Coordinating Agencies

The Mission of the Coordinating Agencies (Agencies) is to coordinate individual actions of participating agencies that will collectively improve water quality on the lower San Joaquin River. These actions include but are not limited to those identified by the San Joaquin River Water Quality Management Group (Group). The Agencies will also work with the Group to identify and assist in implementing actions that will achieve long-term water quality improvement as well as monitor baseline changes affecting water quality improvement.

APPENDIX D-5: Department of Water Resources Statement of Support for the Westside Regional Drainage Plan

August 1, 2006

DWR actions to control salinity in the San Joaquin River upstream of Vernalis

This section summarizes the programs and activities that DWR has engaged in order to reduce the volume and concentration of saline discharges to the San Joaquin River. This information demonstrates the actions that DWR in cooperation with the United States Bureau of Reclamation (USBR) and local agencies have taken and plan to take to help achieve water quality standards in the Lower San Joaquin River Delta.

These measures include: 1) Providing fresh water to dilute saline discharges and to increase flows upstream of Vernalis through the Vernalis Adaptive Management Program (VAMP) agreement and 2) Controlling discharge of saline water into the SJR upstream of Vernalis.

1. Measures to provide fresh water for dilution of saline flows above Vernalis

1. Vernalis Adaptive Management Plan. The San Joaquin River Agreement (SJRA) commits DWR to fund water purchases to meet flow requirements on the SJR for VAMP until water year 2010. Under the SJRA, the USBR and DWR agreed to spend up to $3 million and $1 million, respectively, per year to purchase VAMP water. Until 2004, VAMP water flows volume averaged 63,000 ace-feet from mid April to mid May. In 2005, generally wet conditions in the San Joaquin River basin and tributary basins resulted in relatively high flow conditions entering the spring of 2005. Due to these high flows, DWR was unable to install the temporary Head of Old River Barrier (HORB). Additionally, the flow in the San Joaquin River at Vernalis exceeded the maximum VAMP target flow of 7,000 cfs during the VAMP pulse flow period, therefore no supplemental water was provided by the SJRGA agencies. Due to wet conditions in 2006, a similar scenario is expected.

2. Recirculation. The concept of recirculation means releasing CVP and potentially SWP water pumped from the Sacramento-San Joaquin River Delta into the Newman Wasteway and the San Joaquin River via Delta-Mendota Canal. Identified in D-1641, the concept could be a useful tool to help improve the overall flow and water quality in the San Joaquin River Basin. Still many questions need to be answer to determine its feasibility. DWR collaborated with the USBR and other agencies in a successful Pilot Recirculation Study conducted in August 2004. Currently, DWR is exploring its participation as the lead State agency in an EIR/EIS and a feasibility study of the concept.

2. Measures to control salinity in the San Joaquin River upstream of Vernalis

In D1641, the SWRCB recognizes that regional management of drainage water is the preferred method to meet the SJR objectives (page 84). Measures to control salinity upstream of Vernalis include: (a) On-farm management activities to reduce subsurface drainage, (b) Real-time water quality management to maximize the assimilative capacity of the SJR, and (c) Efforts to improve wetlands discharges:

a) On-Farm Drainage Management Activities

Drainage management activities involving source control have proven to be effective in reducing salt loads in the San Joaquin River. These measures include:

- Irrigation Water Conservation such as use of improved irrigation systems;
- Agricultural tailwater and tilewater control and recycling; and
- Agricultural subsurface drainage water reuse through the San Joaquin River Improvement Project.

Even though the San Joaquin Valley Drainage Implementation Program (SJVDIP) has been idled since 2003, DWR continues to implement many of its recommendations through its Agricultural Drainage and Water Use Efficiency Programs and working in partnership with California Universities, CALFED, USBR, Resource Conservation Districts, Watershed groups, Water and Drainage Districts and many other Local, State and Federal entities. These activities include:

a) providing grants for control of agricultural drainage water and reduction of its toxic elements using (Propositions 13, 50, and 204) and DWR own project fund monies,
b) developing, educate, and promote the use Integrated On-Farm Drainage Management Systems (IFDM) in the San Joaquin Valley,
c) providing technical assistance and collaborating with water and drainage districts, and local entities to reduce and control surface subsurface agricultural drainage water,
d) maintaining research and demonstration projects to develop drainage reuse systems, including development of cost effective salt tolerant crops, drainage treatment and disposal technologies, and salt separation and utilization,
e) monitoring the quality and distribution of shallow groundwater water levels in drainage impaired areas of the San JoaquinValley.

DWR is also a participant in additional efforts proposed by the USBR and Regional Agencies to control saline water discharges into the San Joaquin River. DWR participates by providing technical assistance and cooperation, data, plan review and funding in many cases. These efforts include the West Side Regional Plan, USBR's San Luis Drainage Feature Reevaluation to provide drainage service to the San Luis Unit of the CVP, USBR's Evaluation of its Operation Plan of New Melones Reservoir, and the Integrated On-Farm Drainage Management Program that DWR and collaborating agencies maintain. In addition, DWR supports the recommendations of the San Joaquin River Management Group made on its report controlling salinity in the San Joaquin River. Recommendations include:

1. Fully implementing the West Side Regional Drainage Plan.
2. Further evaluating and pursuing managed wetland drainage management actions to mitigate impacts of February through April drainage releases.
3. Developing a real-time water quality management coordination group involving LSJR tributaries, LSJR drainers and DWR to coordinate reservoir release and SWP/CVP Project operations (Head of Old River Barrier and New Melones operations) to realize opportunities to improve water quality and increase the utility of stored water releases.

The San Joaquin River Water Quality Management Group has merged into the Water Quality Subcommittee of the San Joaquin River Management Plan (SJRMP) with the purpose of implementing the above recommendations. DWR is a lead agency for the SJRMP.

b) Real-time Water Quality Monitoring Program

The Real-time Water Quality Monitoring Program (RTWQMP) provides information on existing water quality conditions and forecasts flow and water quality conditions to SJR water managers and stakeholders. The information provided is important for improving management and coordination of reservoir releases, agricultural and wetlands drainage flows, and eastside tributary releases to achieve water quality objectives at the SJR compliance points. In fact, DWR is collaborating with the San Joaquin River Water Quality Management Group and other stakeholders to realize opportunities to achieve these goals using the RTWQMP and other tools.

DWR operates and maintains 25 river monitoring stations and shares responsibility with USGS for another three stations along the lower San Joaquin River System. DWR staff constantly revises and analyzes the data provided by these and other stations in the LSJR network. In the early stages, the RTWQMP was funded by USBR and then by CALFED. Currently, DWR has assumed responsibility for funding most of the RTWQMP for the San Joaquin River. Table 1 lists the LSJR surface water monitoring stations including DWR stations as well as other cooperating agency stations in the RTWQMP.

