South Orange County Integrated Regional Watershed Management Plan

FINAL JULY 2013

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South Orange County

Watershed Management Area

INTEGRATED REGIONAL

WATERSHED MANAGEMENT PLAN

"An Integrated, Healthy and Balanced Watershed"

2013

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South Orange County Integrated Regional Watershed Management Plan Contacts

County of Orange

Orange County Watersheds
Orange County Department of Public Works
2301 N. Glassell Street
Orange, California 92865
http://www.ocwatersheds.com
MaryAnne Skorpanich Maryanne.skorpanich@ocpw.ocgov.com
Marilyn Thoms marilyn.thoms@ocpw.ocgov.com

IRWM GROUP AGENCIES AND CONTACTS:

City of Aliso Viejo
12 Journey, Suite 100
Aliso Viejo, California *92656*
(949) 425-2500
http://www.cityofalisoviejo.com/
Moya Yahya myahya@cityofalisoviejo.com

City of Dana Point
33282 Golden Lantern
Dana Point, California *92629*
(949) 248-3500
http://www.danapoint.org
Brad Fowler bfowler@danapoint.org
Lisa Zawaski lzawaski@danapoint.org

City of Laguna Beach
505 Forest Avenue
Laguna Beach, California 92651
(949) 497-0328
http://www.lagunabeachcity.net/default.asp
David Shissler dshissler@lagunabeachcity.net
Tracy Ingebrigtsen tingebrigtsen@lagunabeachcity.net

City of Laguna Hills
24035 El Toro Road
Laguna Hills, California 92653
(949) 707-2600
http://www.ci.laguna-hills.ca.us
Ken Rosenfield krosenfield@ci.laguna-hills.ca.us
Humza Javed hjaved@ci.laguna-hills.ca.us

City of Laguna Niguel
27801 La Paz Road
Laguna Niguel, California *92677*
(949) 362-4300
http://www.ci.laguna-niguel.ca.us
Dave Rogers drogers@cityoflagunaniguel.org
Nancy Palmer npalmer@cityoflagunaniguel.org

City of Laguna Woods
24264 El Toro Road
Laguna Woods, California *92637*
(949) 639-0500
http://www.lagunawoodscity.org
Chris Macon cmacon@lagunawoodscity.org

City of Lake Forest
25550 Commercentre Drive
Lake Forest, California 92630
(949) 461-3400
http://www.lakeforestca.gov
Devin Slaven dslaven@lakeforestca.gov
Thomas Wheeler twheeler@lakeforestca.gov

City of Mission Viejo
200 Civic Center
Mission Viejo, California 92691
(949) 470-3000
http://cityofmissionviejo.org
Joe Ames james@cityofmissionviejo.org
Rich Schlesinger rschlesinger@cityofmissionviejo.org

City of Rancho Santa Margarita
22112 El Paseo
Rancho Santa Margarita, California 92688
(949) 635-1800
http://www.cityofrsm.org
E. Maximous emaximous@cityofrsm.org
Joe Parco jparco@cityofrsm.org

City of San Clemente
100 Avenida Presidio
San Clemente, California 92672
(949) 361-8200
http://san-clemente.org/sc/News.aspx?PageID=1
David Rebensdorf drebensdorf@san-clemente.org
William Cameron cameronw@san-clemente.org

City of San Juan Capistrano
32400 Paseo Adelanto
San Juan Capistrano, California 92675
(949) 493-1171
http://www.sanjuancapistrano.org
Ziad Mazboudi zmazboudi@sanjuancapistrano.org

El Toro Water District
24251 Los Alisos Boulevard
Lake Forest, California 92630
(949) 837-0660
http://www.etwd.com
Bob Hill bhill@etwd.com
Dennis Cafferty dcafferty@etwd.com

Irvine Ranch Water District
15600 Sand Canyon Avenue
Irvine, California 92618
(949) 453-5300
http://www.irwd.com
Paul Cook cook@irwd.com
Mark Tettemer tettemer@irwd.com

Moulton Niguel Water District
27500 La Paz Road
Laguna Niguel, California *92677*
(949) 831-2500
http://www.mnwd.com
Joone Lopez jlopez@mnwd.com
Kelly Winsor kwinsor@mnwd.com

Municipal Water District of Orange County
10500 Ellis Avenue
Fountain Valley, California 92728
(714) 963-3058
http://www.mwdoc.com
Karl Seckel kseckel@mwdoc.com
Joe Berg jberg@mwdoc.com
Steve Hedges shedges@mwdoc.com

Santa Margarita Water District
26111 Antonio Parkway
Las Flores, California 92688
(949)459-6400
http://www.smwd.com
Daniel Ferons danf@smwd.com
Don Bunts donb@smwd.com

South Coast Water District
31592 West Street
Laguna Beach, California 92651
(949) 499-4555
http://www.scwd.org
Betty Burnett bburnett@scwd.org

South Orange County Wastewater Authority
34156 Del Obispo Street
Dana Point, California 92629
(949) 324-5421
http://www.socwa.com
Tom Rosales trosales@socwa.com
Brian Peck bpeck@socwa.com

Trabuco Canyon Water District
32003 Dove Canyon Drive.
Trabuco Canyon, California 92679
(949) 858-0277
http://www.tcwd.ca.gov/
Hector Ruiz, P.E. hruiz@tcwd.ca.gov

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LIST OF ACRONYMS

AB	Assembly Bill
ACP	Asbestos Concrete Pipe
AFY	Acre Feet per Year
ASBS	Areas of Special Biological Significance
ATM	Aufdenkamp Transmission Main
BOD	Biological Oxygen Demand
BMP	Best Management Practice
BST	Bacterial Source Tracking
CCA	Critical Coastal Area
CDR	Center for Demographic Research
CDS	Continuous Deflective Separation
CEDEN	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
CTP	Coastal Treatment Plan
CURE	Cleaning Urban Runoff Effectively
DAMP	Drainage Area Management Plan
DBP	Disinfection Byproduct
DNA	Deoxyribonucleic Acid
DRPP	Demand, Runoff, and Pollution Prevention
DWR	Department of Water Resources
EPA	Environmental Protection Agency
ET	Evapotranspiration
ETWD	El Toro Water District
FACC	Funding Area Coordination Committee
FOG	Fats, Oil and Grease
GERA	Gobernadora Ecological Resource Area
GIS	Geographic Information System
HCP	Habitat Conservation Plan
HDD	Horizontal Directional Drilling

ICWM	Integrated Coastal Watershed Management
ID/IC	Illegal Discharge and Illicit Connection
IRP	Integrated Water Resources Plan
IRWD	Irvine Ranch Water District
IRWM	Integrated Regional Water Management
JRTM	Joint Regional Tri-Cities Transmission Main
LRP	Local Resources Program
MGD	Million Gallons Per Day
MNWD	Moulton Niguel Water District
MPN	Most Probable Number
MSCP	Multiple Species Conservation Program
MST	Microbial Source Tracking
MS4	Municipal separate storm sewer systems
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
NCCP	Natural Communities Conservation Plan
NCI	North Coast Interceptor
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
OC	Orange County
OCHCA	Orange County Health Care Agency
OCSD	Orange County Sanitation District
PCC	Portland Concrete Cement
PRC	Poseidon Resources
RAC	Regional Action Committee
RAP	Regional Action Project
RO	Reverse Osmosis
RTP	Regional Treatment Plant
RWQCB	Regional Water Quality Control Board
RWMG	Regional Watershed Management Group
SAMP	Special Area Management Plan

SCE	Southern California Edison
SCWD	South Coast Water District
SERRA	South East Regional Reclamation Authority
SJBA	San Juan Basin Authority
SMWD	Santa Margarita Water District
SOCWA	South Orange County Wastewater Authority
SONGS	San Onofre Nuclear Generating Station
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
SSO	Sanitary Sewer Overflow
TCWD	Trabuco Canyon Water District
TMDL	Total Maximum Daily Load
UV	Ultra Violet
UWMP	Urban Water Management Plan
WIP	Water Importation Pipeline
WMA	Watershed Management Area

SOUTH ORANGE COUNTY WATERSHED MANAGEMENT AREA

2013 INTEGRATED REGIONAL WATER MANAGEMENT PLAN

An Integrated, Healthy and Balanced Watershed

The South Orange County Integrated Regional Water Management (IRWM) Plan has been developed from and coordinates with existing plans and research documents provided by the participating agencies in a manner that identifies and integrates regional projects to improve water supply, protect water quality, enhance the environment, and provide flood risk management. This Plan establishes a priority ranking to help further regional efforts to investigate the feasibility of, and identify funding for, these projects. Individual projects however, will go through the appropriate environmental review and permitting process as funding is secured.

Two new components developed as appendices to the Plan will be adopted at a later date. The first is the Salt and Nutrient Management Plan for which South Orange County Wastewater Authority is serving as the lead agency. The second, the Groundwater Management and Facility Plan, is being led by Santa Margarita Water District on behalf of the San Juan Basin Authority. Both of these appendices are going through a separate review and adoption process by their lead agencies. Members of the Executive Committee, Management Committee, and the public are encouraged to participate in these processes. The review process for the Salt and Nutrient Management Plan has not been finalized by the State Water Resources Control Board so additional steps may be required by the State for this appendix. The Groundwater Management Plan is scheduled to be approved by its lead agencies in October. Once approved by their respective agencies the plans will be presented to the Executive Committee for formal adoption as finalized appendices to the Plan.

1 INTRODUCTION

Located along the scenic and temperate southern coast of California, South Orange County is rich with history. Legacies passed on from native societies, once expansive cattle ranches, and twentieth century entrepreneurial farmers remain a part of the area's culture today. From the landmark Mission San Juan Capistrano near the stunning western coastline to the Cleveland National Forest in the east, South Orange County continues to be a destination known for beauty and a high quality of life.

Following the national migration trends after World War II that drew citizens to Sunbelt cities, the region transitioned into one of the newest areas of urban development in the early 1960's. Several cities incorporated over the subsequent decades, and the population has increased to over 500,000 residents. Most of the coastline is developed, and additional urbanization is anticipated in the backcountry ranch land over the next 20 years. Today, the region's social and cultural makeup includes a unique mix of equestrian lifestyle, authentic Mexican/Hispanic culture, and a progressive business industry.

The region's economy has come into its own from the shadows of Los Angeles to the north and San Diego to the south with a unique technological and business infrastructure. This is demonstrated by the diversity of industries represented – from medical devices to construction – as well as intellectual resources to support this diversity. The recent economic downturn hit the region early and particularly hard, as Orange County was home to countless mortgage brokers, particularly in the sub-prime area. The region's high-tech sector remains a diverse and driving force of the local economy. Venture capital investment appears to be growing again after a sharp decline in the first half of the decade. However, venture capital in the first half of 2009 was below the pace of 2008, suggesting peaks and valleys in future investment. After 10 years of unemployment rates typically lower than the state and U.S. averages, the region's unemployment rate spiked to 9.5% in 2009, which was similar to the rest of the nation. The region's income is rising slower than in past years, increasing 2.4% between 2006 and 2007, compared with 6% between 2005 and 2006, and 5.5% between 2004 and 2005[1]. In 2009, the national inflation rate was negative (deflation), falling 0.34%. As a result, each dollar bought marginally more, but Orange County residents were unlikely to sense the advantage since per capita income declined 5.5% from $51,877 in 2008 to $49,020 in 2009. In 2010, income statistics for both the state and nation indicated a rebound of approximately 3%, reflected in Orange County as well.[2] The unemployment rate in Orange County dropped to 7.0 percent in November 2012, down from the 7.2 percent in October 2012, and below the year-ago estimate of 8.1 percent. This compares with an unadjusted unemployment rate of 9.6 percent for California and 7.4 percent for the nation during the same period. The California Employment Indicator Index, indicates that job growth is sluggish in 2012. Orange County industry employment is showing slight increases and fluctuations with some industries performing better than others, yet overall growth still remains slow due to the extensive impacts associated with the Great Recession. Orange County population growth has slowed. Migration into the County has slowed and even become negative in recent years leaving natural increase as the engine driving growth. Orange County continues to diversify its population yet, while all ethnicities are currently experiencing drops in birth rates, the Latino demographic is largely accountable for the majority of new births and by 2020 the Latino demographic is expected to become the new majority of the population. Overall, Orange County was ranked 38th in population percentage growth from 2000 to 2010 with 5.8%, compared to the state.[3]

Figure 1-1 on the following page shows a map of South Orange County.

[1] Orange County Business Council – Orange County Community Indicators Report - 2010. Available online: www.ocbc.org.

[2] Orange County Business Council – Orange County Community Indicators Report - 2012. Available online: http://cams.ocgov.com/Web_Publisher/Agenda04_03_2012_files/images/O00112-000414A.PDF

[3] County of Orange - OC Economic Indicators Dashboard. December 2012 Metrics. Available online: http://oceconomy.org/population/

Figure 1-1: South Orange County Map

Water is the key element for sustaining South Orange County economies that allow the region to thrive. Significant local investments in water, sewer, and flood infrastructure have been made in the past to allow the area to be served on a reliable basis. Planning and investments to carry the region through the next 25-year planning horizon are critical and are central to preserving the quality of life and planning for flood management; surface runoff management; watershed management; water use efficiency; water supply and reliability; recycled water; habitat preservation, conservation and restoration; water quality protection and improvement; resource stewardship; and related water resource management strategies. Figure 1-2 shows the South Orange County IRWM Plan Goals, which are discussed in further detail below and in Section 4 Objectives.

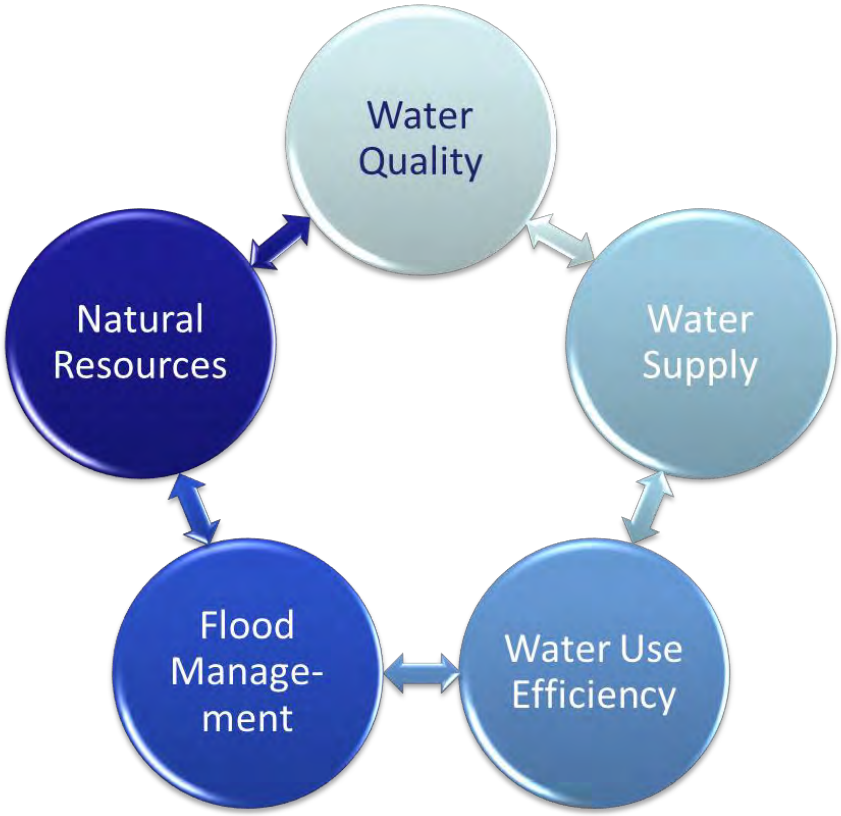

Figure 1-2: South Orange County IRWMP Goals

Water quality improvement efforts over the last decade have resulted in significant improvements in coastal water quality along the County beaches. The Heal the Bay Annual Report (2012) states that the County grades for year-round dry weather were excellent and wet weather grades fair, besting the 5 year average. Coastal and surface water quality remains an important component of the region's IRWM planning. Reducing runoff and improving the water quality in streams and along the beaches is a key goal for the region.

Another key goal of the region is the expansion and protection of the water supply and efficient use of the water. The South Orange County water supply originates predominately from imported sources, making the region subject to conditions and agencies outside of the region. The South Orange County IRWM Plan is aimed at diversifying water sources by developing a variety of local opportunities to decrease the reliance on imported sources. For example, the local San Juan Valley Groundwater Basin has been the subject of multiple management programs for treating existing brackish waters and managing wet year supplies for use during dry year conditions; South Orange County is a leader in implementing water recycling projects turning wastewater into a resource; urban water reuse projects are being developed to help reduce runoff and utilize a local resource; and water conservation projects have been a standard for many years including recent programs using weather-based irrigation controllers. Fiscal resources are also needed to improve the water quality in the local streams to protect the beneficial uses that are listed for these water bodies, and to increase where possible local supply through water reclamation, conservation, stormwater capture/treatment, and groundwater and seawater desalination.

South Orange County is at the forefront of technological and management advances. For example, over the past decade the County of Orange, South Orange County cities, water and wastewater agencies, and interested citizens have been participating in watershed studies for the Aliso Creek, Dana Point Coastal Streams, Laguna Coastal Streams, San Juan Creek, San Clemente Coastal Streams, and San Mateo Creek watersheds. Watershed Management Plans were completed for the Aliso Creek, and San Juan Creek watersheds. These were among the first types of efforts that studied the overall health of the watershed and developed recommendations and actions for implementation on a collective basis among the many partners.

Watershed Workplans[4] have been developed and are regularly updated for the following watersheds in the San Diego Region to comply with Directive G of the San Diego Regional Water Quality Control Board's Order (Regional Board Order No. R9-2009-0002):

- Aliso Creek
- Dana Point Coastal Streams
- Laguna Coastal Streams
- San Juan Creek
- San Clemente Coastal Streams
- San Mateo Creek

[4] OC Watersheds, Watershed Workplans, available online 1/22/13: http://prg.ocpublicworks.com/DocmgmtInternet/Search.aspx

The Watershed Workplans describe the Watershed Permittees' development and implementation of a collective watershed strategy to assess and prioritize the water quality challenges within the watershed's receiving waters, identify and model sources of the highest priority water quality problem(s), develop a watershed-wide best management practices (BMP) implementation strategy to abate highest priority water quality problems, and a monitoring strategy to evaluate BMP effectiveness and changing water quality prioritization in the watershed. South Orange County continues to implement watershed protection and policy compliance.

Another example of the region's progressive approach to water management is the Municipal Water District of Orange County (MWDOC) and the South Orange County water districts water ongoing commitment to system reliability and development of a System Reliability Plan (September 2004). Phase 1 of the study identified both (1) water supply shortages by agency that would occur due to outages of critical components of the regional imported water distribution system, and (2) shortages due to potential supply shortages from extended and severe droughts. The Phase 1 study also identified a range of potential projects that could provide reliability enhancements to mitigate risks of potential regional distribution system outages. This effort provided the foundation for developing candidate water system and supply reliability improvements in Phase 2. The purpose of the Phase 2 plan was to demonstrate the benefits of additional investments to help prevent short-term water shortages caused by facility outages in an area that is over 90 percent reliant on imported water. The Phase 2 plan recommended a number of initiatives to improve water reliability, including ocean desalination in Dana Point to serve South Orange County. Phase 1 & 2 testing of the desalination project was completed from 2005-2007. Activities of Phase 3, Extended Pumping and Pilot Plant Testing, started in 2010 and final reports were completed in May 2012. The final reports are anticipated in summer of 2013.

An update to the 2004 South Orange County Water Reliability Study will be completed in 2013. This update summarizes the considerable investments and improvements resulting from the 2004 study including the ability to sustain short-term supply disruption from several days in the year 2000 to about 16 day or more in 2012. This update also includes a distinction between "system" and "source" reliability. The definitions of each are provided below:

- System Reliability – having the infrastructure to continue meeting customer needs with various parts of the local or regional system out of order. We typically think in terms of days or weeks for durations of outages, although an outage of the Colorado River Aqueduct, the State Water Project, or even parts of the MET system could be out of operation for much longer following a major earthquake.
- Source Reliability – having the water to put into the system on a sustainable basis into the future (main risks are extended drought, regulatory restrictions, and climate change impacts that impose or create delivery shortages on MET). We would typically be looking at shortages affecting us for durations of 1 to 3 years or longer.
- Local Projects that develop a new source of supply provide both system and source benefits.

- Emergency Only Projects provide only system benefits.

Finally, the updated study will include a new list of “system” and “source” reliability projects for consideration to more fully protect the area from longer periods of imported supply system outages and shortages.

The region embraced the Integrated Regional Water Management Planning Act of 2002 to enhance forward planning in an even more coordinated fashion. In 2008, SBX2-1 (Perata) repealed and replaced the Act and appropriates funding from two initiatives passed by voters in 2006 - Proposition 84 and Proposition 1E.

The County of Orange, cities, and water and wastewater agencies of South Orange County formed the South Orange County IRWM Group in 2004 and subsequently developed and adopted the South Orange County IRWM Plan in 2005. The IRWM Group established the South Orange County IRWM region as a cooperative framework for planning and implementing water management strategies in the region.

The South Orange County IRWM Group was recognized as a region during the Proposition 50 IRWM Program Implementation Grant effort in 2005. In 2007, the South Orange County IRWM Region was awarded Proposition 50 funding. Subsequently in 2009 the South Orange County Watershed Management Area (WMA) was recognized as a region during DWR’s Regional Acceptance Process (RAP).

The IRWM Group is incorporating project and planning elements of the South Orange County WMA within the IRWM Plan.

The South Orange County IRWM Group embraces the IRWM model because it brings together short term and long term management strategies that will protect the water supply and water quality of the WMA. The South Orange County agencies maintain the belief that water management strategies can and should be integrated to provide a reliable water supply, protect and improve water quality, and achieve other objectives.

The IRWM Plan is designed to help local agencies and governments manage their water, wastewater, and ecological resources. The purpose of the IRWM Group in developing this Plan is to identify potential projects intended to improve water quality and supply in order to investigate their feasibility, engage in long range water planning, to establish priorities among the proposals of the member entities and obtain potential funding. As the IRWM Plan is implemented, the County, as agent of the State of California, will serve as a conduit for funding to the individual agencies proposing the projects. This IRWM Plan does not commit any resources to implementation of any project nor does its creation constitute a commitment by the County or any member entity to carry out any of the proposed projects. Determinations to proceed with individual projects and required environmental review under the California Environmental Quality Act, will be performed by the individual agencies prior to approval of funding.

Agencies within the coastal zone of South Orange County face unique environmental challenges relative to inland areas, including the protection of millions of visitors who

utilize the ocean for recreation each year, as well as protection of the unique marine resources from polluted runoff. This IRWM Plan includes strategies to comply with Clean Water Act and Porter-Cologne and protect beneficial uses of receiving waters to improve water quality of the coastline. Within the South Orange County WMA, the County coastline includes one ASBS area, Heisler Park Ecological Reserve. In addition, there are three locations within the South Orange County WMA that are on the California's Critical Coastal Areas (CCA) listing – San Juan Creek, Aliso Creek, and Heisler Park Ecological Reserve.

This IRWM Plan also supports the state priorities that relate to the California Water Plan Update 2009, the CALFED Bay-Delta Program, the Department of Water Resources (DWR) Water Recycling Task Force Recommendations, the SWRCB's Recycled Water Policy, Governor Schwarzenegger's 20x2020 Water Conservation Plan of 2010, greenhouse gas (GHG) emissions reduction goals of AB 32, the Water Desalination Task Force Recommendations, the California Ocean Plan, the California Watershed Action Plan, the TMDL List, the comprehensive Orange County Drainage Area Management Plan (DAMP), and the Regional Water Boards Watershed Management Initiative Chapters. The Plan does this through the integration of projects and programs that incorporate a wide range of water management strategies. Beneficial effects from implementation of proposed projects and programs will contribute to the goals and objectives of the local, regional and statewide priorities.

2 GOVERNANCE

The South Orange County Integrated Regional Water Management (South Orange County IRWM) Group was recognized as a region in 2005 during the Proposition 50, Chapter 8 Integrated Regional Water Management Program Implementation Grant (Prop 50) Round 1 effort.

In January 2007, the South Orange County IRWMP was one of seven statewide proposals recommended for funding. In July 2007, the South Orange County IRWM Group executed a Prop 50 Integrated Regional Water Management Implementation Grant Agreement with the State Water Resources Control Board to receive grant funds in an amount of $25,000,000 for the seven highest ranking projects included in the South Orange County IRWMP.

In September 2009, the South Orange County Water Management Area (WMA) was recognized as a Region during the Region Acceptance Process (RAP). The County of Orange was selected to submit the RAP materials on behalf of the South Orange County IRWM Group[5]. This chapter provides description of the composition and structure of the South Orange County IRWM Group, including their role in the WMA, regional watershed management responsibilities, the working relationship of the IRWM Group, and the public outreach process. In addition, this section discusses the relationship between the three IRWM regions within the San Diego Funding Area – San Diego, Upper Santa Margarita, and South Orange County – and the coordination structure within the funding area. The region continues to work together to plan, prioritize, and fund projects in an integrated effort.

2.1 South Orange County IRWM Group

2.1.1 Governance Model for the County of Orange

In June 2003, per direction from the County of Orange Board of Supervisors, the OC Public Works Department, formerly the Resources and Development Management Department, led a task force of city managers and special district general managers, to develop a countywide Water Quality Strategic Plan. The task force proposed a new governance model for water resource management programs based on three geographic sub-areas of the County: the North, Central, and South Orange County Watershed Management Areas (WMA).

WMA Governance Model:

- Continues the watershed approach at a manageable scale
- Is consistent with the likely approach of future stormwater permits
- Facilitates meaningful public and private stakeholder involvement
- Allows for sub-area control of priorities

[5] South Orange County Watershed Management Area – Region Acceptance Process, April 2009

- Is similar to the Measure M structure (renewed Measure M is a local measure that is slated to provide funding for environmental projects and programs)
- Follows the successful model of the Newport Bay Watershed Executive and Management Committees
- Accommodates differences in Regional Water Quality Control Boards
- Accounts for differences in existing infrastructure
- Promotes partnership opportunities, especially between cities and districts
- Fits the logic of the Drainage Area Management Plan
- Allows for optimum use of existing and future funding sources
- Can be accomplished through interagency agreements

From this water quality strategic planning effort, the County of Orange was designated to serve as a regional program administrator. The WMA concept formalizes a partnership between the County, the Orange County Flood Control District, cities, and water and wastewater agencies. It builds upon the long-term cooperative model for managing the countywide municipal stormwater program as well as other desirable features from the partnerships that have been developed to manage Total Maximum Daily Load programs in the Newport Bay Watershed.

2.1.2 Formation of South Orange County WMA

In August 2004, the County, South Orange County Cities, and special districts within the jurisdiction of the San Diego Water Board formed the South Orange County IRWM Group to continue this collaborative effort and to more efficiently coordinate their efforts through the development of an IRWM Plan.

The South Orange County IRWM Group has worked individually and collaboratively over the years to develop integrated regional water management strategies to plan for:

- Flood management
- Surface runoff management
- Watershed management
- Water use efficiency
- Water supply and reliability
- Recycled water
- Habitat preservation
- Conservation and restoration
- Water quality protection and improvement

- Resource stewardship, and
- Related resource management

The South Orange County IRWM Group is comprised of the following cities:

- Aliso Viejo
- Dana Point
- Laguna Beach
- Laguna Hills
- Laguna Niguel
- Laguna Woods
- Lake Forest
- Mission Viejo
- Rancho Santa Margarita
- San Clemente
- San Juan Capistrano

Special districts and agency participants include:

- California State Parks
- City of San Clemente Utilities Divisions
- City of San Juan Capistrano Water Services Department
- The County of Orange
- El Toro Water District (ETWD)
- Irvine Ranch Water District (IRWD)
- Laguna Beach County Water District (LBCWD)
- Natural Resources Conservation Service (NRCS)
- Moulton Niguel Water District (MNWD)
- Municipal Water District of Orange County (MWDOC)
- Orange County Flood Control District (OCFCD)
- Orange County Health Care Agency (OCHCA)
- San Juan Basin Authority (SJBA)

- San Diego Regional Water Quality Control Board (SDRWQCB)
- Santa Margarita Water District (SMWD)
- South Coast Water District (SCWD)
- South Orange County Wastewater Authority (SOCWA)
- Trabuco Canyon Water District (TCWD)

2.1.3 South Orange County IRWM Plan Adoption Status

The 2005 South Orange County IRWM Plan established the County as the lead agency for IRWM Plan implementation, and MWDOC and SOCWA as providers of significant resources and leadership in the South Orange County WMA. Therefore, the Board of Directors for each of these three agencies adopted or accepted the IRWM Plan by resolution as follows (refer to Appendix D): The Orange County Board of Supervisors accepted on June 7, 2005, Resolution No. 05-143; the MWDOC of Directors adopted on June 15, 2005, Resolution No. 1768; and the SOCWA Board of Directors adopted on June 2, 2005, Resolution No. 2005-07. In addition to the resolutions stated above, the following IRWM Group participants adopted, accepted, or approved the IRWM Plan in 2005:

Resolutions of Adoption

- City of Aliso Viejo
- City of San Juan Capistrano
- El Toro Water District
- Municipal Water District of Orange County
- San Juan Basin Authority
- Santa Margarita Water District
- South Coast Water District
- South Orange County Wastewater Authority
- Trabuco Canyon Water District

Resolutions of Acceptance

- City of Dana Point
- City of Laguna Beach
- City of Laguna Niguel
- City of Laguna Woods
- City of Mission Viejo

- City of San Clemente
- The County of Orange
- Moulton Niguel Water District

Resolutions of Support

- City of Laguna Hills
- City of Rancho Santa Margarita

Letters of Support

- City of Lake Forest

The South Orange County IRWM Plan was updated in 2013 to meet the Proposition 84 state guidelines. The 2013 IRWM Plan went through the same adoption process established for the 2005 IRWM Plan and was adopted by the IRWM Group. The resolutions adopting the 2013 IRWM Plan Adoption are included in Appendix D.

2.2 South Orange County WMA Structure and Process

To further solidify this collaborative effort the South Orange County IRWM Group has established a Cooperative Agreement (included in Appendix A) amongst its members. The Agreement provides a framework for planning and implementing water management strategies in the South Orange County WMA and executing an effective decision making process. The cooperative efforts may include but are not limited to addressing water quality impairments, establishing priorities for water resources needs; integrating water resource solutions across traditional disciplinary bounds; and jointly advocating for policies and funding that assist these goals. Through authority of this Agreement the South Orange County IRWM Group has established an Executive committee through which the South Orange County WMA shall be governed and decision making will be effectively accomplished. A Management Committee was also formed to support the Executive Committee, and other Ad Hoc or Standing Committees, as created by the Executive Committee, may also be formed. Figure 2-1 below shows the organizational structure of the South Orange County IRWM Group.

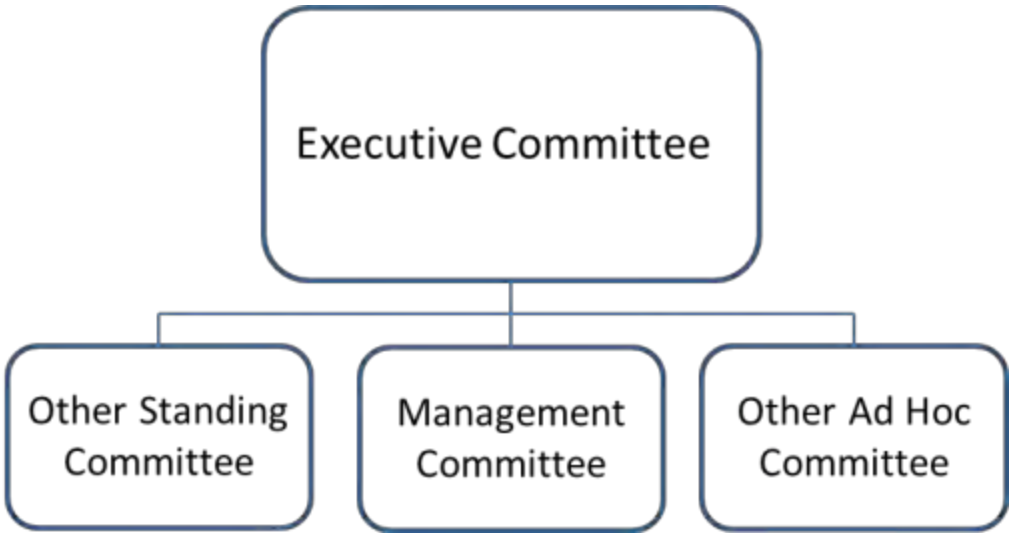

Figure 2-1: South Orange County WMA Governance Structure

2.2.1 Executive Committee

The South Orange County WMA adopted Cooperative Agreement and decision-making framework is governed by the Executive Committee (EC) of the South Orange County IRWM Group. Each of the parties shall appoint an elected or executive level official from its organization to serve as its member and alternate on the Executive Committee. Representatives will serve on the Executive Committee at the pleasure of their appointing party. Each of the parties shall designate a senior staff person as the point of contact to fulfill the intended purpose of the Agreement. For non-voting parties, the representative will be a director or officer of the organization. On matters on which the Executive Committee votes, each voting member shall have one vote. Actions of the Executive Committee shall be approved upon the affirmative vote of a majority of the representatives present. A simple majority of the Executive Committee shall constitute a quorum.