Table 1

SAN JOAQUIN RIVER AND RESERVOIR STATION META DATA

								Real-time Monitoring							Bi-annually Analysis						
Station ID	CDEC ID	River Stations	Elev ft	Latitude	Longitude	County	Operator	Telemetered	Stage	Flow	EC	H2O Temp	DO	Chlorophyll	Minerals (lab)	Nutrients (lab)	Minor Elements (lab)	EC (field)	pH (field)	DO (field)	H2O Temp (field)
B00416		Eastside Bypass Below Mariposa Bypass				Merced	DWR		X	X											
B03115		Stanislaus R. At Koetitz Ranch	30	37º 42' 00" N	121º 10' 12" W	Stanislaus	DWR		X	X					X	X	X	X	X	X	X
B05516		Bear Creek Below Eastside Canal	20			Merced	DWR		X	X											
B07040		San Joaquin River At Maze Road Bridge	39	37.642N	121.228W	Stanislaus	DWR		X	X					X	X	X	X	X	X	X
	BDT	San Joaquin River at Brandt Bridge	0	37.8650 N	121.3231 W	San Joaquin	DWR	X	X		X	X									
B07802	CBP	Chowchilla Bypass	170	36.774N	120.285W	Madera	DWR	X	X	X											
B05155	CRS	Merced River At Cressey	165	37.4250N	120.6630W	Merced	DWR	X	X	X	X	X									
B04130	DCM	Dry Creek near Modesto	88	37.657N	120.923W	Stanislaus	DWR	X	X	X					X	X	X	X	X	X	X
	DNB	San Joaquin River at Donny Bridge	239	36.834N	119.966W	Madera	USBR	X	X	X	X	X									
B00435	ELN	Eastside Bypass Near El Nido	100	37.133N	120.567W	Merced	DWR	X	X	X											
B07375	FFB	San Joaquin R @ Fremont Ford Bridge	65	37.310N	120.930W	Merced	USGS	X	X	X	X				X	X	X	X	X	X	X
	GRF	San Joaquin River At Gravelly Ford	170	36.798N	120.16W	Fresno	DWR	X	X	X	X	X									
	LDC	Little Dry Creek (USBR)	350	36.942N	119.683W	Fresno	USBR	X	X	X											
B04175	LGN	Tuolumne River Below La Grange Dam	170	37.6660N	120.4410W	Stanislaus	USGS	X	X	X											
B05525	MCK	Bear Creek At McKee Road	187	37.309N	120.444W	Merced	USACE	X	X	X											
B07710	MEN	San Joaquin River Near Mendota	170	36.783N	120.367W	Fresno	USGS/DWR	X	X	X					X	X	X	X	X	X	X
B05184	MMF	Merced River Below Merced Falls	310	37.522N	120.331W	Merced	Merced Co.	X	X	X											
B04120	MOD	Tuolumne River At Modesto	90	37.6500N	121.0010W	Stanislaus	DWR	X	X	X	X	X									
B95820	MSD	San Joaquin River At Mossdale Bridge	31	37.786N	121.306W	San Joaquin	Co.	X	X		X	X	X	X							
	MSG	Mud Slough Near Gustine	70	37.263N	120.906W	Merced	USGS	X	X	X	X	X									
	MSGCR	Mud Slough At Gun Club Road		37.231N	120.899W	Merced	Grasslands		X	X	X	X									
B05170	MSN	Merced River Near Snelling	260	37.5020N	120.4510W	Merced	DWR	X	X	X											
B05125	MST	Merced River Near Stevinson	82	37.3710N	120.9310W	Fresno	DWR	X	X	X	X	X			X	X	X	X	X	X	X
B07300	NEW	San Joaquin River At Newman	90	37.3500N	120.9770W	Merced	USGS/DWR	X	X	X											
B03175	OBB	Stanislaus River At Orange Blossom Bridge	117	37.7830N	120.7500W	Stanislaus	DWR	X	X	X	X	X									
	OCL	Orestimba Creek Near Crows Landing	65	37.414N	121.015W	Stanislaus	USGS	X	X	X	X	X									
	OH1	Old River at Head	15	37.8080N	121.3290W	San Joaquin	DWR	X	X	X		X									
B87100	ORE	Orestimba Creek Nr Newman		37.316N	121.124W	Stanislaus	USGS	X	X	X											
B03125	RIP	Stanislaus River At Ripon		37.7300N	121.1090W	San Joaquin	USGS	X	X	X											
	RPN	Ripon	35	37.7300N	121.1090W	San Joaquin	USBR	X			X	X	X								
	RR1	Rough and Ready Island	15	37.9630N	121.3650W	San Joaquin	DWR	X	X	X	X	X		X							
B07250	SCL	San Joaquin River At Crows Landing Bridge	60	37.428N	120.003W	Stanislaus	USGS	X	X	X	X	X									
B07798	SJB	San Joaquin River Below Bifurcation	170	36.773N	120.286W	Madera	DWR	X	X	X											
B07885	SJF	San Joaquin River Below Friant	294	36.984N	119.723W	Fresno	USGS	X	X	X	X	X									
	SJL	San Joaquin R Below Old River Nr Lathrop	10	37.810N	121.323W	San Joaquin	DWR	X	X												
B07200	SJP	San Joaquin River At Patterson Bridge	97	37.4940N	121.0810W	Stanislaus	DWR	X	X	X	X	X			X	X	X	X	X	X	X
B07400	SJS	San Joaquin River Near Stevinson	82	37.2950N	120.8510W	Merced	DWR	X	X	X	X	X			X	X	X	X	X	X	X
B03185	SKF	Stanislaus R Bl Goodwin Nr Knights Ferry	253	37.854N	120.637W	Calaveras	USGS	X	X	X											
B03160	SOK	Stanislaus River At Oakdale	120	37.777N	120.852W	Stanislaus	USGS	X				X									
B00470	SSH	Salt Slough Near Stevinson	75	37.248N	120.851W	Merced	USGS	X	X	X	X	X			X	X	X	X	X	X	X
B07020	VER	Vernalis (USBR)	35	37.6670N	121.2670W	San Joaquin	USBR	X			X	X									
	VNS	San Joaquin River At Vernalis	35	37.6670N	121.2670W	San Joaquin	USGS/DWR	X	X	X											
NIGEL'S STATIONS																					
	DEL	Del Puerto Creek		37º 32' 29.3" N	121º 07' 2.0" W	Stanislaus	SJVDA	X	X	X	X	X									
		Grayson Drain																			
	HOS	Hospital Creek		37º 36' 37.7" N	121º 13' 50.8"	Stanislaus	SJVDA	X	X	X	X	X									
	ING	Ingram Creek		37º 36' 0.8" N	121º 13' 30.2"	Stanislaus	SJVDA	X	X	X	X	X									
	MSM	Marshall-Spanish -Moran Drains		37º 26' 10.7" N	121º 02' 10.2"	Stanislaus	SJVDA	X	X	X	X	X									
	NJD	New Jerusalem Drain		37º 43' 36.1"	121º 17' 58.4"	San Joaquin	SJVDA	X	X	X	X	X									
	RAM	Ramona Lake		37º 24' 49.9" N	121º 00' 53.6"	Stanislaus	SJVDA	X	X	X	X	X									
	WES	Westley Wasteway		37º 33' 27.3" N	121º 09' 36.3"	Stanislaus	SJVDA	X	X	X	X	X									
ADDITIONAL STATIONS																					
B00770.00		Delta-Mendota Canal to Mendota Pool	160	36º 47' 12" N	120º 23' 04" W	Fresno					X	X	X		X	X	X	X	X	X	X
B00400.00		Mud Slough at Hwy 140	60	37º 17' 28" N	120º 56' 40" W	Merced					X	X	X		X	X	X	X	X	X	X
B08735.00		Orestimba Creek at Hwy 33	106	37º 22' 42" N	121º 03' 18" W	Stanislaus					X	X	X		X	X	X	X	X	X	X
B07080.00		San Joaquin River at Grayson (of Laird Sl.)	30	37º 33' 48" N	121º 09' 06" W	Stanislaus									X	X	X	X	X	X	X
B04105.00		Tuolumne River at Tuolumne City	40	37º 36' 12" N	121º 07' 00" W	Stanislaus									X	X	X	X	X	X	X

One important activity of this program is forecasting flow and salinity conditions on the SJR so that decision makers can take advantage of assimilative capacity of the river when available. For this purpose, DWR collects data from the network of stations and inputs it into the San Joaquin River Input-Output Day (SJRIODAY) model. The model forecasts salinity and flow conditions on the River near Vernalis, and other upstream stations on a biweekly basis. DWR publishes the information on its website on a weekly basis. Currently DWR is evaluating options to upgrade the current forecast model and extend its capabilities to the LSJR compliance points.

c) Efforts to Improve Wetlands Discharges

As per 1998 data, wetlands discharges contributed about 9% of the total salt load in the San Joaquin River at Vernalis. The contribution is likely to be higher today as additional water supply and land are acquired for managed wetlands wildlife refuges through CVPIA, EWA, and other programs. Timing of wetland releases with assimilative capacity of the SJR will result in significant water quality improvements. However, little has been done in this regard due to concerns over disrupting existing, proven wetland management practices.

Research is needed to determine if improved wetlands management practices can be achieved for the benefit of both wildlife and SJR water quality. Current research has focused on real-time water quality monitoring and adaptive management. Research goals are to coordinate timing of wetland discharges when assimilative capacity is available. Multiple grants have been provided for these purposes. In addition to funds provided by CALFED for the study on the *Effect of Delayed Wetland Drawdown on Moist Soil Plants*, staff from DWR and DFG is conducting a joint study to assess other aspects of delayed wetland drawdown. The study will complement DFG’s current wetland drawdown research. DWR, DFG and U.C. Davis staff is working cooperatively on preparing the study plan.

The studies on delayed wetland drawdown are complemented with a study funded by DWR under Proposition 204 (drainage sub-account). The study is a part of the Real-time Water Quality Monitoring Program.