The Executive Committee will have the following duties and powers:

a. Identify and prioritize water resource issues, problems and improvement projects.

b. Establish policy direction for the South Orange County WMA and its committees.

c. Approve an annual work plan for the South Orange County WMA.

d. Approve an annual cost-shared budget for the administration and activities of the South Orange County WMA, its committees, projects, or actions, including any administrative support for the South Orange County WMA.

e. Approve significant updates of the South Orange County IRWM Plan and its prioritized lists of projects and activities.

f. Approve grant applications for funding South Orange County WMA projects or programs.

g. Allocate any new non-grant revenue sources available for South Orange County WMA projects based on capital improvement plan priorities.

h. Encourage and facilitate voluntary agreements between the parties to fund and implement South Orange County WMA projects and programs.

i. Review and report to the parties as to whether adequate and reasonable progress is being made on water quality and water resource issues in the South Orange County WMA.

j. Elect a chair and vice-chair.

k. Meet upon the request of the chair, but at least every six months unless the parties agree to meet less frequently.

l. Convene committees and workshops as deemed appropriate.

m. Establish procedures and rules of conduct for the group, as needed.

The Executive Committee cannot bind the parties' respective organizations. All recommendations of the Executive Committee requiring funding or action on behalf of any party are subject to approval by the parties' governing bodies and subject to the budget process governing those bodies.

2.2.2 Management Committee

The Management Committee (MC) composed of an executive level manager or executive officer from participating agencies will meet, as appropriate, for the purpose of discussing IRWMP implementation and refinement issues, and to provide recommendations to the EC and South Orange County IRWM Group. The Management Committee will implement interim and long-term updates and/or amendments to the IRWMP approximately every five years or as needed. The MC will perform strategic decision making, make project recommendations, coordinate project implementation, and provide program advocacy. Activities of the MC will facilitate focused and streamlined South Orange County IRWM Group meetings. These representatives have voting authority and are hereinafter referred to as Voting Management Committee members (VMCM).

The MC will have the following duties and responsibilities:

- To recommend an annual cost-shared budget for the administration and activities of the SOC WMA, its committees and projects or actions.
- To recommend an annual work plan for the SOC WMA for updates and implementation of the SOC IRWMP, including updates that may be funding source specific.

- To recommend the multi-year capital improvements plan and funding source specific prioritizations that would support implementation of the IRWMP.
- To make recommendations for the allocation of any revenue such as grant funding that the SOC WMA receives to projects and activities based on priorities articulated in the IRWMP.
- Where consensus exists, to authorize the County to apply for grants or seek other funds to support the implementation of the SOC IRWMP
- With staff, prepare recommendations for the allocation of any revenue that the SOC WMA receives for projects and activities based on priorities of the IRWMP.
- To initiate studies or investigations of the feasibility or appropriateness of projects or courses of action within the scope of the SOC IRWMP.
- To monitor performance of the SOC IRWMP implementation and projects to ensure quality efforts are accomplished.
- To evaluate implementation projects and efforts to recognize successful projects and efforts and to improve performance of less successful projects.
- To ensure performance, analytical and other data and information is managed in a manner that allows it to be accessed and utilized for the benefit of the SOC WMA and the State.

For other State and Federal agencies, the representative will be a general manager, or executive officer of the organization. These representatives do not have voting authority but will participate in an advisory capacity and are hereinafter referred to as Non-Voting Management Committee members.

On matters on which the Management Committee votes, each representative shall have one vote. Actions of the Management Committee shall be adopted upon the affirmative vote of a majority of the Management Committee present. A simple majority of the Management Committee shall constitute a quorum. The Management Committee will meet as needed but no less than four times per year.

2.2.3 Other Standing Committees or AdHoc Committees

Other Standing or AdHoc Committees shall function solely as an advisory committee to the Management Committee. The Committees may provide advice and information on plan objectives, priorities and programs.

The County of Orange will lead quarterly IRWM Plan meetings with the IRWM Group. Group members may expand or contract as appropriate from time to time. The quarterly meetings will focus on status of plan and project implementation; project funding; monitoring, data management and reporting, and review and consideration of regional priorities and necessary refinement. The County will be responsible for drafting and distributing meeting minutes to the IRWM Group.

The Committees will continue to meet, as determined appropriate, for the purpose of discussing IRWM Plan implementation and refinement issues, and to provide recommendations to the IRWM Group. All committee meetings will be open to the public. The County will provide staff to support the South Orange County IRWM Group and its committees. The Committees will continue to perform strategic decision making, project recommendations, coordination of project implementation, and provide program advocacy. Activities of the Committees will facilitate focused and streamlined IRWM Group meetings.

This three-layer method of administration will promote partnership opportunities between cities and special districts, as well as elected officials and non-elected representatives. It will also facilitate ongoing and meaningful public and private stakeholder involvement, group participation and decision making, while focusing on one administering agency for coordination and management. The administrating agency will be accountable to the IRWM Group and outside funding sources that require regional applications and agreements.

Each South Orange County IRWM Group member shall provide appropriate staff to actively participate in IRWM efforts and committees. Decisions regarding the SOC WMA will be determined primarily by consensus but for matters on which the EC and MC vote, each member with voting privileges shall have one vote. Actions of the EC and MC shall be adopted upon the affirmative vote of a majority of the committee present. A simple majority shall constitute a quorum.

2.3 Regional Water Management Responsibilities

The following sections describe the South Orange County IRWM Group varying levels of regional water management responsibility.

2.3.1 City Participants

The water management responsibilities of the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente and San Juan Capistrano are largely tied to surface runoff and their roles as members of the Orange County Stormwater Program, a collaborative program between the County of Orange, all incorporated cities within the County, and the Orange County Flood Control District (OCFCD), formed to comply with the requirements of Municipal National Pollutant Discharge Elimination System Municipal Separate Sewer System (NPDES MS4) Permits. The Orange County Stormwater Program (OCSP) own and operate MS4s, therefore they are required under the Federal Clean Water Act to obtain an NPDES MS4 permit to:

- Effectively prohibit non-stormwater discharges into the MS4, and
- Develop controls to reduce the discharge of pollutants from MS4s to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as Administrator or the State determines appropriate for the control of such pollutants.

In response to these regulations the OCSP has obtained, renewed, and complied with NPDES MS4 permits from both the Santa Ana and San Diego Regional Water Quality Control Boards since 1990. They have also developed a Drainage Area Management Plan, which contains the specific water pollutant control program elements for the OCSP and serves as their primary policy and implementation document for compliance with NPDES MS4 permit requirements.

In order to effectively carry out the requirements of the OCSP, the Permittees in both Regional Board areas agreed that the County would be the Principal Permittee and the OCFCD and the incorporated cities would be Permittees. As the Principal Permittee, the County has managed the overall stormwater program cost effectively by combining resources to complete activities that benefit all of the Permittees. The County, as Principal Permittee, collaborates with all Permittees by facilitating the following:

- Providing administrative and technical support for the Permittees and the committees within the management structure;
- Developing and executing inter-governmental agreements necessary for program implementation;
- Planning and implementation needed to direct and implement the program for short and long term;
- Developing Best Management Practices (BMPs);
- Developing reports and other materials required by the NPDES MS4 permits;
- Developing budgets and fiscal analyses;
- Reviewing and developing policy positions and representing the Orange County Stormwater Program before appropriate agencies; and
- Program coordination with all affected local government agencies.

The following is a brief description of each of the member cities:

City of Aliso Viejo: Aliso Viejo is a 7.5 square mile planned community with a population of approximately 49,477. Land use within the city consists of 1605 acres residential, 508 acres commercial, 293 acres community facilities, and 1330 acres open space. Approximately 85% of the city lies in the Aliso Creek Watershed. The remaining portion in the northwest part of the city drains to the Laguna Coastal Streams Watershed.

City of Dana Point: Dana Point lies directly on the Pacific Coast. The city covers an area of approximately 6.5 square miles with a population of approximately 33,863 people. Land uses within the city consist of: 2488 acres residential, 327 acres commercial and office, 18 acres industrial, and 1316 acres community, open space, and Harbor Marine Land & Transportation. The City falls within three watersheds: Dana Point Coastal Streams, San Juan Creek, and San Clemente Coastal Streams.

City of Laguna Beach: Laguna Beach covers an area of approximately 8.8 square miles with a population of about 23,105 people. Developed land use within the city consists of 35% residential, 4% commercial uses, and 1% each industrial and institutional.

Undeveloped open space, recreational, and environmentally sensitive lands make up approximately 50% of the total area. The majority of these areas drain into the Aliso Creek and Laguna Coastal Streams watersheds.

City of Laguna Hills: Laguna Hills covers an area of approximately 6.7 square miles. The City has a population of just over 30,703 people. It is located in central Southern Orange County, and does not border the coastline. The City falls within three major watersheds: San Juan Creek, Aliso Creek, and the San Diego Creek (part of Central WMA).

City of Laguna Niguel: Laguna Niguel is a 14.8 square mile planned community in South Orange County. Existing and planned use of Laguna Niguel includes 3,603 acres residential, 467 acres commercial, 134 acres mixed uses, 211 acres public/institutional facilities and 3,763 acres designated to parks and open space. The city has an estimated 64,065 residents as of 2010. Land formations in the City of Laguna Niguel drain into three major watersheds: Aliso Creek, Dana Point Coastal Streams/Salt Creek, and San Juan Creek/Oso Creek.

City of Laguna Woods: Sitting on roughly 3.1 square miles, the City of Laguna Woods is home to about 16,500 residents and is primarily a residential community. Land use within the city consists of approximately; 91.8 acres commercial, 1310.9 acres residential, 447.6 acres open space, and 75.9 acres of an urban activities center. The City drains into three major watersheds: Aliso Creek, Laguna Coastal Streams, and Newport Bay watersheds.

City of Lake Forest: The City of Lake Forest is a master-planned city located between Interstate 5 and Saddleback Mountain in the central portion of South Orange County. The City has a population of 78,501 people within 17.8 square miles. Land uses within the city include 3,618 acres of residential, 3,311 acres of open space/parks, 727 acres of commercial/professional office, and 1,086 acres of business park/light industrial. Lake Forest falls within the Aliso Creek and Newport Bay Watersheds.

City of Mission Viejo: The City of Mission Viejo is one of the original master planned communities in South Orange County, with the first homes being built and sold in 1966. The City is approximately 17.7 square miles in size with a population of approximately 94,824. The City has approximately 30% of the land area dedicated to open space and parks. The remaining uses are approximately 60% residential and 10% commercial/light industrial. About 80% of the City is within the San Juan Creek Watershed, while the remaining 20% lies within the Aliso Creek Watershed.

City of Rancho Santa Margarita: The City of Rancho Santa Margarita is a small urban community located in the eastern portion of South Orange County along the Santa Ana Mountains. The City covers approximately 13 square miles, and is home to approximately 48,550 residents. Land use within the city consists of: 1,660 acres residential, 422 acres commercial, 191 public, 4,872 open space/parks, and 299 acres other. The city drains primarily into San Juan Creek Watershed, and partially into Aliso Creek Watershed.

City of San Clemente: The City of San Clemente covers an area of about 18.7 square miles and has a population of approximately 64,542 people. Land use in the City

consists of approximately 3,959 acres residential and 233 acres commercial. The city drains primarily into the San Clemente Coastal Streams Watershed, with which it shares almost an identical boundary. Small portions of the city also drain to the San Mateo Creek Watershed.

City of San Juan Capistrano: San Juan Capistrano is home to about 35,321 people and occupies 14.1 square miles. The city land uses consists of 3,592 acres of residential, 889 acres of non-residential, 3,404 acres of open space and recreational land, and 1,090 acres of other uses (e.g., roadways, highways). San Juan Capistrano lies within the San Juan Creek Watershed.

2.3.2 Special Districts and Agency Participants

California Department of Parks and Recreation: The California Department of Parks and Recreation seek to provide for the health, inspiration and education of Californians by helping to preserve the state's biological diversity, protecting natural and cultural resources, and creating opportunities for outdoor recreation. They have jurisdiction over several natural areas in South Orange County, including Doheny State Park Beach, San Clemente State Beach and Corona Del Mar State Beach.

City of San Clemente Utilities Division: The City of San Clemente Utilities Division covers a service area of 14.2 square miles. The City's Utility Division provides water and sewer service to a population of approximately 59,000. The city maintains 210 miles of water lines and 14 storage reservoirs, 16 pump stations, 56 pressure reducing stations, and well water capacity up to 1,100 acre-feet. In addition, the city maintains 180 miles of sewer lines, 12 sewer lift stations, a 6.9 MGD Water Reclamation Plant, and 62.5 miles of storm drain lines with 1,880 catch basins run through the City.

City of San Juan Capistrano Water Services: The City of San Juan Capistrano's Public Works Department took over operation of the Capistrano Valley Water District in 1997. The City of San Juan Capistrano services an area of approximately 14.4 square miles. The existing service area population is 37,233 and is projected to increase to 41,725 by ultimate build out in the year 2020. The City's system consists of 33 separate pressure zones, which include 190 miles of pipelines, ten reservoirs, nine booster pump stations, 2 imported sources of domestic water supply, two potable water wells, and a 5 million gallon per day (MGD) groundwater recovery plant. The City currently supplies an average daily demand of 7.44 MGD, with a maximum daily demand of 14.14 MGD.

County of Orange: The County of Orange, represented in this process primarily by OC Watersheds Program, is active in integrated water management in various ways. The County of Orange is both a landowner and a regional planner for the area, and is engaged in various municipal operations such as roads and flood control. Furthermore, the County is partnered with each city and the Orange County Flood Control District to comply with NPDES MS4 permit requirements. Through OC Watersheds Program, the County of Orange has been the primary coordinator for regional water quality testing, inspection, education and report compliance. The County has jurisdiction over several County beaches, parks, and facilities including Dana Point Harbor.

El Toro Water District (ETWD): ETWD provides water service to approximately 52,170 residents situated on 8.5 square miles. ETWD owns and operates the largest covered

drinking water reservoir in the County with a capacity of 275 MG. Their average annual daily water demand is 9 MGD. Additionally, they provide sanitation services through their wastewater treatment plant. Serviced communities include Aliso Viejo, Lake Forest, Laguna Hills, Laguna Woods, and portions of Mission Viejo.

Irvine Ranch Water District (IRWD): IRWD provides drinking water, wastewater collection and treatment, recycled water, and surface runoff treatment to more than 330,000 residents in Central and South Orange County. Wastewater is treated at the Michelson Water Reclamation Plant and the Los Alisos Water Reclamation Plant providing recycled water for landscape irrigation, agriculture, industrial and commercial needs. The IRWD service area encompasses nearly 181 square miles. IRWD serves the city of Irvine and portions of Tustin, Newport Beach, Costa Mesa, Orange, and Lake Forest, Santa Ana, and unincorporated Orange County. In the South Orange County WMA, IRWD provides water services to 13,725 people.

Laguna Beach County Water District (LBCWD): The District operates and maintains the Aufdenkamp and the Coast Supply transmission lines which provide water from the Colorado River and Northern California. LBCWD provides water services to 25,000 people within an 8.5 square mile area of Southern Orange County, including portions of the city of Laguna Beach, a portion of Crystal Cove State Park, and the unincorporated community of Emerald Bay. LBCWD services mainly residential water users. The District sells about 4,500 acre feet of water annually. In an effort to supply a reliable source of water for the community, the LBCWD is looking to resume its groundwater pumping in the Santa Ana River Basin in addition to other water supply projects.

Moulton Niguel Water District (MNWD): MNWD provides imported water, recycled water and wastewater collection and treatment for approximately 166,964 residents in an area of 36.5 square miles and includes the City of Laguna Niguel and portions of the cities of Laguna Hills, Mission Viejo, Dana Point, and Aliso Viejo. In 2008-2009, MNWD imported 33,100 AF of water from MWD. In the same year the recycled water demand of MNWD was 8,000 AF. MNWD is participating in the Baker Water Treatment Plant, the Upper Chiquita Reservoir, and the South Orange Coastal Desalter.

Municipal Water District of Orange County (MWDOC): MWDOC provides imported water to more than two million Orange County residents through 27 cities and water districts and two private water companies. MWDOC's service area is a total of a 600 square-miles. In order to maintain a more reliable water supply, MWDOC continues to implement a number of projects including storage, recycling, conjunctive use with groundwater basins; ocean desalination, and groundwater development that will contribute to enhanced water reliability.

Orange County Flood Control District (OCFCD): Orange County Flood Control District (OCFCD) is a separate political entity, governed by the County Board of Supervisors and staffed by OC Public Works. OCFCD's purpose is to: (1) control flood and storm waters within the County boundary, and streams flowing into the County; (2) improve channels to remove or reduce flood flows to containment within the FEMA Special Flood Hazard Area (SFHA) also known as the 100-year floodplain; (3) improve deficient channels in accordance with OCFCD criteria to convey the 100-year storm event;(4)

mitigate the effects of tides and waves; and (5) to protect the harbors, waterways, public highways, and property in the County from such waters.

Orange County Health Care Agency (OC HCA): The OC HCA is dedicated to protecting and promoting the optimal health of individuals and families through partnerships, leadership, policy development and service. The agency is highly involved with water quality in the WMA, and is responsible for water quality sampling at over 150 locations along the County coastline, an activity that has been ongoing for 45 years.

San Diego Regional Water Quality Control Board (SDRWQCB): The SDRWQCB makes critical water quality decisions for its region, including setting standards, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions.

San Juan Basin Authority (SJBA): The SJBA was created in 1971 as a Joint Powers Authority for the purpose of carrying out water resources development of the San Juan Basin (Basin). The current members of the SJBA are the Santa Margarita Water District, MNWD, City of San Juan Capistrano Water Services Department, and the South Coast Water District. These districts are the major retail water agencies within the basin.

Santa Margarita Water District (SMWD): SMWD services 62,000 acres with a population of 150,000 with potable water and recycled water and operates three sewage treatment plants. Communities serviced include Rancho Santa Margarita, Los Flores, Coto de Caza, Mission Viejo, Ladera Ranch and Talega. SMWD operates 30 domestic reservoirs containing 298 million gallons of water.

South Coast Water District (SCWD): SCWD delivers an estimated 6,532 acre-feet of potable water per year, treats four million gallons of wastewater per day and provides recycled water to the 45,000 residents within their service area. Current water storage capacity is 40.9 million gallons. The District's potable water distribution system consists of 147 miles of pipelines, 11 pump stations, 1,500 fire hydrants, 1,700 valves, and 16 reservoirs that can store 22 million gallons of water. The SCWD sewer collection system consists of 136 miles of gravity pipelines, 14 lift stations, approximately 3 miles of force mains and 3,408 maintenance holes.

South Orange County Wastewater Authority (SOCWA): SOCWA was created as a regional Joint Powers Authority with ten member agencies in 2001. Its mission is the collection, transmission, treatment, and disposal of wastewater; the reclamation of wastewater for beneficial reuse as recycled water on behalf of its member agencies; and the treatment, disposal and beneficial reuse of wastewater biosolids. The authority serves approximately 520,000 residents in a 220 square mile service area which is roughly co-terminus with the area of the IRWM Plan. The SOCWA operates four regional wastewater treatment plants and two ocean outfalls.

Trabuco Canyon Water District (TCWD): TCWD is located in the Southeastern portion of the County at the foothills of the Santa Ana Mountains and encompasses approximately 9,100 acres. It serves an estimated population of 13,665 in the City of Rancho Santa Margarita and unincorporated area of the County; specifically the communities of Dove Canyon, Robinson Ranch, Trabuco Highlands, Walden, Rancho

Cielo, Portola Hills, Santiago Canyon Estates and Fieldstone, a section of Portola Hills. TCWD supplies approximately 3,700 acre-feet of potable water through imported wholesale water supplies and local ground water. TCWD also provides wastewater, reclaimed water, and recycled water service to major communities within TCWD's service area.

2.3.3 Other Participants in the South Orange County IRWM Group

Audubon Starr Ranch: The National Audubon Society is an over 100 year old 501(c)3 nonprofit organization whose mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity. Starr Ranch is a 4,000 acre Audubon California sanctuary in southeast Orange County, California. Our mission is to offer innovative approaches to land management and environmental education that will influence the way Orange County citizens appreciate, conserve, and manage wildlands.

California Department of Fish and Wildlife (CDFW): CDFW (formerly California Department of Fish and Game) is responsible for conserving, protecting and managing California's fish, wildlife, and native and native plant resources. Per Fish and Wildlife Code Section 1602 entities are required to notify DFW of any proposed activity that may substantially modify a river, stream or lake.

California Department of Transportation (Caltrans): Caltrans manages more than 50,000 miles of California's highway and freeway lanes and adjacent property within rights of way, provides inter-city rail services, permits more than 400 public-use airports and special-use hospital heliports, and works with local agencies.

Clean Water Now! Coalition: The Clean Water Now! Coalition is dedicated to the protection, restoration and preservation of aquatic and riparian systems.

Juaneño Band of Mission Indians: The Juaneño Band of Mission Indians traditionally known as the Acjachemen nation is the indigenous Native American Indian tribe of the lands now known as Orange and San Diego Counties. The Acjachemen territory extended from Las Pulgas Creek in northern San Diego County up into the San Joaquin Hills along the Orange County's central coast, and inland from the Pacific Ocean up into the Santa Ana Mountains. The bulk of the population occupied the outlets of two large creeks, San Juan Creek and San Mateo Creek. The Juaneño Band of Mission Indians is seeking federal recognition as a federally organized tribe. They are headquartered in the City of San Juan Capistrano.

Latino Health Access (LHA): The mission of LHA is to assist in improving the quality of life and health of uninsured, under-served people through quality preventive services and educational programs, emphasizing responsibility and full participation in decisions affecting health.

Miocean: Miocean is a nonprofit foundation that is focused on reducing urban run-off pollution affecting the County's 42 miles of coastline. They raise private sector funds general corporate in nature to fortify local government efforts to address ocean pollution. They also focus nearly 50 percent of their funds on education and prevention projects.

National Hispanic Environmental Council (NHEC): NHEC is a national non-profit organization founded in 1995. The organization seeks to educate, unite and engage the Latino community on environmental and sustainable development issues. Currently there are over 6,100 members nationwide who further their credo: "because it's our environment too."

Natural Resources Conservation Service (NRCS): NRCS provides expertise and technical assistance to government agencies and owners of private land for conserving their soil, water, and other natural resources. Emphasis is placed on local partners and cooperative progress. Many opportunities for partnership with the NRCS exist in South Orange County.

Nature Reserve of Orange County (NROC): NROC is a non-profit corporation that manages the Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) for the Central and Coastal Subregion of the County. They coordinate land management activities of public and private landowners within the 37,000 acre reserve system, conduct wildlife and habitat research and monitoring, and restore disturbed habitats. The reserve is the result of conservation planning at the natural community level by federal and state wildlife agencies, county and city governments, major landowners, and the environmental community.

Orange County Coastkeeper (Coastkeeper): Coastkeeper's goal is to protect and preserve all County water bodies and restore them to healthy, fully functioning systems that will protect recreational uses and aquatic life. In pursuit of this goal, Coastkeeper balances education, advocacy, research and enforcement to increase awareness of environmental issues and reduce pollution of County watersheds and coastal waters.

Sierra Club: The Sierra Club works to protect our planet by engaging in political activity, leading trips into nature, and organizing citizen action in local community campaigns.

South Laguna Civic Association: The South Laguna Civic Association is an organization of South Laguna residents striving to preserve and enhance the environment, maintain the unique village character of the community, preserve open space, conserve natural resources, and protect outstanding geographical features, ensure planned and orderly growth, inform citizens on issues affecting South Laguna, and ensure the residents of South Laguna a significant, representative voice in the future of their community.

Surfrider Foundation (South Orange County Chapter): Surfrider Foundation is a non-profit environmental organization working to protect our ocean, waves and beaches. The South Orange County Chapter of Surfrider Foundation has over 1000 members who reside in the communities of Laguna Beach, Aliso Viejo, Laguna Hills, Laguna Woods, Lake Forest, Laguna Niguel, Dana Point, San Juan Capistrano, Mission Viejo, Rancho Santa Margarita, and San Clemente.

Trout Unlimited: Trout Unlimited is a national organization with more than 140,000 volunteers organized into about 400 chapters from Maine to Montana to Alaska. This dedicated grassroots army is matched by a respected staff of lawyers, policy experts and scientists, who work out of more than 30 offices nationwide. These conservation

professionals ensure that TU is at the forefront of fisheries restoration work at the local, state and national levels.

2.4 Statutory Authority and Plan Relationship

The South Orange County IRWM Group includes agencies that have statutory authority over water management, as defined to include water use, water delivery, natural waters, water supply, water quality, and flood waters. The agencies are listed in *Chapter 2.*1 *South Orange County IRWM Group* and are consistent with the following list:

1) California State Parks
2) California Department of Fish and Wildlife
3) California Department of Transportation
4) City of Aliso Viejo
5) City of Dana Point
6) City of Laguna Beach
7) City of Laguna Hills
8) City of Laguna Niguel
9) City of Laguna Woods
10) City of Lake Forest
11) City of Mission Viejo
12) City of Rancho Santa Margarita
13) City of San Clemente
14) City of San Clemente Utilities Division
15) City of San Juan Capistrano
16) City of San Juan Capistrano Water Services Department
17) County of Orange
18) El Toro Water District
19) Irvine Ranch Water District
20) Laguna Beach County Water District
21) Moulton Niguel Water District
22) Municipal Water District of Orange County
23) Natural Resources Conservation Service
24) Orange County Flood Control District
25) Orange County Health Care Agency
26) San Diego Regional Water Quality Control Board
27) San Juan Basin Authority
28) Santa Margarita Water District
29) South Coast Water District

30) South Orange County Wastewater Authority
31) Trabuco Canyon Water District

Table 2-1 outlines the IRWM Group participants and their relationship to the IRWM Plan development, including their authority and support.

Table 2-1: South Orange County IRWM Group Participants

Entity	***IRWM Plan Authority/Support***
County of Orange	Land use, recreational facilities, stormwater management, water quality
City of Aliso Viejo	Land use, recreational programs/facilities, economic and community development, stormwater management, water quality, water conservation, solid waste and recycling, habitat restoration
City of Dana Point	Land use, cooperation with water districts on water conservation & sanitary sewer operation and maintenance, solid waste and recycling, recreational programs/facilities, economic and community development, stormwater management, ocean water quality, planning and implementation of projects and programs to protect the Marine Protected Areas, habitat protection and restoration, planning and implementation of projects and programs to protect a Critical Coastal Area
City of Laguna Beach	Land use, water service, water conservation, sanitary sewer service, solid waste, groundwater management, recreational programs/facilities, economic and community development, stormwater management, water quality; planning and implementation of projects and programs to protect the Critical Coastal Areas and Areas of Special Biological Significance, habitat protection and restoration
City of Laguna Hills	Land use, recreational programs/facilities, economic and community development, stormwater management, water quality, water conservation, solid waste and recycling, habitat restoration, green building
City of Laguna Niguel	Land use, recreational programs/facilities, economic and community development, stormwater management, water quality

Entity	*IRWM Plan Authority/Support*
City of Laguna Woods	Land use, recreational programs/facilities, economic and community development, and stormwater management, water quality, water conservation, solid waste and recycling, habitation restoration, green building
City of Lake Forest	Land use, recreational programs/facilities, economic and community development, stormwater management, water quality
City of Mission Viejo	Land use, recreational programs/facilities, economic and community development, stormwater management, water quality
City of Rancho Santa Margarita	Land use, solid waste and recycling, recreational programs/facilities, economic and community development, stormwater management, water quality
City of San Clemente	Land use, water service, water conservation, sanitary sewer service, solid waste, recreational programs/facilities, economic and community development, stormwater management, water quality
City of San Juan Capistrano	Land use, water service, water conservation, sanitary sewer service, solid waste and recycling, green building program, recreational programs/facilities, economic and community development, stormwater management, water quality
California State Parks	Protect and preserve the state's natural and cultural resources
El Toro Water District	Potable and recycled water service, water conservation, wastewater collection and treatment
Irvine Ranch Water District	Land use, potable and recycled water service, groundwater management, water conservation, wastewater collection and treatment, habitat protection and restoration; water quality
Moulton Niguel Water District	Potable and recycled water service, water conservation, wastewater collection.
Municipal Water District of Orange County	Water resource planning, water conservation
Natural Resources Conservation	Provide expertise and technical assistance for the

Entity	***IRWM Plan Authority/Support***
Service	conservation of land, water and other natural resources.
Orange County Flood Control District	Land use, flood control, floodplain management, stormwater protection, water quality
San Juan Basin Authority	Groundwater management, water conservation, water quality
San Diego Regional Water Board	Provide critical water quality decisions including: setting standards, issuance of permits for discharges, and enforcement actions.
Santa Margarita Water District	Potable and recycled water service; water conservation; groundwater management, wastewater collection and treatment.
South Coast Water District	Potable and recycled water service, water conservation; wastewater collection and treatment.
South Coast Wastewater Authority	Wastewater collection, transmission, treatment, and disposal. The reclamation of wastewater for beneficial reuse of recycled water.
Trabuco Canyon Water District	Potable and recycled water service, water conservation, groundwater management, wastewater collection and treatment
Other Participants	***IRWM Plan Support***
Audubon California	Volunteer and organization support for programs for habitat protection and restoration, public education and water quality.
California Department of Fish and Wildlife	Organizational support for programs to conserve, protect and manage California's fish, wildlife, and native and native plant resources.
California Department of Transportation	Landowner, funding and organization support for projects and programs related to the State's transportation facilities
Clean Water Now! Coalition	Organizational support for programs related to habitat protection, public education and water quality.
Juaneno Band of Mission	Organizational support to help engage indigenous

Entity	*IRWM Plan Authority/Support*
Indians	Native American Indian tribes in the South Orange County WMA.
Latino Health Access	Programs and facilities related to protecting the health of disadvantaged communities including water quality and recreation.
Miocean	Funding, organizational support for programs related to protecting and improving watershed and coastal water quality.
National Hispanic Environment Council	Organizational support to help engage the Latino community on environmental and sustainable development issues.
Nature Reserve of Orange County	Organizational programs designed to manage open space areas within Central/Coastal Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP)
Orange County Coastkeeper	Funding, volunteer and organization support for programs for habitat protection, public education and water quality.
Orange County Health Care Agency	Environmental health, ocean water protection program, water quality, ocean & beach closures.
Sierra Club	Volunteers and organization support for programs to protect the environment.
South Laguna Civic Association	Volunteers and organization support for programs to protect the environment in South Laguna Beach.
Surfrider Foundation- South Orange County Chapter	Funding, volunteers, and organizational support for programs related to coastal water quality, water conservation, and water recycling

2.5 Public Outreach and Involvement Process

2.5.1 Summary of Outreach and Communication

As discussed in Chapter 11: Stakeholder Involvement, the South Orange County IRWM Group uses a variety of methods to engage the general public. The process provides balanced access and opportunity for participation in the IRWM process. They include participating in stakeholder workshops, inclusion in the IRWM process, communication via email and information sharing via the County's website www.ocwatersheds.com.

The website also provides contact information and email links for the South Orange County IRWM Group.

A PowerPoint presentation and fact sheet explaining the IRWM process was developed for South Orange County IRWM Group participants to use in educating their individual City Councils and Board of Directors and stakeholders. For example, an Update on South Orange County IRWM Group Efforts was presented to the County Board of Supervisors March 2008, and the Integrated Watershed Management Planning Efforts in the County were provided to American Society of Civil Engineers in August 2008.

Since 2004, the South Orange County IRWM Group has provided informational presentations on the status and progress of the South Orange County IRWM efforts. As part of the process, in 2004 and 2005 the South Orange County IRWM Group developed goals and objectives as well as a prioritized list of projects. In 2010, the County started an update of the Plan and in 2011 formed an Ad Hoc Committee to lead the effort. The Management Committee and Ad Hoc Committee updated the Plan to meet requirements in the Proposition 84 Guidelines. As a part of this effort the group defined new goals, objectives and strategies for the region. A workshop was held to rank the goals and objectives for the Plan, which were then used for ranking projects in the Plan and in grant applications.

IRWM meetings and public workshops are regularly held to provide stakeholders with an updated IRWM Plan status. Additionally, the County of Orange continues to provide information and updates on the IRWM process through the OC Watersheds IRWM webpage (www.ocwatersheds.com/wma_IRWM.aspx). This webpage provides information including: descriptions of County WMAs, the IRWM grant process, calls for projects and project information forms, meetings and presentations, IRWM Group meeting announcements, and IRWM Plan updates. Refer to Chapter 11 for more detail on Stakeholder Outreach.

2.5.2 Letters of Support from Non-Agency Stakeholders

The following letters of support were received from non-agency stakeholders, as included in Appendix E:

- Penny Elia. July 8, 2013. Environmental Advocate, Laguna Beach. Supports the opportunity to be part of the IRWM Group along with other important stakeholders that understand the importance of working together towards solutions.
- FluvialTech Inc. June 28, 2013. Hasan Nouri, P.E., Hoover Medalist, President. Supports development of the IRWM Plan.
- MiOcean. June 28, 2013. Patrick R. Fuscoe, Chairman. Supports coastal area projects for improved coordination among local agencies with shared responsibilities for watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources.
- South Laguna Civic Association. June 26, 2013, Michael Beanan, Vice President. Supports the management of the Aliso Creek Watershed and watershed management throughout the region.