APPENDIX D-6: Statement of Commissioner Keyes on Implementation of WRDP

Statement of John W. Keys, III, Commissioner
Bureau of Reclamation
U.S. Department of the Interior
Before the
Resources Committee
Subcommittee on Water and Power
U.S. House of Representatives
on
Implementation of the Westside Regional Drainage Plan as a Way to Improve San Joaquin River Water Quality
July 28, 2005

My name is John Keys, and I am the Commissioner for the U.S. Bureau of Reclamation. My testimony today will provide background on the agricultural drainage challenges in California's Central Valley and review the current status of our actions to address this matter, including an overview of the drainage service alternatives that are currently under review through the NEPA process.

The San Luis Unit of the Central Valley Project contains some of the most productive agricultural land in the nation. However, tight clay soil that underlies much of this land can cause water and salts to accumulate in the root zone. In the 1960 San Luis Unit authorizing legislation Congress decided that not only was a dependable irrigation water supply needed to realize the tremendous agricultural potential of these lands, but that a drainage system was needed to control the shallow water table under much of the land. The 1960 Act included a provision for an interceptor drain to carry this drainage water to the Sacramento-San Joaquin Delta.

In the 1970s, Reclamation constructed about 85 miles of the San Luis Drain as well as the first stage of Kesterson Reservoir. Some 42,000 acres of farmland in Westlands Water District and other San Luis Unit districts were connected to the Drain and subsurface drainage water flowed to Kesterson where it was impounded and evaporated. Within about five years, selenium (a naturally occurring element present in the drainage water) bioaccumulated in the food chain and caused reproductive impairment and deformities in wildlife at the Reservoir. Following a Nuisance and Abatement Order issued by the State Water Resources Control Board, the San Luis Drain and Kesterson Reservoir were closed.

Upon the discovery of the selenium issues at Kesterson Reservoir, the State of California and the Department of the Interior undertook a major investigation of the drainage problems and potential solutions for the entire San Joaquin Valley. In 1990 the investigators produced a report outlining a broad spectrum of recommendations for managing the drainage problems in the Valley without the need to export water and salts, at least for several decades.

In 1991, Reclamation developed a plan for drainage specific to the San Luis Unit based in large part on the recommendations of the San Joaquin Valley Drainage Program. Shortly thereafter, landowners in the Unit filed suit seeking, among other things, completion of the Drain to the Delta. In 1995, the Federal District Court found that the San Luis Act imposed a mandatory duty on the Secretary to provide drainage service to the Unit, that failure to do so constitutes agency action unlawfully withheld, and ordered Reclamation to apply for a discharge permit in order to complete the Drain to the Delta. Upon appeal of that Order, the 9th Circuit affirmed that the Secretary has a mandatory duty to provide drainage service to the Unit, but held that the Secretary has discretion to provide that service other than through an interceptor drain to the Delta. Upon remand, the District Court modified its Order, directing the Secretary to, without delay, provide drainage service to the Unit, and to submit to the Court a plan describing the actions it would take to promptly provide drainage to the Unit. Reclamation submitted a Plan of Action to the Court which included preparation of an EIS.

Reclamation has met all its milestones to date that it laid out in the Plan of Action submitted to the Court. A Draft Environmental Impact Statement, published in May, is currently undergoing public review. We are continuing to develop feasibility level designs and cost estimates for alternatives. We are also continuing to field test reverse osmosis and selenium treatment systems in the San Luis Unit, and are working with local water districts to implement on-the-ground drainage projects that are consistent with elements included in our alternatives such as drainage reuse areas. A Record of Decision is scheduled to be completed by July 2006.

Alternatives Upon issuance of the Appeals Court Opinion and subsequent revised District Court Order, Reclamation undertook to evaluate all reasonable alternatives for providing drainage service to the Unit. In identifying and formulating alternatives, we identified four related project objectives the alternatives should meet:

1) the drainage service alternative consist of measures and facilities to provide a complete drainage solution, from production through disposal, avoiding a partial solution or a solution with undefined components;
2) the drainage service alternative be based on technically proven and cost effective components;
3) drainage service be provided in a timely manner; and
4) the drainage alternative minimize adverse environmental effects and risks.

In formulating alternatives Reclamation determined the acreage of land that will require drainage service and has determined a reasonable future drainage output from the Unit. All of the action alternatives use the determined values of drainage output and drainwater quality in the design of project features and in the analysis of environmental effects. Reclamation determined that 298,000 acres in Westlands Water District, or almost half of the District, and about two-thirds, or 81,000 acres, of the northern San Luis Unit and adjacent lands (which is often referred to as the Grasslands Drainage Area) will require service. We estimate the average annual output of drainage from these 379,000 total acres to be 97,000 acre-feet per year.

Although the area is generally already highly efficient in its water use, all of the action alternatives include an estimate of additional reasonable, cost-effective measures that could and are expected to be taken at the farm and district level to reduce the drainage output. We estimate that these measures would reduce drainage output from the 379,000 acres to 70,000 acre-feet per year.

Seven action alternatives are evaluated in the Draft EIS. The alternatives can be grouped by their final discharge location - Delta, ocean and in-valley evaporation. Four alternatives - Delta discharge at one of two potential locations, ocean discharge, and in-valley evaporation, provide drainage service to all 379,000 acres of land that require it. Three additional alternatives combine in-valley evaporation with varying levels of land retirement. Land retirement, defined as removal of lands from irrigated agricultural production, would reduce drainwater production and thus reduce the size of the in-valley treatment and disposal facilities. The alternatives would cease irrigation on 92,600, 194,000 and 308,000 acres respectively, reducing drainage production from 70,000 acre-feet per year to 61,000, 45,000 and 27,000 acre-feet respectively.

Reclamation found it cost effective in all alternatives to further reduce the volume of water requiring disposal through regional drainwater reuse areas. The collected drainage water would be transported to up to 16 regional reuse areas where the water would be applied to salt tolerant crops and forages. Drainage water from the reuse areas would then be treated as necessary and disposed of according to the alternative.

For the ocean disposal alternative, water from the reuse areas would be transported and discharged approximately 1.4 miles off the coast near Point Estero at a depth of about 200 feet.

For the delta disposal alternatives, water from the reuse areas would be processed through a biological selenium treatment plant prior to discharge at one of two locations; near Chipps Island and at Carquinez Straits.

For the In-Valley alternatives, water from the reuse areas would undergo reverse osmosis treatment producing about 50% clean reusable product water. The remaining 50% more concentrated water would undergo selenium treatment prior to disposal in evaporation ponds.

The estimated construction costs identified in the draft EIS of the alternatives range from $589 million to $918 million. On a present worth basis, which is the combined construction and annual operation, maintenance and rehabilitation costs presented as a one time cost, three full-service alternatives - Ocean Disposal, Delta-Chipps Island, and In-Valley Disposal are nearly identical at about $562 million. The In-Valley Disposal with Land Retirement alternatives range from $626 million up to $857 million on a present worth basis. All of the alternatives exceed the spending limit authorized under the San Luis Act.

The Draft EIS does not identify an agency preferred alternative. However, the document does indicate our current thinking that one of the In-Valley alternatives is likely to be the agency preferred alternative. All of the In-Valley alternatives allow for flexibility in implementation, including a phased approach for construction and mitigation and the ability to evaluate and incorporate new technologies. The least net cost alternative is the In-Valley alternative that includes 308,000 acres of land retirement. The In-Valley alternative that includes retirement of 194,000 acres is most closely consistent with a locally developed alternative, the Westside Regional Drainage Plan (SJRECWA et al. 2003).

The Draft EIS discusses alternatives that have not undergone Administration review for technical feasibility, cost-benefit analysis, or budgetability. Additionally, decisions about drainage issues of the San Luis Unit cannot be undertaken in a vacuum, and will be evaluated in the broader context of other south-of-Delta actions, such as those carried out under the CALFED program, and other decisions regarding the management of irrigation water and return flows in the area.

I am pleased to answer any questions.

APPENDIX D-7: Testimony of Gary Bobker on Implementation of WRDP

TESTIMONY OF
GARY BOBKER, PROGRAM DIRECTOR, THE BAY INSTITUTE,
BEFORE THE U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON RESOURCES, SUBCOMMITTEE ON WATER AND POWER, OVERSIGHT HEARING ON
IMPLEMENTATION OF THE WESTSIDE REGIONAL DRAINAGE PLAN AS A WAY TO IMPROVE SAN JOAQUIN WATER QUALITY
July 28, 2005
Washington D.C.

Mr. Chairman, members of the subcommittee:

My name is Gary Bobker. I am the program director at the Bay Institute, a nonprofit conservation organization that works to protect and restore the ecosystems of San Francisco Bay and its watershed. TBI has been active since the mid-1980s in issues involving the management of agricultural subsurface drainage in the Westside San Joaquin Valley. Personally, I helped negotiate the terms of the Grasslands Bypass Agreement and was involved in the effort to secure adequate wastewater discharge requirements for the disposal of drainwaters to evaporation ponds in the Tulare Basin.