- Surfrider Foundation. June 24, 2013.Rick Wilson, Coastal Management Coordinator. Supports watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources.
- Audubon California, Starr Ranch Sanctuary. February 5, 2013, Sandy DeSimone, Ph. D., Director – Research and Education. Supports progressive and inclusive approach to water conservation in the region.
- Orange County Business Council. January 13, 2005, Terry Hartman, Chair, Infrastructure Committee; Julie Puentes, Executive VP Public Affairs. Supports collaborative effort for water reliability in the WMA.
- MIOCEAN. March 4, 2005, Patrick R. Fusco, P.E., Chairman. Supports organization of the South Orange County IRWM Group to prioritize and implement projects in the WMA.
- Surfrider, Laguna Beach Chapter. June 13, 2006, Rick Wilson Chairman. Supports IRWM Plan's holistic, region-wide approach to water management and open dialogue it has facilitated in South Orange County.

2.6 Working Relationship of South Orange County IRWM Group

2.6.1 Regional Participation and Project Coordination

As discussed earlier, participants in the South Orange County IRWM Group have worked individually and collaboratively over 30 years to develop and integrate regional strategies that address, raise awareness, and coordinate numerous and varied water management projects.

The first meeting of the South Orange County IRWM Group was held in 2004 and included multiple stakeholders in South Orange County, attended by the County, cities, and water and wastewater agencies. The South Orange County IRWM Group identified preliminary goals, objectives, and priorities for meeting the water resource needs of South Orange County, and set a schedule for future meetings.

Meetings were held at least twice a month through the development of the 2005 IRWM Plan. The South Orange County IRWM Group continues to inform and invite additional stakeholders to the South Orange County IRWM Group meetings, and the South Orange County IRWM Group has grown to represent at least 30 entities. The stakeholders represent agencies and organizations that have developed an integrated approach to addressing the objectives and water management strategies of the IRWM Plan. Refer to Section 4 for discussion on the collaborative process used to established plan objectives. Significant progress was made to identify the myriad of projects that have been included in existing plans and incorporating those projects into the IRWM Plan. A comprehensive list of South Orange County IRWM Group meetings is included in Section 11.

As the 2005 South Orange County IRWM Plan was being developed, numerous iterations of the Draft South Orange County IRWM Plan were made available to the South Orange County IRWM Group and public stakeholders for review and comment. Comments were received, reviewed and discussed by multiple participants of the South

Orange County IRWM Group prior to incorporation into the Final South Orange County IRWM Plan.

In June 2005, the South Orange County IRWM Group submitted the South Orange County IRWM Plan for Proposition 50, Chapter 8 Integrated Regional Water Management Program Implementation Grant funds. In January 2007, the South Orange County IRWMP was one of seven statewide proposals recommended for funding. In July 2007, the South Orange County IRWM Group executed a Prop 50 Integrated Regional Water Management Implementation Grant Agreement with the State Water Resources Control Board to receive grant funds in an amount of $25,000,000 for the seven highest ranking projects included in the South Orange County IRWMP. They include:

1. Water Use Efficiency Program Expansion: MWDOC on behalf of 13 cities and 12 special districts in South Orange County
2. Canada Gobernadora Multipurpose Basin: Santa Margarita Water District
3. Heisler Park Marine Habitat Protection: City of Laguna Beach
4. J.B. Latham Treatment Plant – Advanced Water Treatment: South Orange County Wastewater Authority, in cooperation City of San Juan Capistrano, Moulton Niguel Water District, and South Coast Water District
5. Recycled Water Transmission System Improvements: City of San Juan Capistrano
6. Recycled Water Treatment and Distribution: City of San Clemente
7. Aliso Creek Ecosystem Restoration Project: County of Orange, South Orange County Wastewater Authority (SOCWA), and Moulton Niguel Water District (MNWD).

In September 2009, the South Orange County WMA was recognized as a Region during the RAP. With the funding of the South Orange County IRWM Group's seven projects underway and the release of the new Proposition 84 IRWMP Standards, the South Orange County IRWM Group identified areas of the existing South Orange County IRWM Plan (adopted in 2005) that need to be re-written/revised to reflect the new priority projects for the region and meet the Proposition 84 standards.

In September 2010, the South Orange County WMA submitted a Planning Grant Proposal under DWR's IRWM Program to update the 2005 IRWMP to comply with recent Proposition 84 standards. In December 2010, the Planning Grant was recommended for funding.

In addition, in 2011 the South Orange County WMA submitted a Prop 84 IRWM Round 1 Implementation Grant for the following three projects - (1) South Orange County Water Smart Landscape (WSL) Project, (2) Rockledge Ocean Protection Project, and (3) Shadow Rock Detention Basin Project. The region was awarded $2,316,780 in funding.

The following is a list of all the South Orange County IRWM Group meetings, including work group, executive committee and management committee meetings, held in support of the 2013 IRWM Plan:

September 14, 2004	March 30, 2010
October 11, 2004	May 4, 2010
October 25, 2004	May 25, 2010
November 8, 2004	April 7, 2011
November 22, 2004	May 31, 2011
December 13, 2004	July 11, 2011
January 3, 2005	July 14, 2011
January 17, 2005	August 8, 2011
January 31, 2005	September 12, 2011
February 16, 2005	October 3, 2011
February 28, 2005	October 16, 2011
March 14, 2005	November 7, 2011
April 18, 2005	December 5, 2011
May 2, 2005	January 9, 2012
May 16, 2005	February 6, 2012
May 31, 2005	February 9, 2012
July 11, 2005	March 5, 2012
January 17, 2006	April 9, 2012
February 6, 2006	May 3, 2012
March 24, 2006	May 7, 2012
April 10, 2006	June 4, 2012
February 17, 2007	August 6, 2012
July 2, 2007	September 10, 2012
November 15, 2007	October 1, 2012
July 22, 2008	November 1, 2012
September 18, 2008	December 3, 2012
October 15, 2008	January 7, 2013
November 20, 2008	February 4, 2013
April 15, 2009	February 7, 2013

April 7, 2011	March 4, 2013
May 31, 2011	April 8, 2013
July 11, 2011	May 2, 2013

Recent South Orange County WMA Stakeholder meeting minutes are available on the OC Watersheds website:
http://ocwatersheds.com/programs/ourws/wmaareas/wmasouthoc

The South Orange County WMA has implemented an aggressive approach to project coordination. The Group reviews each project included in the IRWM Plan for its multiple benefits, diversity of participants, regional impact and synergies or linkages to other projects. Projects that contain multiple elements result in tremendous added value for the WMA. Beyond the geographical linkages, the Projects share synergistic benefits to achieve total watershed efficiency. This IRWM Plan demonstrates an integrated project implementation approach, which provides greater value as a regional planning tool and offers greater advantages than individual efforts due to its ability to create project linkages, incorporate multiple strategies, and leverage agency resources.

Many agencies within the South Orange County WMA have established partnerships to develop both individual and regional projects. Within the South Orange County IRWM Plan, several projects include partnerships among agencies to collaborate for regional benefits, linkages, and environmental justice. This South Orange County IRWM Plan has implemented several Regional Action Projects. One example is the Demand Runoff and Pollution Prevention (DRPP) Project. The DRPP encourages the structural conversion of existing landscape features that have a high impact on surface runoff quantity/quality and water demand. The DRPP Regional Action Project is divided into a public sector component targeted at converting landscaping at municipal facilities; and a private sector component that will encourage private landowners to implement environmentally friendly re-landscaping projects on their properties. These projects convert portions of highway medians by removing turf, planting native drought-tolerant vegetation, and installing ET irrigation controllers. Several other DRPP projects are planned throughout the WMA in the coming years.

Furthermore, the Municipal Water District of Orange County (MWDOC) has successfully implemented a water use program throughout the region. MWDOC collaborates with 13 cities and 12 special districts in South Orange County to encourage removal of non-functional turf; upgrade antiquated irrigation timers to weather-based self-adjusting irrigation timers, and convert high-volume overhead spray irrigation to low-volume irrigation. MWDOC implements comprehensive landscape improvement programs targeting publicly owned and other commercial landscapes properties throughout the South Orange County WMA.

Regional programs have been established that include partnerships between multiple projects to provide broad regional benefits, while maximizing resources. Most notably, South Orange County Team Arundo was formed during the IRWM planning process. An offshoot of the South Orange County IRWM Group, membership includes the

County, cities, developers, regulators, non-profit organizations, and public stakeholders. Arundo is a highly invasive bamboo that can overwhelm fresh water riparian habitat areas.

South Orange County Team Arundo has developed a region-wide program for the restoration of riparian habitat in the San Juan Hydrologic Unit (SJHU) through the control of invasive non-native plants (mainly Arundo donax and pampas grass) and the planting of native species. Arundo and pampas grass pose a serious threat to the native flora and fauna, and are a significant flood and fire risk to the community. The plants have a severe and negative impact on biological function within the riparian system. The plants are not utilized as a food source and have poor structure for nesting and use by other organisms as shelter. The invasive non-native plant control and riparian restoration program for the SJHU is based on a systematic watershed based control of target species that provides long term ecological and resource protection benefits. This process, along with details related to restoration and exotic plant control methods have been developed in coordination with the California Department of Fish and Wildlife, U.S. Geological Survey Biological Resources Division and the US Fish & Wildlife Service. South Orange County Team Arundo has mapped the non-native riparian plant species in the SJHU, identifying over 315 acres of target invasive plants. In addition, they have obtained all the necessary regulatory permits and environmental documents to remove non-native species in the SJHU.

2.6.2 IRWM Plan Updates and Sharing of Information

As discussed in Section 2.6.1, the South Orange County IRWM Group officially began meeting in 2004. The members of the South Orange County IRWM Group plan and execute both short-term capital improvement programs and long-term plans and management programs. The Group's plans, reports, studies, and programs along with regional plans and programs provide the foundation for the IRWM Plan and present a coordinated integrated approach.

Many existing plans, including Master Plans, Facility Plans, Watershed Management Plans, recycled water studies, feasibility studies, and long-range plans, contain proposed projects that are instrumental in meeting the goals and objectives of the South Orange County WMA. Many projects found in the local and regional plans and studies have been incorporated into the South Orange County IRWM Plan, and will continue to be implemented in concert with those plans. Chapter 10, Coordination with Existing Local/Regional Plans identifies the plans that were reviewed and incorporated into this plan.

Change is anticipated within the Region due to evolving considerations, issues, and planning efforts. No plan, as with this IRWM Plan, should be static. Instead, the IRWM Plan is considered a living planning document and is flexible to adapt to change.

Given the high levels of interaction involved in the drafting and implementation of other regional plans in South Orange County, local agencies and groups have become skilled at coordinating responses to regional concerns, and as a result are well prepared to modify priorities as needed within the IRWM Plan. In addition to the IRWM Group coordination format, member agencies also interact at Watershed Stakeholder

workshops and various related task forces and workgroups, such as MWDOC's Water Use Efficiency Workgroup. Through these established and intersecting networks, members of the IRWM Group have extensive access to information and one another, solidifying their ability to collectively respond to regional changes.

The IRWM Group brings issues, concerns, changes, and activities to scheduled IRWM Plan meetings. Each meeting includes an agenda item specifically for the discussion and opportunity to collectively hear, understand and respond to points of concern, issues, and amendments. This allows the effective refinement of regional goals and objectives as needed, for the benefit of the region and its individual stakeholders. In this manner, all stakeholders to the IRWM Plan will be afforded the opportunity for input to amend the Plan.

As discussed in Section 2.2, the Management Committee will continue to lead IRWM Plan updates. The IRWM Plan will be updated no less than once every five years and will be accomplished in the IRWM Group environment affording the opportunity for input from all stakeholders. Periodic amendments to the Project List will be made to respond to and adjust for regional changes. A public information meeting(s) will be held to ensure participation and input by the public and private stakeholders. Figure 2-2 below shows the IRWM Plan Update Process.

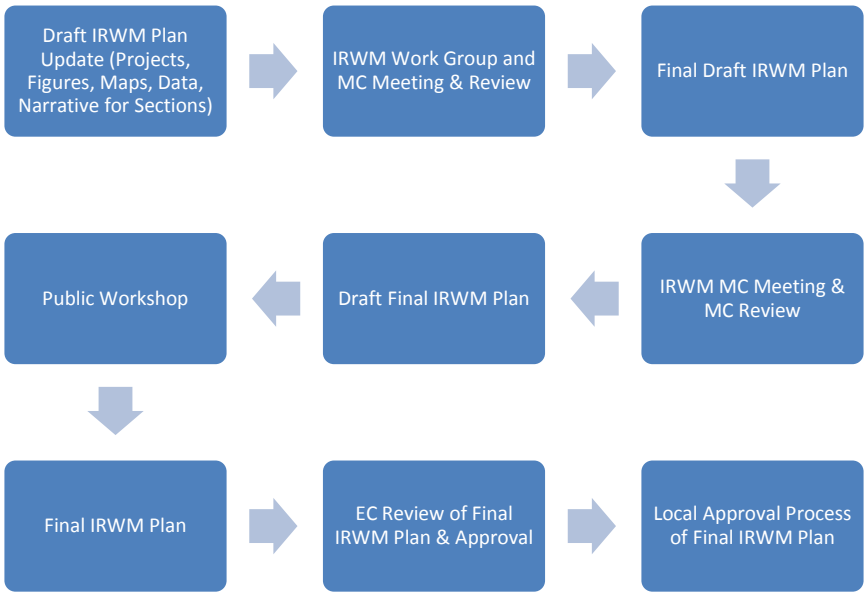

Figure 2-2: IRWM Plan Update Process

Today, the South Orange County IRWM Group continues to meet to discuss IRWM Plan short term and long term implementation, collaborative opportunities, the status of existing projects, proposals for new projects, updates from the State, potential funding opportunities and the need for plan refinements. As mentioned previously the County of Orange provides information and updates on the IRWM process through the OC Watersheds IRWM webpage (www.ocwatersheds.com/wma_IRWM.aspx). Members of the IRWM Group have access to: IRWM work products; committee meeting schedules,

agendas, and summaries; contact information; and links to relevant web pages and information.

Information about the IRWM Plan is shared amongst the IRWM Group via a project website. The website contains meeting notes, presentations, and technical reports regarding the IRWM Plan and process.

Cooperation within the South Orange County IRWM Group for the development and implementation of the IRWM Plan has been exceptional. One example of this is the Gobernadora Multi-purpose Basin (Project), which is anticipated to be approximately 36 acres, located upstream of Gobernadora Ecological Reserve Area (GERA) and just south of the Coto De Caza planned community. The Project was on the 2005 IRWM Plan project list and received funding; Therefore, the project is included on the funded list in Appendix F of this IRWM Plan. The Project includes development of the following:

- Surface runoff water quality basin to improve water quality for downstream riparian and wetlands areas
- Storm water detention basin to protect downstream wetlands and riparian habitat from further erosion and deposition damage
- Collection system to capture and harvest drainage flows for recycled water use in the existing Portola Reservoir
- Regional trail link for overall trail connection from Thomas F. Riley Park to Caspers Wilderness Regional Park

The Basin will be utilized to reduce storm peak flows by flood storage, divert and naturally treat surface runoff and storm flows to 1) reduce downstream erosion and sedimentation, 2) provide harvesting of excess surface water and groundwater, and 3) improve the water quality in the Gobernadora Creek and San Juan Creek, including the downstream GERA.

The Project has required coordination among many entities and includes facilities for water quality, drainage peak flow retarding, Regional Riding and Hiking Trail, and nonpotable water extraction/recycling. A concept plan for the Project has been approved by the public and private Stakeholders. This Project has served as a catalyst in bringing together the public and private interests.

The Stakeholders for the Project are Santa Margarita Water District (SMWD), County of Orange (County) and Rancho Mission Viejo, LLC (RMV) (“Stakeholders”). The San Juan Basin Authority (SJBA) may desire to participate as a stakeholder; this will be confirmed through the development of the Project, under this MOU and prior to construction.

A Memorandum of Understanding (MOU) has been completed to fully address the Project and the Stakeholders’ rights, responsibilities and obligations of the Stakeholders. In the MOU, the Stakeholders have addressed the following key features of the Project:

1. Environmental Certification

2. Costs and Funding Plan
3. Design
4. Right-of-way
5. Construction
6. Ownership and Concurrent Use
7. Operations and Maintenance (O&M)
8. Consistency with Ranch Plan

This MOU is intended as a precursor document for general terms for the understanding of the Stakeholders concerning the funding, design, construction, operation of the Project and establishes a process under which the Stakeholders will work cooperatively to develop a detailed description of the Project, and sets forth the responsibilities of the Stakeholders to perform the analysis of the Project required by CEQA.

In addition to sharing information and coordinating amongst themselves, the South Orange County IRWM Group met with the State Water Board, San Diego Regional Water Board and DWR staff throughout the South Orange County IRWM planning process. Local and Sacramento meetings were held to discuss planning efforts including coordination of the South Orange County IRWM Plan development, objectives, strategies, project prioritization and implementation. The South Orange County IRWM Group also coordinates with federal agencies for project implementation, as required. The Group has developed a positive working relationship with IRWM Program staff at the State Water Board while administering the Prop 50 grant funds.

The South Orange County IRWM Group continues to coordinate with DWR staff regarding Proposition 84. During the RAP process, the County and members of the South Orange County IRWM Group met with DWR staff to discuss how the South Orange County WMA collaborates as a Region. Following the meeting, the South Orange County WMA was approved as a Region. DWR staff members are continuously invited to attend South Orange County IRWM Group meetings.

2.7 Adding New Members

Participation in the South Orange County IRWM Group and its committees, Executive and Management, will primarily be comprised of representatives from the County, South Orange County Cities, water, and wastewater agencies that make up the group. It is realized that there are other parties within the South Orange County WMA that have responsibilities for water resource management. These other parties include but are not limited to the California Department of Fish and Wildlife, California Department of Transportation, Orange County Transportation Authority, and Rancho Mission Viejo. The South Orange County IRWM Group is committed to engaging these other parties, as appropriate and therefore welcomes their participation. Participation in the South Orange County IRWM Group is open to all interested parties and will be encouraged by aggressively advertising of public workshops via email and postings on the County's website www.ocwatersheds.com.

2.8 Working Relationship of Tri-County FACC

This chapter provides an overview of the WMA's commitment to inter-regional collaboration within the San Diego Funding Area via the Funding Area Coordinating Committee (Tri- County FACC).

2.8.1 Coordination within San Diego Funding Area

During the Proposition 50 grant cycles, three IRWM regions emerged within the San Diego Funding Area – the San Diego, Upper Santa Margarita, and South Orange County IRWM regions. The San Diego IRWM program is managed by the Water Authority, City of San Diego, and County of San Diego; the Upper Santa Margarita IRWM program is managed by Riverside County Flood Control and Water Conservation District (RCFCWCD), County of Riverside, and Rancho California Water District (RCWD); and the South Orange IRWM program is managed by the County of Orange, Municipal Water District of Orange County (MWDOC), and South Orange County Wastewater Authority (SOCWA).

The Upper Santa Margarita Regional Watershed Management Group (RWMG), San Diego RWMG, and South Orange County IRWM Group collaborate in an inter-regional body established via a Memorandum of Understanding (MOU) and known as the Tri-County FACC.

The Tri-County FACC enables the three RWMGs to balance the necessary autonomy of each planning region to plan at the appropriate scale with the need to improve inter-regional cooperation and efficiency. It ensures close coordination of the three planning regions to improve the quality and reliability of water and to protect and enhance natural resources in the San Diego Funding Area. The three RWMGs work together with their advisory groups to identify cross-boundary projects and common programs of value across planning regions and align project implementation.

The Tri-County FACC builds a foundation that ensures sustainable water resources planning within the Funding Area. The three RWMGs commit to coordinated planning, including watersheds that cross planning region boundaries which include the San Mateo Creek watershed area and the Santa Margarita River watershed area. This approach will capture the integration of water supply, wastewater, and watershed planning across regions in the three coordinated IRWM Plans. Figure 2-3 shows the Watershed Overlap within the IRWM Areas.

Each of the Tri-County FACC members has prepared and adopted an IRWM Plan and desires close coordination to enhance the quality of planning, identify opportunities for supporting common goals and projects, and improves the quality and reliability of water in the San Diego Funding Area. The Tri-County FACC coordinates and works together with their advisory groups to address issues and conflicts across planning regions, identify common objectives and projects that address those needs, and provide general planning cooperation for shared watersheds.

By consensus, the Tri-County FACC has developed an agreement to improve IRWM planning in the Funding Area to coordinate across planning region lines and facilitate

the appropriation of funding for IRWM projects. The following sections outline the Tri-County FACC's governance agreements.

Sharing of Information

The RWMGs have agreed to share data and information to inform efforts within the Funding Area and inter-regionally. This information sharing helps to facilitate collaboration and address interregional needs. Some of the organizations that help in this data sharing effort include MWD, the San Diego Regional Water Quality Control Board, and the Stormwater Monitoring Coalition. Each of the IRWM Plans in the San Diego Funding Area includes sections on data management and project selection. The Tri-County FACC serves as an advisory body in the development of projects or programs that may cross IRWM Region boundaries, which may be funded, administered, or implemented by multiple Regions. Additionally, projects of importance to the watersheds that exist in multiple IRWM Regions are identified for coordination and prioritization in each of the relevant regions' project selection process.

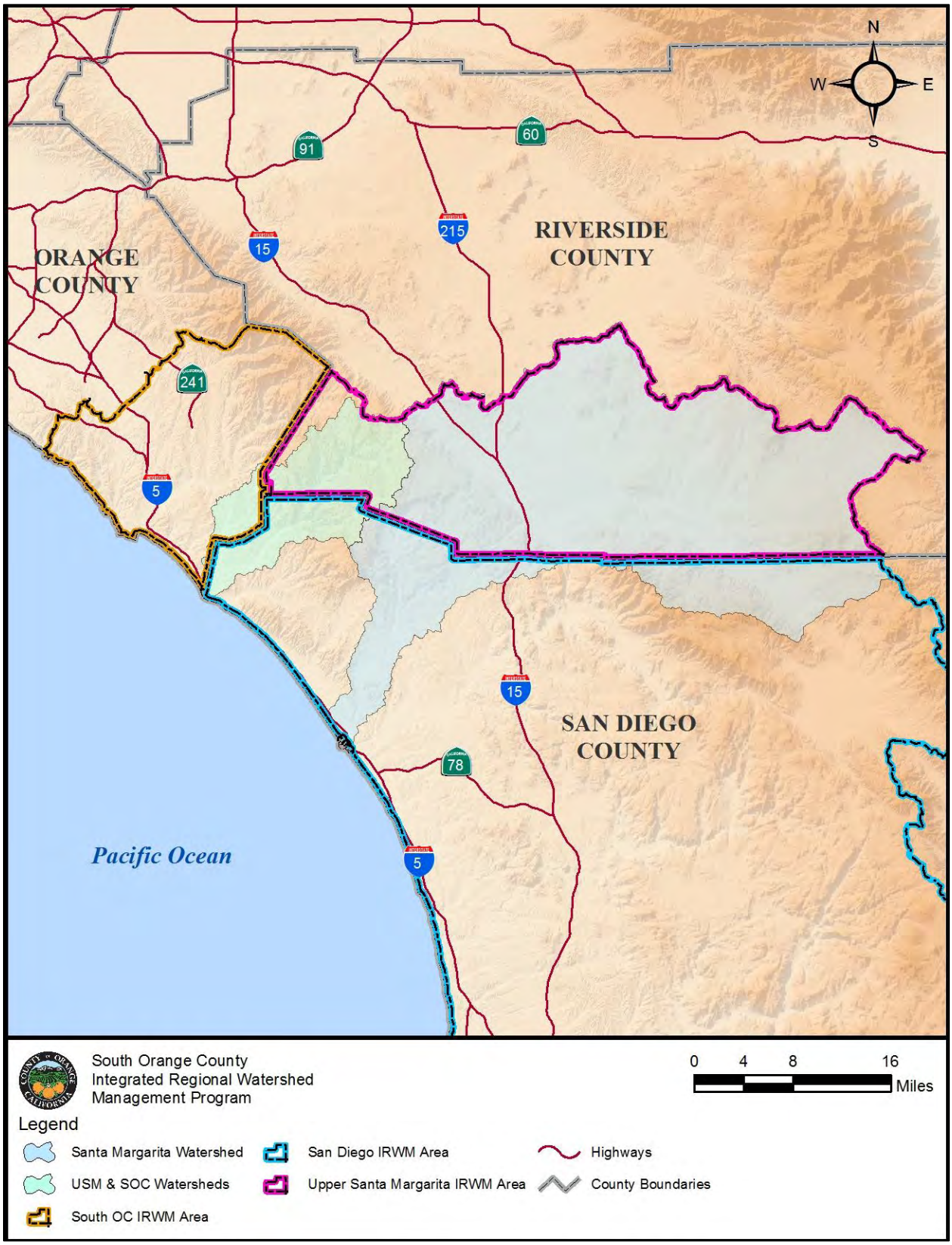

Figure 2-3: Watershed Overlap within IRWM Areas

Tri-County FACC members also collaborate in support of MWD's drought and conservation programs. In response to three years of drought and severe water supply challenges, the MWD Board of Directors (which comprises representatives of the member agencies) declared a Water Supply Alert in southern California and increased MWD's water conservation efforts throughout its six-county service area. The Water Supply Alert urged cities, counties, local public water agencies and retailers to achieve extraordinary conservation by adopting and enforcing drought ordinances, accelerating public outreach and messaging, and developing additional local supplies. The Tri-County FACC has aided in these efforts by providing collaborative opportunities for the three IRWM regions and identifying projects or programs that may help achieve water conservation goals.

Additionally, Tri-County FACC members are collaborating to address water quality concerns via the Stormwater Monitoring Coalition (SMC). This group is comprised of all Phase 1 municipal stormwater NPDES lead permittees and NPDES regulatory agencies in southern California. RWMG members from each of the three planning regions are part of the SMC, including the County of Orange, Riverside County Flood Control and Water Conservation District, and County of San Diego. SMC members have combined resources to address data gaps and cooperate on developing technical information and tools to improve stormwater decision making, as well as improve monitoring effectiveness by promoting standardization and coordination across individual NPDES municipal programs.

Another example of collaboration and information sharing among Tri-County FACC regions is in the development of Total Maximum Daily Loads (TMDLs) during the amendment process. RWMG members of the Upper Santa Margarita, San Diego, and South Orange County IRWM planning regions are invited to attend regional action committee meetings, in order to stay better informed of the priorities and needs of the San Diego Regional Water Board and provide feedback through the public participation process.

Shared Infrastructure

Each of the IRWM Regions in the Tri-County FACC is dependent on imported water, supplied through Metropolitan, and therefore share infrastructure that serves the Funding Area. Shared infrastructure includesthe Colorado River Aqueduct (CRA), along with major reservoirs such as Diamond Valley Lake,Lake Skinner, and other major pipelines owned and operation by MWD. Diamond Valley Lake is a reservoir located at the northernmost portion of the Upper Santa Margarita Watershed and is connected to Lake Skinner by the Southwestern Riverside County Multi-Species Reserve. Adjacent to Lake Skinner is MWD's Skinner Water Treatment Plant. Within the Funding Area, more than 4 million residents in Riverside and San Diego counties rely on treated imported water from the Skinner Water Treatment Plant. These shared facilities serve a critical role in bringing together water management interests from all three IRWM planning regions.

In addition to MWD-owned imported water infrastructure, , South Coast Water District shares use of pipelines with the Water Authority to convey supplies to the northernmost

areas of Camp Pendleton. These shared facilities ensure delivery of imported water supplies to all Tri-County FACC members and their stakeholders.

Competing Interests

Historically, the Tri-County FACC members have found themselves in conflict over water supply issues. However, various agreements and legal settlements have led to a cooperative management of water allocations between these entities. Currently, there is significant agreement on water allocations, and the Tri-County FACC is supporting collaborative efforts to improve the storage and management of water resources. Recently, some long-standing conflicts have been resolved. Significant funding for projects to benefit the upper and lower river areas were authorized and funded in the Federal Omnibus Lands Bill signed in March 2009. While individual areas within the Tri-County FACC indeed have competing local interests, recent settlements and the Tri-County FACC MOU attest to the willingness and capacity of the region to work together when fairness and certainty are documented.

2.8.2 Evolution of Inter-Regional Planning

The three separate IRWM planning regions – San Diego, Upper Santa Margarita, and South Orange County – were established and formalized in 2006 and 2007 during development of their IRWM Plan documents. Since that time, the three regions have developed and formalized a working relationship for joint IRWM planning in shared watershed areas. Figure 2-4 shows the evolution of regional planning in the San Diego Funding Area.

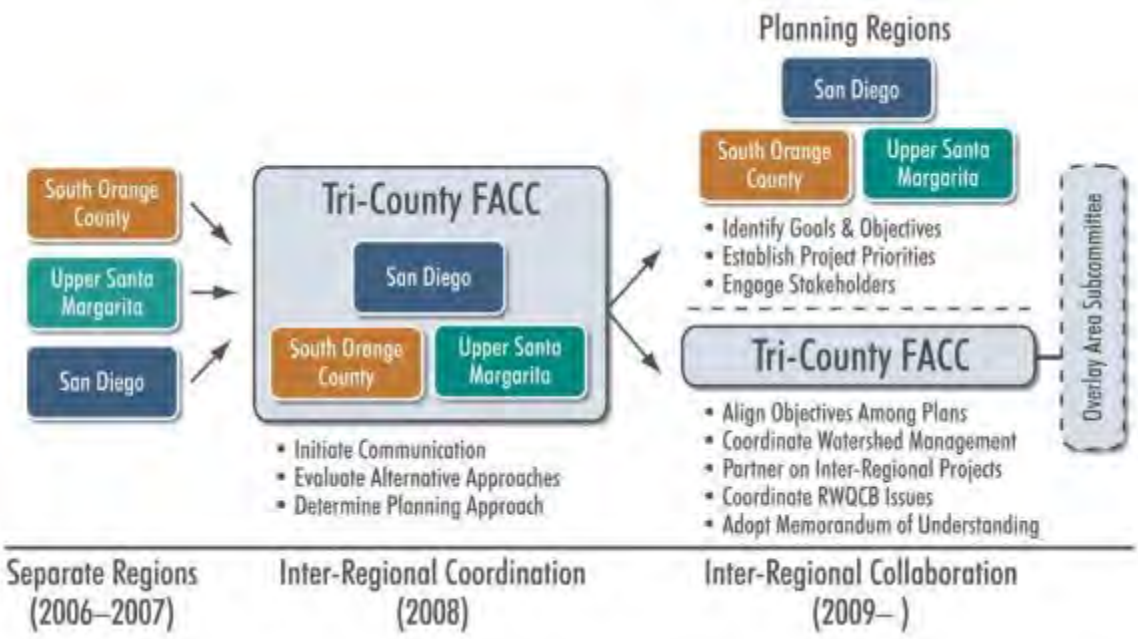

Figure 2-4: Evolution of Regional Planning in the San Diego Funding Area

In June 2008, the Tri-County FACC program sent a letter to DWR offering to work directly with DWR as a test pilot in inter-regional collaboration. DWR staff encouraged the development of alternatives to consider governance and organization of the regions. Throughout that year, the three RWMGs undertook a coordinated evaluation of the planning region boundaries and potential alternatives for reformulation. By late 2008, the three RWMGs had determined that major differences between the three regions indicated that water management planning is better and more efficiently conducted at the local scale. However, formalizing the Tri-County FACC would allow the RWMGs to better coordinate on water management issues, objectives, and projects within watershed areas that cross regional boundaries. Moving forward, the Tri-County FACC will enable a high level of coordination for water resources management issues that are common to the three regions.

2.8.3 Committed Inter-Regional Process

Figure 2-5, Tri-County FACC Boundaries, illustrates the boundaries of the three IRWM planning regions and the Tri-County FACC. The Tri-County FACC will build a foundation that ensures sustainable water resources planning within the Funding Area by serving as an umbrella organization, allowing the three IRWM regions to coordinate water resources planning activities and pool resources. Because human-made water infrastructure systems are the key water management units in the Funding Area, the planning regions reflect this reality and cross-boundary watershed issues are addressed via a collaborative subcommittee process.

Figure 2-5: Tri-County FACC

The three RWMGs will undertake coordinated planning within the Watershed Overlay Areas, which comprise the Santa Margarita River and San Mateo Creek Watersheds. A Watershed Overlay Subcommittee was organized to consider issues and develop projects pertaining to the Overlay Areas. Water resources projects and programs that may benefit from Funding Area-wide coordination, administration, funding, or support are identified by the Tri-County FACC and/or Subcommittee. One result of the Watershed Overlay Subcommittee meeting was coordination of invasive removal projects and Salt and Nutrient Management Plans. Projects within the Watershed Overlay Areas identified as valuable and benefiting from cross-boundary coordination are considered in the three IRWM project selection processes.

All three IRWM Plans – San Diego, Upper Santa Margarita, and South Orange County – will contain references to the entire Funding Area, to the coordination that is occurring among planning regions, and to the MOU governing the Tri-County FACC. Each IRWM Plan will identify common goals and objectives, water management strategies, issues, and challenges being addressed via inter-regional collaboration.