Thank you for the opportunity to discuss the challenge of solving the Westside San Joaquin Valley's perennial salt and selenium management problems. For too long after the discovery of widespread and severe wildlife contamination at Kesterson, inadequate drainage management continued to cause waterbird deaths and deformities at evaporation ponds and degraded water quality in the San Joaquin River. For too long, a comprehensive approach to transforming drainage management was impeded by local efforts to revive the San Luis Drain or oppose land retirement initiatives, despite successful initiatives by some parties, such as the Grasslands drainers in implementing the Grasslands Bypass Agreement, to significantly reduce drainage impacts.

In many respects, the Westside Regional Drainage Plan represents an important step forward by local interests themselves towards finally implementing a permanent, economically viable, environmentally responsible, in-valley solution.

First and foremost, the Westside Plan would help achieve the all-important goal of ending discharge of contaminated agricultural drainwaters to the San Joaquin River and the Bay-Delta estuary. These downstream aquatic ecosystems are highly sensitive to – and have been experiencing high levels of – contamination by persistent, bioaccumulative trace elements like selenium. Water quality objectives for selenium in the San Joaquin River have been routinely violated for years, and elevated levels are commonly found in biota throughout San Francisco Bay. Completing the San Luis Drain to the Delta and increasing selenium and other loads to the Bay would have catastrophic effects on the estuarine food web, in an ecosystem where pelagic fish species and food web organisms are already experiencing severe population declines.

Second, the Westside Plan would implement many actions that are consistent with the recommendations contained in our 2003 *Drainage without a Drain* report, issued by a number of conservation groups and downstream water interests, to implement the "Four R's": Reduce, Reuse, Retire, and Reclaim. These actions are also consistent with the findings of the San Joaquin Valley Drainage Program's 1990 Management Plan for Agricultural Subsurface Drainage and Related Problem, also known as the Rainbow Report.

<u>Reduce:</u> An obvious truth is that the less agricultural drainage is created, the easier it is to manage. Installing drip irrigation systems, lining canals, reducing pre-season irrigation and implementing other source control measures are helping the Grasslands Area meet its load reduction requirements, and could dramatically reduce the volume of drainage created throughout the rest of the federal drainage service area. The Westside Plan proposes to implement such source control measures on a regional basis.

<u>Reuse:</u> Keeping subsurface agricultural drainage from reaching sensitive aquatic or wildlife environments does not mean keeping it out of controlled agricultural environments. Applying drainwater to salt-tolerant crops, recycling higher quality water for use on salt-sensitive crops, using drainage for dust control, and other reuse practices could solve as much of the drainage problem as source control. Again, the Westside Plan would pursue re-use projects that could significantly reduce the volume of drainage generated throughout the region.

Reuse facilities are an important part of the drainage solution. If improperly operated, however, the potential for ponding, food web creation, offsite migration, and other opportunities for biological uptake can very quickly make these facilities dangerous to wildlife. Conservative design, strict oversight, dedicated financial reserves for clean-up and mitigation, and independent monitoring systems are key components for making reuse a safe and efficient part of the solution.

<u>Retire:</u> Some lands with elevated sol and shallow groundwater selenium levels are simply too severely impaired to continue to irrigate, because they disproportionately contribute to water quality degradation in the underlying aquifer and in downstream areas. It is a measure of the progress made in developing a common understanding of the Westside drainage problem that local interests now recognize that large-scale land retirement is an integral part of the solution.

In our view, however, more work needs to be done on the Westside Plan's proposed land retirement element. To begin with, between 300,000 and 400,000 acres will need to be retired in the federal drainage service area to prevent continuing water quality degradation from the most severely drainage-impaired lands. The benefits created by retiring all the severely impacted lands is clearly shown in the draft San Luis Drainage Feature Re-evaluation Environmental Impact Statement, where the most comprehensive land retirement option (the In- Valley Drainage Impaired Area Land Retirement alternative) is also the most cost-effective on a regional and national basis, according to the Bureau of Reclamation's own National Economic Development analysis.

In addition, it is unclear how retired lands will be managed, and who will be legally responsible for that management. Permanent cessation of irrigated agriculture or any other activities that may create water quality impacts must be assured, and the United States relieved of any ongoing liability for management of these lands.

Finally, the disposition of water supplies made available by retiring drainage impaired lands needs to reflect the broader obligations of the water right holder, in this case, the Bureau of Reclamation. The Bureau's contractual commitments to deliver water to its customers on the Westside must be weighed against its other statutory and regulatory requirements to comply with state water quality standards, federal and state endangered species protections, and Congressional directives to provide water for fish, wildlife and habitat restoration, among other things. The unfortunate fact is that the Bureau does not fully comply with all these obligations, and some or all of the water supply may be needed in order to come into compliance.

<u>Reclaim:</u> Together, source control, reuse, and land retirement can reduce the volume of contaminated agricultural drainage by over 90%. Treatment technologies are available to reclaim solid salts from the last increment of drainwater, and pilot projects to apply these technologies have begun to be implemented in the Grasslands Area. A number of commercial uses for reclaimed salts exist, and developing a viable market for these salts is the final remaining step in achieving an environmentally and economically efficient solution to the drainage problem. The Westside Plan would build on these early treatment investments and help develop a viable reclaimed salt market.

It is important to emphasize that reclaimed salts are hazardous substances. Any salts that are not marketed must be tightly controlled in order to prevent site and offsite contamination and comply with hazardous waste disposal regulations.

There is a fifth R in play, in addition to the four R's identified in our report: Relief from further drainage service. We understand that some parties may propose to absolve the federal government of any future obligation to provide drainage service in return for helping to underwrite some of the programs contained in the Westside Plan. We look forward to reviewing the details of any such proposal. Certainly such a proposal must also address the specific performance assurances regarding monitoring, liability for managing retired lands, and other important components of the Plan that the federal government should receive from the Westside drainers.

In any case, relief from drainage service should not be confused or conflated with relief from having to comply with water quality regulations. The State of California is in the process of developing new, more protective load limitations for salt and other drainage constituents that are discharged to the San Joaquin River. Pursuing the four R's embodied in the *Drainage without a drain* report and the Westside Plan will ensure that upstream parties will be able to comply with downstream water quality protections. Only those who are not serious about implementing such programs need fear these water quality requirements.

To repeat, implementing the source control, drainage reuse, land retirement, and salt disposal/reclamation measures contained in our report and the Westside Plan would preclude the need for any significant drainage volume to be disposed of. Failing to do so, on the other hand, would create large-scale environmental effects – not just in the sensitive coastal and estuarine aquatic environments affected by ocean or Delta disposal options, but in the San Joaquin Valley itself, where insufficient drainage volume reduction would result in the creation of thousands of acres of new evaporation ponds with elevated selenium levels, which would contaminate wintering and resident waterbirds and require mitigation on an unprecedented scale. This is a future, which can and should be avoided. The Westside Plan, our 2003 report, and the recent draft San Luis Drainage Feature Re-evaluation EIS conclusively demonstrate that an in-valley approach that precludes the need for disposal to ponds, the Delta or the ocean is the best option for solving the drainage problem from both an environmental and economic perspective.

Again, thank you for the opportunity to come before the subcommittee.