To facilitate DWR's review process, all three planning regions will coordinate their Regional Action Plan submittals and IRWM grant applications. Further, the three RWMGs will coordinate on grant funding requests to ensure that the sum of the total grant requests does not exceed the amount identified for the San Diego Funding Area.

IRWM planning under the proposed region boundaries allows for agency, regulatory, non-profit, and public participation at the local scale. For example, public workshops are hosted in different locations throughout the San Diego Region to enable more convenient access by participants and DAC representatives. The creation of larger planning regions would limit local involvement and reduce the value of the IRWM planning process to the regions, the Funding Area, and the State.

2.8.4 Memorandum of Understanding

In March and April 2009, the three RWMG agencies that comprise the Tri-County FACC jointly adopted an *MOU for Integrated Regional Water Management Planning and Funding in the San Diego Funding Area* to outline their commitment to inter-regional coordination (refer to Appendix B). The efforts of the Tri-County FACC are intended to enhance the quality of water resources planning, identify opportunities for supporting common goals and projects, and to improve the quality and reliability of water in the Funding Area. *Section 2.11 Tri-County Funding Area Coordination Committee Structure and Governance* contains an overview of the agreements set forth in the Tri-County FACC MOU.

2.8.5 Water Management Differences

As described above, the three adjacent planning regions in the San Diego Funding Area have reconsidered their governance and regional boundaries to ensure the best approach for local stakeholders. The three RWMGs began meeting in February 2008 to discuss ways to collaborate on IRWM planning. At DWR's suggestion, the group developed a matrix of five planning region alternatives and evaluated 15 factors to determine the most appropriate and productive approach. The San Diego Region

presented this alternatives matrix to the Regional Action Committee (RAC) for discussion, and incorporated RAC suggestions into the Tri-County FACC final draft.

Through the course of this evaluation, the three RWMGs determined that the multiple regional differentiators that spurred development of three separate IRWM Plans held true. Clear division within the following water management factors warrants three separate planning regions.

Water Supply

Each of the three IRWM regions contains independent water supply agencies drawing from different water sources. The South Orange County WMA is comprised of the Municipal Water District of Orange County (MWDOC) and member agencies; the Upper Santa Margarita region is comprised of the Rancho California Water District, Elsinore Valley Municipal Water District, Eastern Municipal Water District, and Western Municipal Water District; and the San Diego Region is comprised of the San Diego Water Authority and its 24 member agencies, as well as numerous small water systems in rural areas. Section 2.8 Working Relationship with Tri-County FACC provides an overview of shared regional infrastructure in the Funding Area, including delivery of imported water from MWD's Skinner Water Treatment Plant, a treatment facility of Statewide importance. Although some infrastructure is shared, none of the water supply agency service areas overlap across the IRWM regions.

Additionally, each of the three IRWM regions depend to a varying degree on imported water supplies and receives deliveries from a different combination of sources. Because of this, the quality of water supplies and necessary treatment differs across the regions. Although supply diversification planning is underway in all three regions, development of local supplies is, by definition, conducted at the local scale.

Wastewater/Recycled Water

Each of the three IRWM regions contains separate wastewater agencies, reclamation plant operators, and water recycling programs. Most of South Orange County's wastewater is managed by the South Orange County Wastewater Authority (SOCWA), a joint powers agency whose members are all of the ten sewer agencies in South Orange County, while Riverside and San Diego each contain multiple water and wastewater agencies. None of these wastewater agencies or their recycled water infrastructure overlaps across the IRWM regions.

Wastewater disposal practices also vary between the regions, with Upper Santa Margarita exporting treated wastewater to the Santa Ana River watershed and South Orange County and San Diego have aggressive recycled water projects and discharge excess effluent through deep ocean outfalls. Riverside County (unlike Orange and San Diego counties) has no connection to regional ocean outfall disposal systems. Ongoing conflicts related to discharge of recycled water to the Santa Margarita River have not yet been resolved. Collaboration through the Tri-County FACC provides the adjacent regions with an opportunity to find common ground and develop solutions to these water management conflicts.

Groundwater

Each of the three IRWM regions maintains a different level of dependence on groundwater supply. In contrast with San Diego's limited groundwater production (2%), a larger proportion of South Riverside and Orange county supplies are obtained from groundwater. Groundwater accounts for 10% of overall supplies in the South Orange County WMA. Geologic conditions preventing the subsurface movement of groundwater between the upper and lower Santa Margarita River basins limit extraction within the northern San Diego Region. Groundwater extraction and recharge facilities are localized within each region. No groundwater basins are shared across the IRWM regions.

Land Use Planning

Each of the three IRWM regions contains different local and regional land use planning authorities and transportation programs, as well as different development trends. The South Orange County WMA is comprised of the County of Orange and 12 cities, and regional coordination occurs through Southern California Association of Governments (SCAG)/Orange County Council of Governments (OCCOG). The Upper Santa Margarita region is comprised of Riverside County, four cities, and regional coordination occurs through SCAG/Western Riverside Council of Governments (WRCOG). The San Diego Region is comprised of San Diego County, 18 cities, and regional coordination occurs through the San Diego Association of Governments (SANDAG). None of these land use authorities overlap across the IRWM regions.

Flood Protection

Each of the three IRWM regions contains independent flood control agencies and programs. The South Orange County WMA contains Orange County Flood Control District (OCFCD); the Upper Santa Margarita region contains Riverside County Flood Control and Water Conservation District (RCFCWCD); and the San Diego Region contains San Diego County Flood Control District. None of these flood control agencies overlap across the IRWM regions.

Runoff Water Quality

Each of the three IRWM regions has obtained and complies with separate NPDES MS4 permits, surface runoff management planning, and regional pollution prevention programs. The County of San Diego is the Principal Co-permittee for the San Diego MS4 permit (Order R9-2007-0001); RCFCWCD for the Riverside County MS4 permit (Order R9-2010-0016); and County of Orange for the South Orange County MS4 Permit. Stormwater compliance measures, monitoring programs, and BMPs used in Orange and Riverside counties vary from those used by San Diego County. The Regional permit is pending adoption.

Environmental Resources

Each of the three IRWM regions contains different habitat conservation planning efforts and nature reserves. The County of San Diego led development of the San Diego County Multiple Species Conservation Program (MSCP) (with the City preparing an

MSCP for lands within their jurisdiction), while the County of Riverside led development of the Western Riverside Multi-Species Habitat Conservation Plan (MSHCP). None of these habitat conservation planning efforts overlap across the IRWM regions. Conservation plans are being or have been prepared by the County Water Authority, San Diego Gas and Electric (SDGE), San Diego Association of Governments (SANDAG), Orange County, and Riverside County for lands adjacent to the Plan area. Preserve areas in adjacent Plan areas were integrated into the planning process to ensure that the core biological areas in the Plan area were well connected with core biological areas across jurisdictional borders.

The South Orange County WMA includes a number of protected areas that form a network of interconnected and isolated biological communities. The Southern Subregion Natural Community Conservation Plan (NCCP) / Habitat Conservation Plan (HCP) consists of 132,000 acres which includes 40,000 acres within the Cleveland National Forest and 92,000 acres within the Planning Area. The Southern Subregion NCCP/HCP was prepared by the County in cooperation with the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS). The Southern Subregion NCCP/HCP focuses on long-term protection and management of multiple natural communities that provide habitat essential to the survival of a broad array of wildlife and plant species.

Political Realities

Each of the three IRWM regions contains separate legal (both regulatory and legislative), taxing, and funding authorities. For example, the Orange County Transportation Authority administers Measure M (a half-cent local transportation sales tax) which includes a water quality program for transportation-related pollution; this contributes to IRWM Plan implementation in Orange County. Each of the three IRWM regions has identified an appropriate means of administering and funding integrated regional planning within their proposed regional boundary. None of these political boundaries overlap across the IRWM regions.

Following the RWMG's determination that the existing IRWM regions are appropriate planning-level entities, the Tri-County FACC was established as a means of coordinating planning within the Funding Area. This approach allows the three RWMGs to balance the necessary autonomy of each planning region to plan at an appropriate scale with the need to improve inter-regional cooperation and efficiency. To address DWR's concerns, the three planning regions are committed to identifying cross-boundary projects and common programs that address key challenges. This approach will capture the integration of water supply, wastewater, and watershed planning across three coordinated IRWM regions.

2.8.6 Relationship and Coordination with Watershed Management Areas

At its essence, the Watershed Management Area is a collaborative framework for municipalities and special purpose agencies to work collaboratively and find synergies across water resource disciplines. Its purpose is to bring together a wide variety of water resource managers in order to achieve more comprehensive and cost effective solutions to Orange County's water resources needs. Member agencies voluntarily

enter into a cooperative agreement that forms the Watershed Management Area. Governance includes a policy committee of elected officials to oversee each Watershed Management Area. Senior staff from each member organization form a management committee to develop a joint work plan and oversee its implementation. Regular stakeholder forums are held to involve the public and share information across organizations within each Watershed Management Area.

The South Orange County WMA is unique in its habitat values, open space, un-channelized creeks, reserves, parks, and forests. The South Orange County WMA is adjacent to the Central Orange County WMA (Santa Ana Watershed Funding Area), North Orange County WMA (Santa Ana Watershed Funding Area) to the north and the Upper Santa Margarita Watershed (San Diego Funding Area) to the South. Figure 2-6 shows the Orange County Watershed Management Areas.

The Central Orange County WMA is located entirely in Orange County and is comprised of the San Diego Creek, and Newport Bay watersheds. It lies within the Santa Ana Regional Water Quality Control Board boundary.

The North Orange County WMA encompasses 241,000 acres (376 square miles) in Northern Orange County. The NOC WMA is bordered by Los Angeles County to the North and West and to the East by San Bernardino County. The three watersheds in this area are the San Gabriel River/Coyote Creek, Anaheim Bay-Huntington Harbour and the Santa Ana River. All three watersheds lie within the Santa Ana Regional Water Quality Control Board boundary.

Today, throughout Orange County, these groups meet together on a regular basis to collaborate on water resource issues, including water supply, surface water quality, flood management, wastewater, and natural resource protection. Integrated Regional Water Management Plans have been developed in all three Watershed Management Areas. In the process of developing these plans, goals and solutions specific to each Watershed Management Area are formulated through consensus. Likewise, a custom slate of projects and programs is developed to address the water resource needs of each Watershed Management Area.

In the future the ability to fund water resource projects will be challenging. With the collaborative process, Orange County continues to be a leader in meeting those challenges. Watershed Management Areas and Integrated Regional Water Management Plans are key tools to accessing federal, state and local grant opportunities to help offset the investment necessary to sustain the water resource needs of the region.

In the South Orange County WMA, integration is effectively achieved across regional boundaries by the Orange County Water District, MWDOC and member agencies. Stormwater management and pollution control is effectively coordinated across watershed boundaries by Orange County Public Works (OCPW) Department as the principal National Pollutant Discharge Elimination System (NPDES) Permittee, TMDL program coordinator, and Flood Control infrastructure owner and operator of county-wide regional and subregional flood control facilities. Environmental stewardship is integrated across adjacent regions through the Nature Reserve of Orange County as

administrator of Central/Coastal Orange County Habitat Conservation Plan, environmental coalitions such as the Friends of Harbors, Beaches, and Parks, Orange County Green Vision, and the oversight and planning of regulatory agencies such as the California Dept. of Fish and Wildlife. The Central Orange County WMA, North Orange County WMA, and the South Orange County WMA are integrated through the sharing of County Staff.

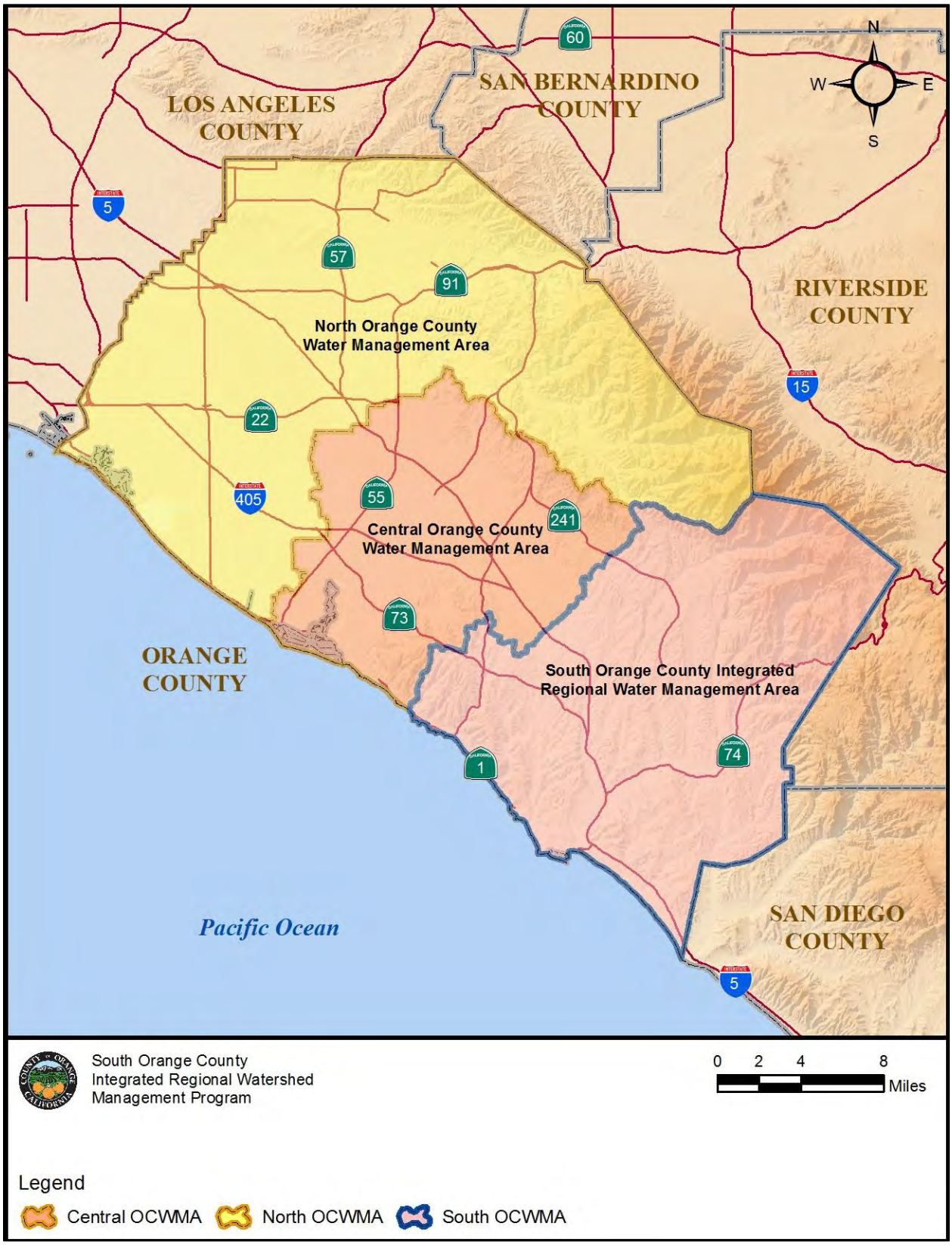

Figure 2-6: Orange County Watershed Management Areas

2.8.7 Overlapping and Void Areas

The San Diego Region does not overlap with any other proposed IRWM region. In establishing the Tri-County FACC, the three RWMGs identified one small void area between the three planning regions utilized for the Proposition 50 grant funding cycle. The Upper Santa Margarita IRWM region has incorporated that small area (a portion of the upper San Mateo Creek watershed) into its region boundary in order to ensure that all land area within the San Diego Funding Area is addressed in an IRWM planning effort. Additionally, the Tri-County FACC Overlay Subcommittee will be working collaboratively to define water management projects and programs that address common goals and objectives within the three IRWM Plans.

2.9 Tri-County FACC Structure and Governance

2.9.1 History and Background

In February 2008, the three planning regions representing the San Diego Funding Area began coordination to identify cooperation opportunities, share information, and determine equitable allocation of funding that allowed certainty and trust to be built. Through regular meetings over a period of 15 months, the Tri-County FACC developed the MOU, which was reviewed and approved by all RWMG agencies from each planning region. Each public agency was represented by staff, agency council, and executive management in reviewing the MOU. This process culminated in full execution of the MOU for Integrated Regional Water Management Planning and Funding in the San Diego Funding Area on April 28, 2009 (see Appendix B).

In June 2008, the Tri-County FACC sent a letter to DWR offering to work directly with DWR as a test pilot in inter-regional collaboration. DWR staff encouraged the development of alternatives to consider governance and organization of the regions. This interaction was very beneficial because it allowed FACC members to explore ways to work together and provided a timely opportunity to review progress to date with the RWMG agencies and the advisory committees of all the planning regions.