Attachment: *Drainage without a drain*

APPENDIX D-7: Presentation for UC Center for Water Resources

UC Center for Water Resources

2006 Salinity and Drainage Conference

"A Local Solution to Salinity Management in the Grassland Drainage Area

and benefits to the San Joaquin River"

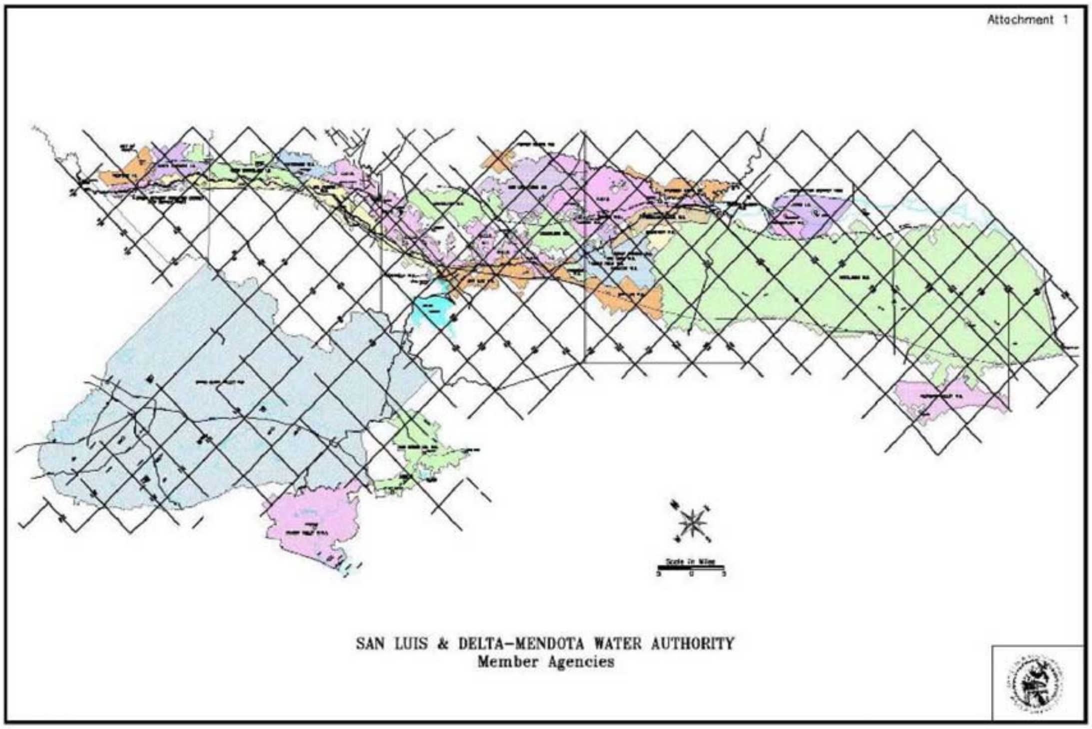
March 29, 2006

Comments on behalf of:

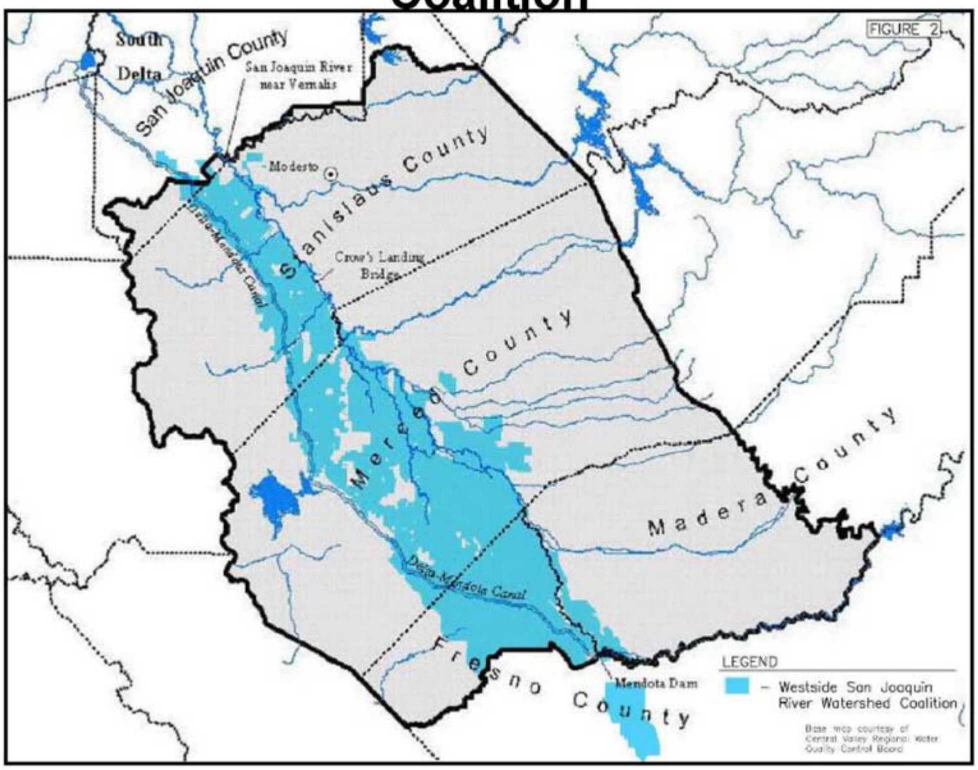
- San Luis & Delta-Mendota Water Authority
- San Joaquin Valley Drainage Authority
- San Joaquin River Exchange Contractors Water Authority
- Grassland Basin Drainers

Joe McGahan

- Westside San Joaquin River Watershed Coalition
- Grassland Bypass Project


Attachment 1
SAN LUIS & DELTA-MENDOTA WATER AUTHORITY
Member Agencies

Westside San Joaquin River Watershed Coalition

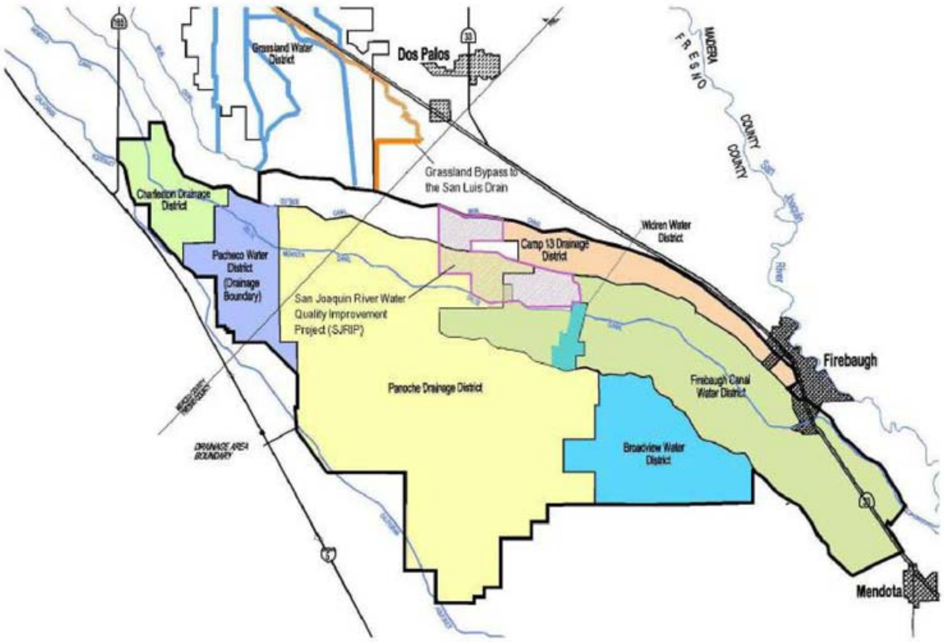


Development of Best Management Practices on the West Side of the San Joaquin Valley

- $40 million projects set to be completed within the next 4 years
- 39 different projects

Example projects:

- Efficient Irrigation System Installation
- Pesticide and sediment BMP development
- Upstream dissolved oxygen studies
- Drainage treatment
- Reuse area infrastructure
- Panoche/Silver Creek watershed studies
- Tailwater return projects



Grassland Drainage Area
San Joaquin River Water Quality
Improvement Project
Location Map

SUMMERS ENGINEERING, INC.
Consulting Engineers
HANFORD CALIFORNIA
SEPTEMBER 2003

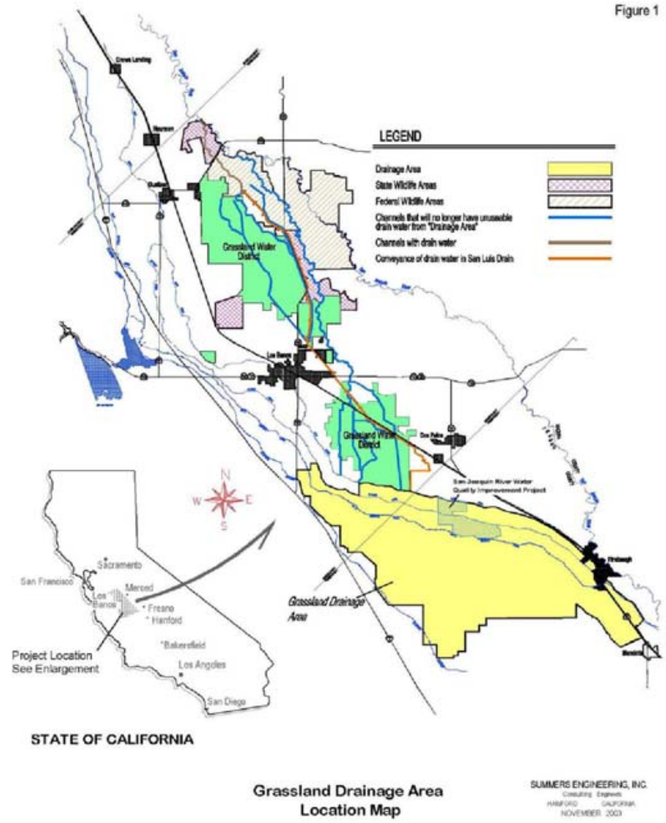
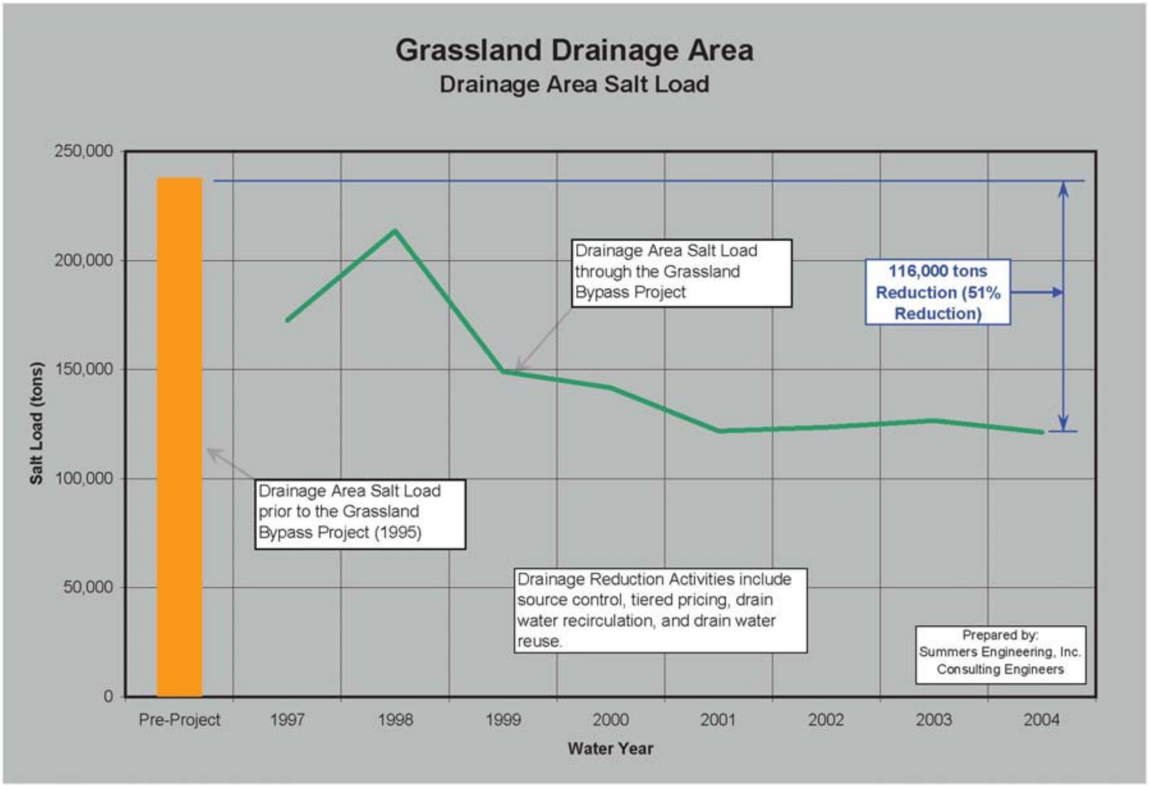


Figure 1
LEGEND
Drainage Area
State Wildlife Areas
Federal Wildlife Areas
Channels that will no longer have unuseable drain water from "Drainage Area"
Channels with drain water
Conveyance of drain water in San Luis Drain
Grassland Water District
Grassland Water District
San Joaquin River Water Quality Improvement Project
Grassland Drainage Area
N
W
E
S
Sacramento
San Francisco
Merced
Los Banos
Fresno
Hanford
Bakersfield
Los Angeles
San Diego
Project Location
See Enlargement
STATE OF CALIFORNIA
Grassland Drainage Area
Location Map
SUMMERS ENGINEERING, INC.
Consulting Engineers
HANFORD CALIFORNIA
NOVEMBER 2003


Grassland Drainage Area
Drainage Area Salt Load
Salt Load (tons)
250,000
200,000
150,000
100,000
50,000
0
Drainage Area Salt Load through the Grassland Bypass Project
116,000 tons Reduction (51% Reduction)
Drainage Area Salt Load prior to the Grassland Bypass Project (1995)
Drainage Reduction Activities include source control, tiered pricing, drain water recirculation, and drain water reuse.
Prepared by: Summers Engineering, Inc. Consulting Engineers
Pre-Project
1997
1998
1999
2000
2001
2002
2003
2004
Water Year

Dennis Falaschi – General Manager
Panoche Drainage District

- Background and SJRIP Drainage Reuse Project

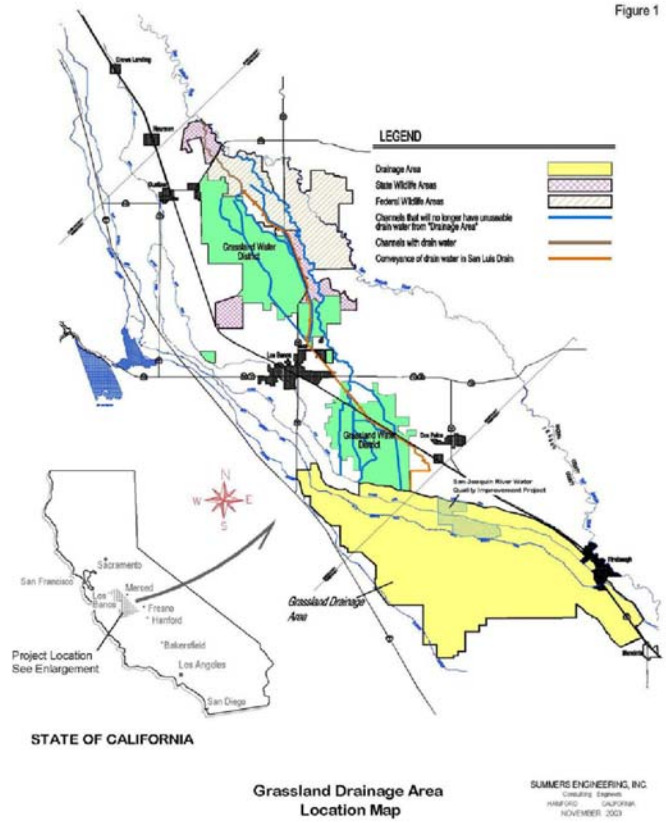


Figure 1
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San Diego
Project Location
See Enlargement
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Grassland Drainage Area
Location Map
SUMMERS ENGINEERING, INC.
Consulting Engineers
HANFORD CALIFORNIA
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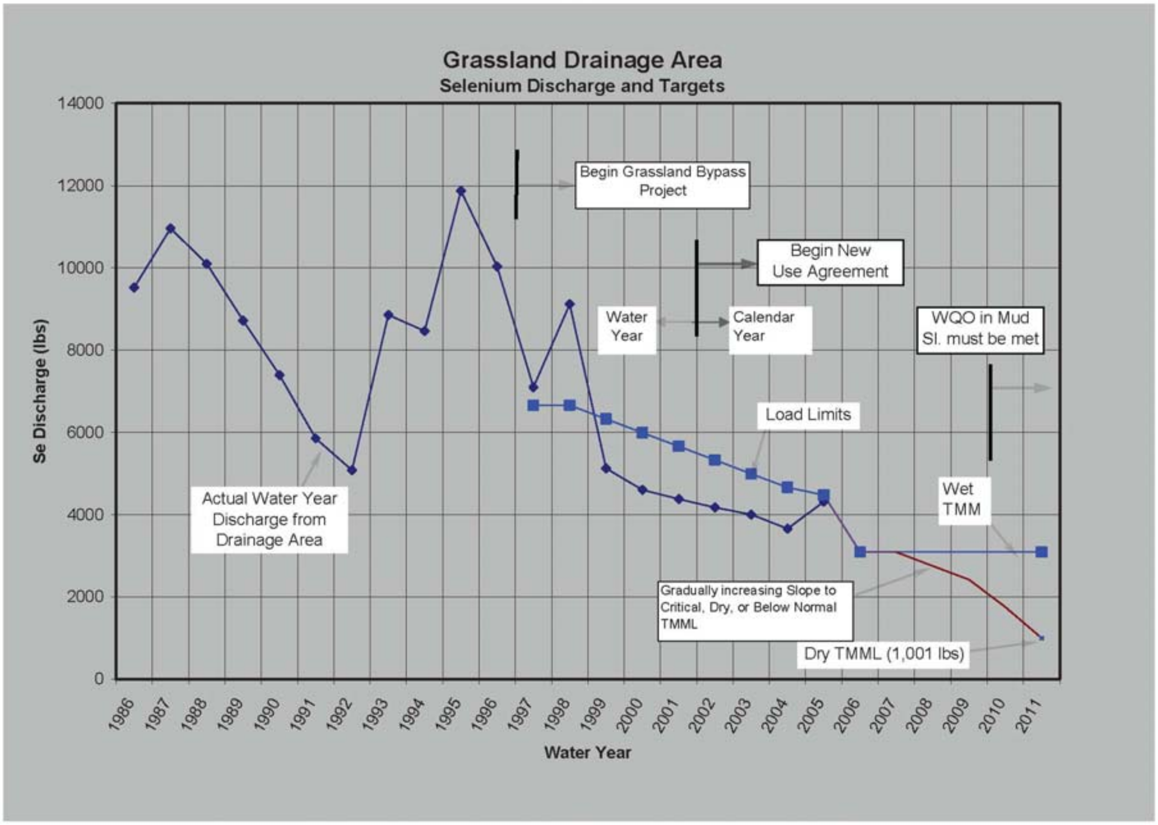
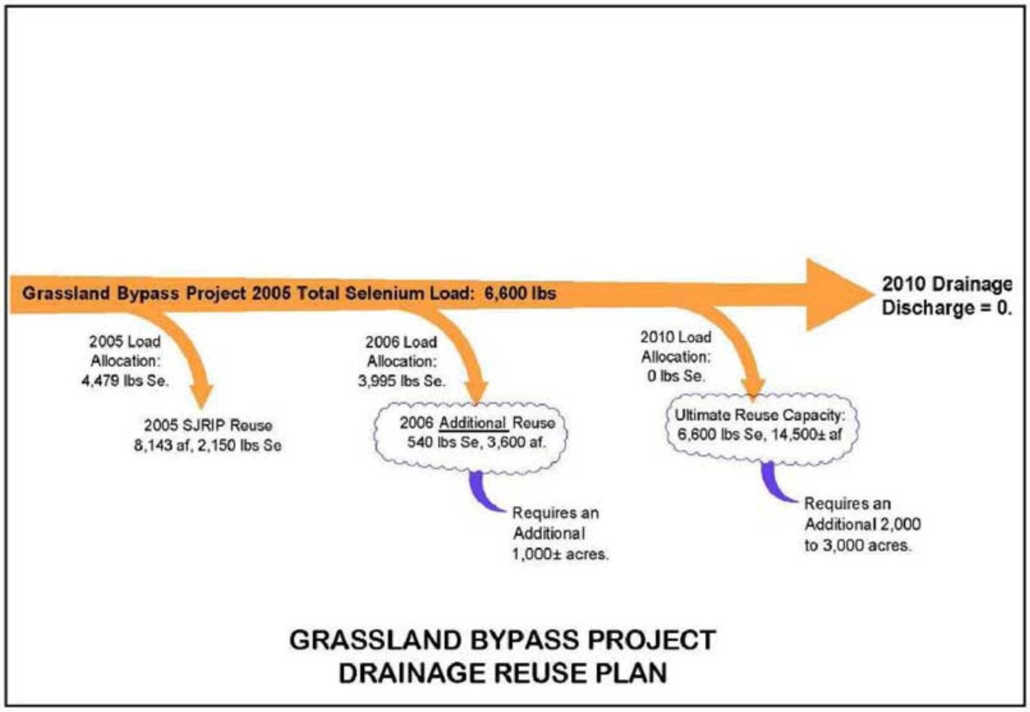

Grassland Drainage Area
Selenium Discharge and Targets
Se Discharge (lbs)
14000
12000
10000
8000
6000
4000
2000
0
Begin Grassland Bypass Project
Begin New Use Agreement
Water Year
Calendar Year
WQO in Mud Sl. must be met
Load Limits
Actual Water Year Discharge from Drainage Area
Wet TMM
Gradually increasing Slope to Critical, Dry, or Below Normal TMML
Dry TMML (1,001 lbs)
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Water Year

Drainage Plan to Achieve Reductions

Accomplished through:

- Reuse of drain water
- Source Control
- Recirculation of drain water
- Treatment of drain water
- Groundwater Pumping (following presentation)


Grassland Bypass Project 2005 Total Selenium Load: 6,600 lbs
2010 Drainage Discharge = 0.
2005 Load Allocation: 4,479 lbs Se.
2005 SJRIP Reuse 8,143 af, 2,150 lbs Se
2006 Load Allocation: 3,995 lbs Se.
2006 Additional Reuse 540 lbs Se, 3,600 af.
Requires an Additional 1,000± acres.
2010 Load Allocation: 0 lbs Se.
Ultimate Reuse Capacity: 6,600 lbs Se, 14,500± af
Requires an Additional 2,000 to 3,000 acres.
GRASSLAND BYPASS PROJECT
DRAINAGE REUSE PLAN

Drainage Reuse

- **Current Project – San Joaquin River Improvement Project (SJRIP)**
  - 3,500 acres of salt tolerant crops
  - Reuse 8,100 af of drain water in 2005
  - Future expansion to about 6,000 acres
  - This provides immediate drainage relief while other projects are being implemented

Jose Tall Wheatgrass

Sunflowers

Source Control

- **Facility Improvements:** Canal lining and piping
- **Irrigation Improvements:**
  1. **Keep pre-irrigation to an absolute minimum (preferably less than 6")**
  2. **Improve irrigation systems**
     - Shorter water runs
     - Drip irrigation
     - Avoid over-watering
  3. **Tailwater Return Systems**

Drainage Recirculation

- **All participating districts have implemented recycling**

Drainage Treatment

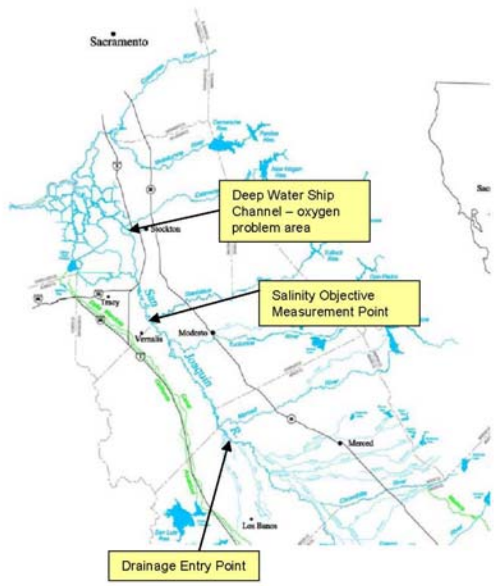
- **Ultimate disposal for salt**
- **Currently in development**
  - Reverse Osmosis (RO) treatment and salt crystallization that will produce a clean water stream and a dry waste product.
- **Pilot Plant planned for this spring**

Chris White – General Manager, Central California Irrigation District

- Development of Westside Regional Drainage Plan

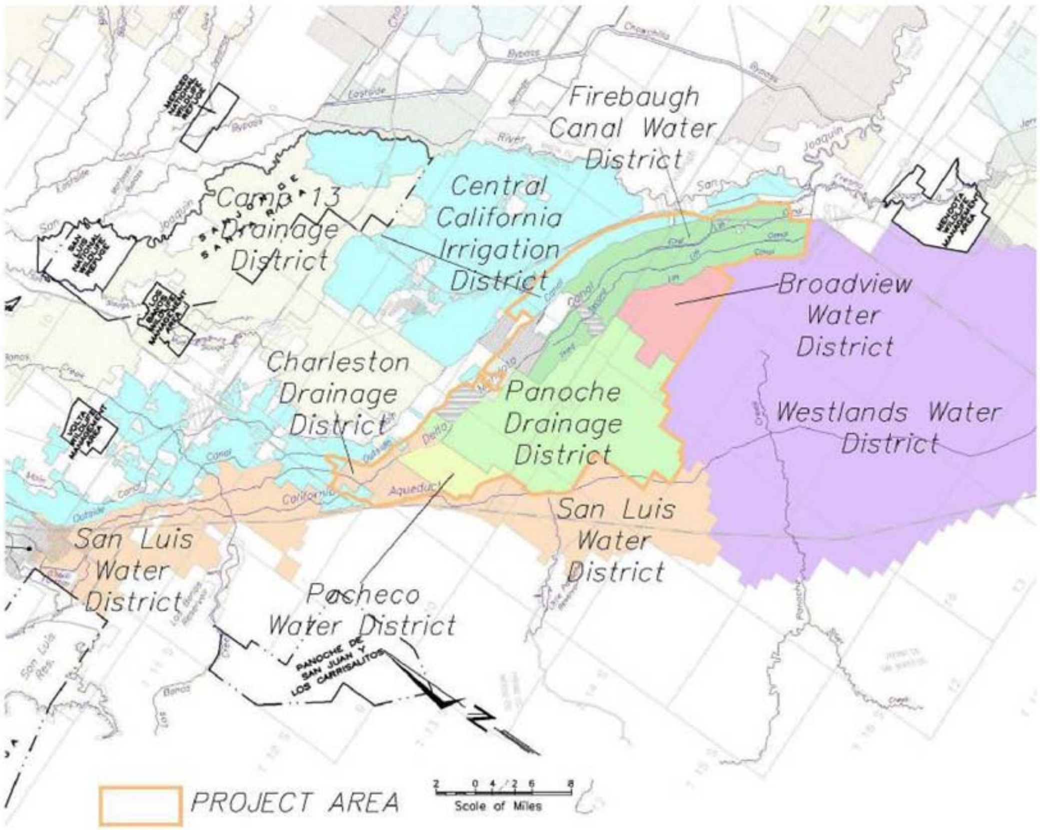
San Joaquin River Water Quality Issues and Drainage Plan Benefits

- San Joaquin River an Impaired Water Body under Clean Water Act
- Total Maximum Daily Load (TMDLs) adopted to address violations
  - Salinity: Restrict loads of salt
  - Dissolved oxygen: Restrict loads of oxygen demand, address flows and ship channel
- USBR Responsibility at Vernalis for Salinity

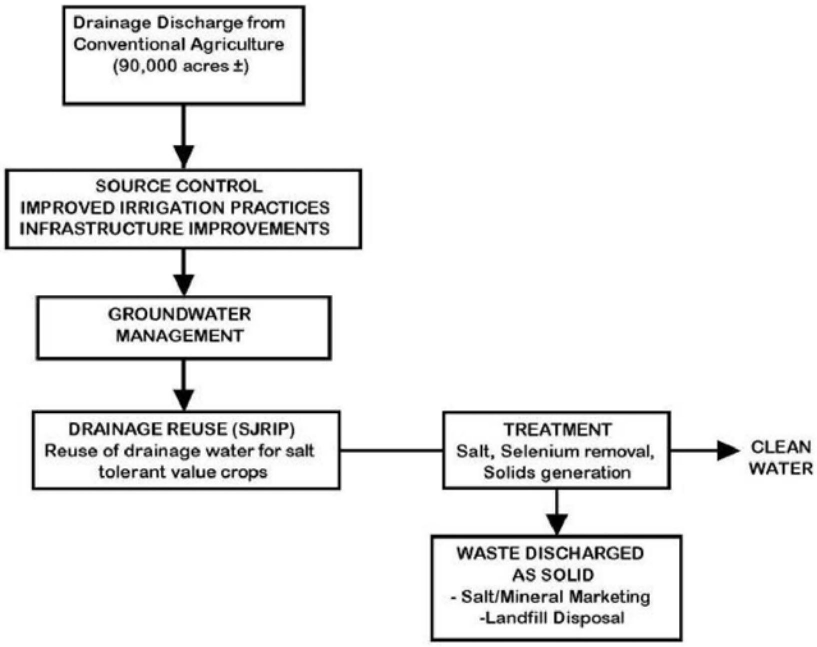


San Joaquin River Water Quality Issues and Drainage Plan Benefits (continued)

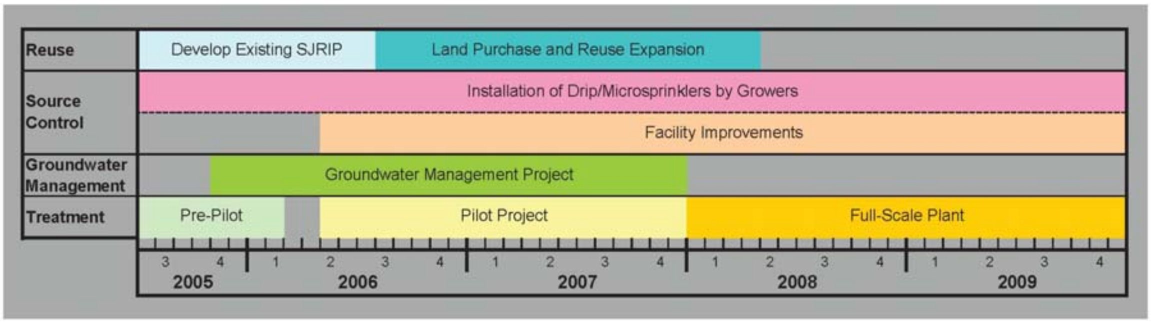
- <u>Benefits of Plan</u>
  - Improves water quality for lower San Joaquin and Delta
  - Reduces salt loads to assist compliance with salinity objective at Vernalis at all times
  - Lessens need for New Melones releases; increases storage for other uses
  - Removes impediment to CALFED Delta Improvements Package
  - Plan is consistent with the USBR San Luis Unit Drainage Feature Re-evaluation


Firebaugh
Canal Water
District
Central
California
Irrigation
District
Camp 13
Drainage
District
Broadview
Water
District
Charleston
Drainage
District
Panoche
Drainage
District
Westlands Water
District
San Luis
Water
District
San Luis
Water
District
Pacheco
Water District
PANOCHE DE SAN JUAN Y LOS CARRISALITOS
PROJECT AREA
Scale of Miles

Solution – Westside Regional Drainage Plan



Project Timeline



Westside Regional Drainage Plan Funding – to date

Grassland Drainage Area
Previous Funding for the In-Valley Drainage Solution

Project	Funding Source	Grant Funding	Loan Funding	District Funding	Total
Grassland Bypass Construction	SWRCB State Revolving Fund		$ 600,000 *		$ 600,000
Charleston D.D. Recirculation System	SWRCB State Revolving Fund		$ 320,000 +		$ 320,000
Charleston D.D. Recirculation System : CH-3	Charleston D.D.			$ 71,200	$ 71,200
Firebaugh Canal W.D. Recirculation Systems	Firebaugh Canal W.D.			$ 271,100	$ 271,100
Pacheco W.D. Drainwater Recirculation System	SWRCB State Revolving Fund		$ 1,375,000 +		$ 1,375,000
Panoche W.D. Drainwater Recirculation System	SWRCB State Revolving Fund		$ 4,228,000 +		$ 4,228,000
Pacheco W.D. Acquisition of Improved Irrigation Equipment	SWRCB State Revolving Fund		$ 737,500 +		$ 737,500
Panoche D.D. Acquisition of Improved Irrigation Equipment	SWRCB State Revolving Fund		$ 4,997,294 *		$ 4,997,294
Panoche D.D. Road Watering Project	Panoche D.D.			$ 12,000	$ 12,000
Westlands W.D. Acquisition and Retirement of Broadview W.D.	Westlands W.D.			$ 27,000,000	$27,000,000
San Joaquin River Improvement Project (SJRIP)					
Land Purchase & Initial Development	Prop 13 (DA)	$ 17,500,000			$17,500,000
2004-05 Development Project	USBR	$ 904,100		$ 95,900	$ 1,000,000
Halophyte Development Project	USBR	$ 290,000		$ 15,000	$ 305,000
Grassland Integrated Drainage Management Proj.	Prop 13	$ 987,200		$ 246,800	$ 1,234,000
PE-5 Pump Station	Panoche D.D.			$ 13,200	$ 13,200
		$ 19,681,300	$ 12,257,794	$ 27,725,200	$59,664,294

* Repaid by the District.
+ Repayment in Progress by District

•Includes $27,000,000 for Broadview Purchase not included in written comments.

Westside Regional Drainage Plan Funding – future funding needed to complete implementation

- $20,820,000 Reuse Project Expansion
- $1,320,000 Broadview Water District Reuse Project
- $20,640,000 Irrigation Improvements
- $10,790,000 Conveyance Facilities Improvements
- $23,430,000 Treatment and Disposal
- $3,000,000 Westlands Water District Groundwater Pumping
- $12,000,000 Deep Groundwater Pumping

$92,000,000 Total