2.9.2 Summary of the Governance MOU

The MOU provides for a long-term stable group to coordinate current and future issues related to IRWM planning in the larger Funding Area. The coordinating role of the committee provides for MOU renewal to support the IRWM program beyond the current grant cycle. Funding allocations are specific to Proposition 84, because of the nature and specifics of the bond language.

The MOU accomplishes the following for the Funding Area:

- Defines terms, which enables all parties to use a common language;
- Clearly identifies boundaries of the three planning regions covering the entire Funding Area;
- Identifies Watershed Overlay Areas to facilitate planning and coordination in cross-boundary watersheds;

- Creates an ongoing process for coordination and planning in the Funding Area and in the Overlay Areas;
- Provides for advisory committee cross membership to promote understanding, communication, and cooperation;
- Provides for IRWM Plan consistency, common references, and coordination of grant submittals to facilitate DWR's review process;
- Determines the funding allocation among the planning regions for Prop 84; and
- Identifies a process for identification and funding of common programs found by the Tri-County FACC to be of high value across the Funding Area.

In the unlikely event that any RWMG agency or group withdraws from the Tri-County FACC, members of the Tri-County FACC will continue to coordinate with the withdrawn agency and consider them as a stakeholder to the maximum extent possible. Additionally, the remaining members will negotiate with the withdrawn member to determine fair allocation of funding within the principles provided in the MOU agreement and will notify DWR as to the outcome of these negotiation and coordination efforts.

2.9.3 Future Efforts and Cooperation

The Tri-County FACC is working to identify areas of additional cooperation and to align planning efforts both to increase efficiency and to better inform each planning region about the efforts and plans of the others. The Tri-County FACC will build a foundation that ensures sustainable water resources planning within the Funding Area by serving as an umbrella organization, allowing the three IRWM regions to coordinate water resources planning activities and pool resources. Because human-made water infrastructure systems are the key water management units in the Funding Area, the planning regions reflect this reality and cross-boundary watershed issues are addressed via a collaborative subcommittee process.

The three RWMGs are undertaking coordinated planning within the Watershed Overlay Areas, one for the Santa Margarita River watershed area and one for the San Mateo Creek watershed area. The Watershed Overlay Subcommittee meets to discuss water resources projects and programs that may benefit from funding area-wide coordination, administration, funding, or support. Projects within the Watershed Overlay Areas identified as valuable and benefiting from cross-boundary coordination will be considered in the three IRWM project selection processes. A project may be proposed by a single RWMG or by several, where relevant to the Overlay Areas. However, the Tri-County FACC will coordinate to ensure that project costs are only identified once among the proposals.

3 REGIONAL DESCRIPTION

3.1 South Orange County IRWM Area

The South Orange County IRWM Area contains a unique piece of social and cultural history. As described in Section 1. Introduction, legacies passed on from native societies, once expansive cattle ranches, and twentieth century entrepreneurial farmers remain a part of the area's culture today. From the landmark Mission San Juan Capistrano near the stunning western coastline to the Cleveland National Forest in the east, South Orange County continues to be a destination known for beauty and a high quality of life. Most of the coastline is developed, and additional urbanization is anticipated in the backcountry ranch land over the next 20 years. Today, the region's social and cultural makeup includes a unique mix of equestrian lifestyle, authentic Mexican/Hispanic culture, and a progressive business industry. The economic conditions of the region are reflective of the rest of the state and nation. As mentioned in Section 1, the unemployment rate in Orange County dropped to 7.0 percent in November 2012, down from the 7.2 percent in October 2012, and below the year-ago estimate of 8.1 percent. This compares with an unadjusted unemployment rate of 9.6 percent for California and 7.4 percent for the nation during the same period. The California Employment Indicator Index indicates that job growth is sluggish in 2012. Orange County industry employment is showing slight increases and fluctuations with some industries performing better than others, yet overall growth still remains slow due to the extensive impacts associated with the Great Recession. Orange County population growth has slowed. Migration into the County has slowed and even become negative in recent years leaving natural increase as the engine driving growth. The County continues to diversify its population yet, while all ethnicities are currently experiencing drops in birth rates, the Latino demographic is largely accountable for the majority of new births and by 2020 the Latino demographic is expected to become the new majority of the population. Overall, Orange County was ranked 38th in population percentage growth from 2000 to 2010 with 5.8%, compared to the state.[6]

As shown in Figure 3-1, the South Orange County WMA includes the area that encompasses the SJHU in South Orange County, California, as defined in the Water Quality Control Plan of the San Diego Basin (Basin Plan). The South Orange County IRWM Group determined that the South Orange County WMA, as defined herein, is an appropriate Region for integrated water planning because of its congruence with the natural hydrogeologic barriers of the SJHU within the San Diego Water Board boundaries. The San Diego Water Board boundary stretches along 85 miles of scenic coastline from South Newport Beach to the Mexican Border and extends 50 miles inland to the crest of the coastal mountain range. The San Diego Water Board boundary makes up the northern border of the South Orange County WMA while the Southern border is consistent with the border of Orange County.

[6] County of Orange - OC Economic Indicators Dashboard. December 2012 Metrics. Available online: http://oceconomy.org/population/

The appropriateness of the Region is supported by its congruence with the natural hydrogeologic barriers of the SJHU, the Region 9 Water Quality Control Board, and the collaborative nature of the agencies that strive for efficient and environmentally sound management of the Region's natural resources.

The SJHU is a collection of coastal watersheds that covers 496 square miles in San Diego, Orange, and Riverside counties. The SJHU is naturally divided by major water bodies and represents an important water resource in one of the most arid regions of the nation. The SJHU is comprised of six major watersheds: 1) Laguna Coastal Streams, 2) Aliso Creek, 3) Dana Point Coastal Streams (Salt Creek), 4) San Juan Creek, 5) San Clemente Coastal Streams, and 6) San Mateo Creek, and two groundwater basins: 1) San Juan Valley Groundwater Basin and 2) San Mateo Groundwater Basin. Refer to Figure 3-1 for a map of the IRWM Region and Figure 3-5 for the IRWM Region Watersheds and Surface Water Bodies.

The Mediterranean climate in South Orange County is characterized by brief, intense storms between October and March. It is not unusual for a majority of the annual precipitation to fall during a few storms in close proximity to each other. The higher elevation portions of the watershed (typically the headwater areas) typically receive significantly greater precipitation, due to orographic effects.

In addition, rainfall patterns are subject to extreme variations from year to year and longer-term wet and dry cycles. The combination of steep, short watersheds; brief intense storms; and extreme temporal variability in rainfall result in "flashy" systems where stream discharge can vary by several orders of magnitude over very short periods of time.

The geology, topography, and climate of the coastal watersheds of South Orange County make them unique among the watersheds in the United States. The Transverse and Peninsular Ranges are intensely sheared and steep due to ongoing uplift and tectonic activity. In addition, these ranges are located close to the coast, resulting in steeper, shorter watersheds than those found in most other portions of the country. Figure 3-2, Topographical Features, shows ground elevations throughout the South Orange County WMA.

Three counties and several municipalities have jurisdiction over portions of the SJHU. Riverside County includes a small portion (17.8%) of the SJHU, and no municipalities are found within this portion. More than half of the SJHU (51.7%) is located within Orange County, and the remainder (30.5%) is in San Diego County. In Orange County, the cities of Aliso Viejo, Mission Viejo, Laguna Beach, Laguna Woods, Laguna Niguel, Dana Point, Lake Forest, Rancho Santa Margarita, San Juan Capistrano, and San Clemente occur within the SJHU. Although a small portion (7.2%) of the SJHU is developed, most of this development is concentrated within the north-western portion of the SJHU. The undeveloped portion, the Southern and interior portions, occupies 91.8% of the SJHU. Agricultural land use occupies less than 1% of the land. Refer to Section 10.2 Local Land Use Planning for a discussion on regional land use. A very large and mostly undeveloped portion of the watershed is encompassed by the Camp Pendleton Marine Corps Base in northern San Diego County. Other large areas of

open space are found within the Cleveland National Forest. Caltrans is another major landowner, and it has jurisdiction over the major freeways that traverse the watershed.

Figure 3-1: IRWM Regional Location

Figure 3-2: Topographic Features

3.2 Cities and Special Districts

The IRWM Group consists of the following cities, state, county, and special districts. Figure 3-3 shows IRWM Member Cities and Figure 3-4 shows IRWM Member Districts, all of which serve as the beneficiaries of the IRWM Plan.

The IRWM Group cities include the following:

- Aliso Viejo
- Dana Point
- Laguna Beach
- Laguna Hills
- Laguna Niguel
- Laguna Woods
- Lake Forest
- Mission Viejo
- Rancho Santa Margarita
- San Clemente
- San Juan Capistrano
- Unincorporated Orange County

The IRWM Group special districts and agency participants include:

- California State Parks
- City of San Clemente Utilities Divisions
- City of San Juan Capistrano Water Services Department
- County of Orange
- El Toro Water District
- Irvine Ranch Water District
- Laguna Beach County Water District
- Moulton Niguel Water District
- Municipal Water District of Orange County
- Natural Resources Conservation Service
- Orange County Flood Control District

- Orange County Health Care Agency
- San Diego Regional Water Quality Control Board
- San Juan Basin Authority
- Santa Margarita Water District
- South Coast Water District
- South Orange County Wastewater Authority
- Trabuco Canyon Water District

Figure 3-3: IRWMP Member Cities

Figure 3-4: IRWM Member Districts

3.3 Water Related Components of WMA

3.3.1 Watersheds and Biological Significant Units

San Juan Hydrologic Unit

The SJHU is naturally divided by major water bodies.[7] This hydrologic unit is located in the southern portion of Orange County, approximately 50 miles south of Los Angeles and 65 miles north of San Diego. The two major natural surface water bodies within the Unit are San Juan Creek and San Mateo Creek. Within the WMA, seven major watersheds and two groundwater basins make up the Orange County portion of the Unit. The Unit and its water bodies are summarized below. Figure 3-5 IRWM Region Watersheds and Surface Water Bodies illustrates the location of each watershed in the WMA and shows the locations of the major creeks and their tributaries throughout the WMA.

Watersheds

The South Orange County WMA includes the area that encompasses the San Juan Hydrologic Unit (SJHU) in South Orange County, California, United States, as defined in the San Diego Region 9 Basin Plan. Each watershed is discussed below:

3.3.1.1 Aliso Creek Watershed

The Aliso Creek Watershed covers 30.4 square miles and its main tributary, Aliso Creek, originates in the Santa Ana Mountains inside the boundaries of the Cleveland National Forest. The watershed includes portions of the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Lake Forest, Mission Viejo and unincorporated Orange County.

Aliso Creek falls under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.13). The Basin Plan lists the English Canyon, Sulphur Creek, and Wood Canyon tributaries to Aliso Creek as receiving waters. The following existing beneficial uses are designated in the Basin Plan for the Aliso Creek watershed: agricultural supply; non-contact water recreation; warm freshwater habitat; and wildlife habitat. The following designations apply to the mouth of Aliso Creek: contact water recreation; non-contact water recreation; wildlife habitat, rare, threatened, or endangered species; and marine habitat.

[7] California Department of Water Resources. San Juan Valley Basin Description. 1/23/2013 Online: http://www.water.ca.gov/groundwater/bulletin118/bulletin118update2003.cfm

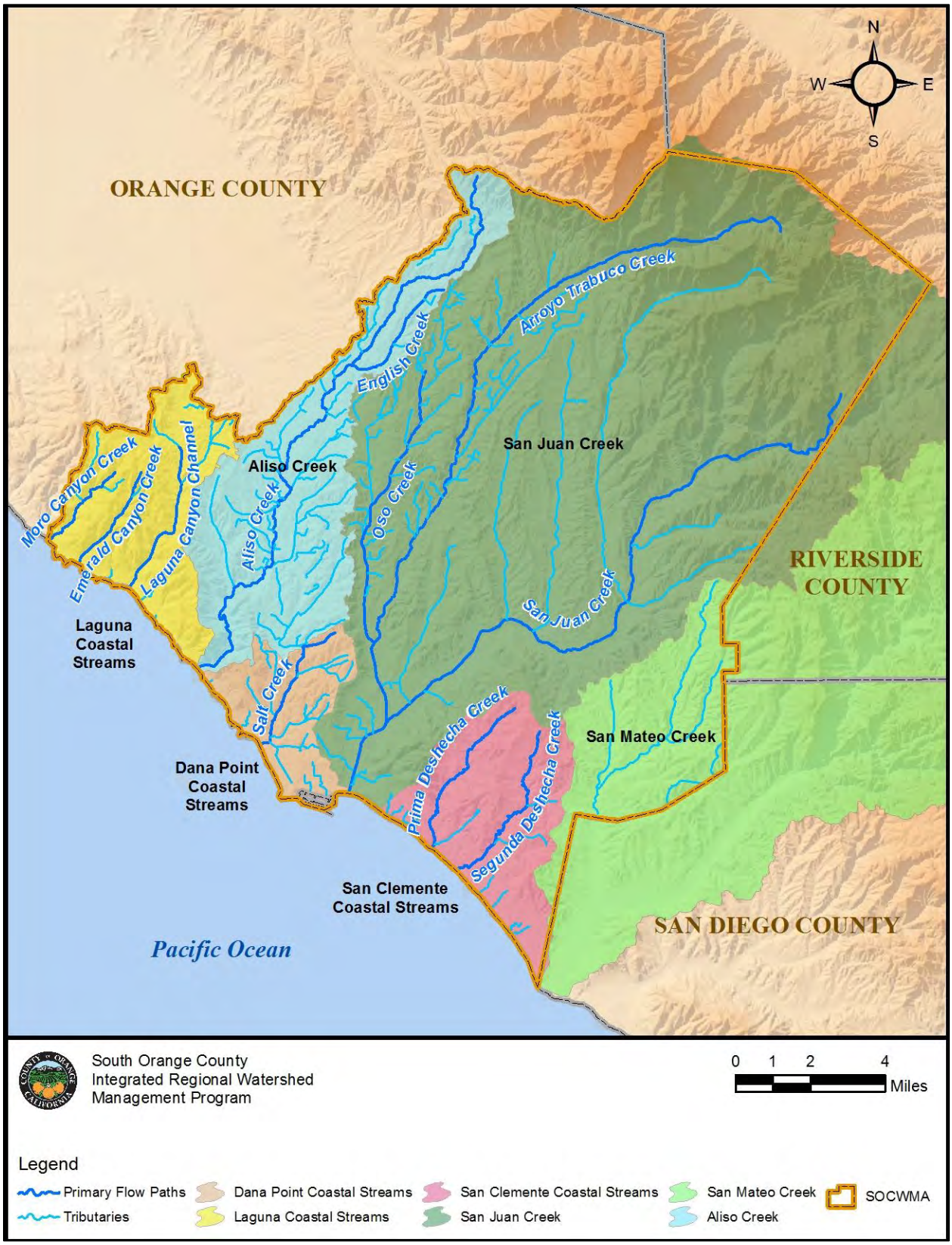

Figure 3-5: IRWM Regional Watershed and Surface Water Bodies

As outlined in the Aliso Creek Watershed Management Plan[8], the watershed suffers from a number of problems related to water resources. The identified problems are grouped in four general categories: creek instability, water quality, loss of fish and wildlife habitat, and flooding damages.

Watershed management has become necessary in order to decrease negative impacts of human activities and to increase the positive impacts. Economic resources are necessary to enable the community to address and solve resource problems such as nonpoint source pollution. Establishment of a goal-oriented management program can prevent problems before they occur and will result in less expensive and more efficient use of community energy. Efforts to accomplish needed improvements will include programs to reach several listed objectives of the plan. These objectives are measurable milestones that will enable the community to track progress toward maintaining a natural balance in watershed resources. Most of the objectives promote and encourage practices and behaviors that support development of a healthy environment for the watershed. Education is therefore a major component of this management program, as well as enhanced public outreach to promote a more complete understanding of the environmental problems and the ecological value of the Aliso Creek Watershed.

The County continues to move forward with the Aliso Creek Mainstem Feasibility Study in an effort to produce a sustainable restoration plan for the project area. The original project, the Aliso Creek Water Quality SUPER Project (which combined 2005 IRWMP Priority A Projects 8 & 9), was integrated into the US Army Corps of Engineers (Corps) feasibility study process. This process evaluates baseline conditions, future without project conditions, and conducts alternatives analysis before developing a final plan for public review. The baseline conditions report has been finalized by the Corps. Pending receipt of federal funding, the Corps will complete the alternative analysis process followed by the preliminary design and engineering phase.

An Annual Watershed Workplan for Aliso Creek is developed by the associated Watershed Permittees to comply with Directive G of the San Diego Regional Water Quality Control Board's Order (Regional Board Order No. R9-2009-0002). The Watershed Workplan describes the Watershed Permittees' development and implementation of a collective watershed strategy to assess and prioritize the water quality problems within the watershed's receiving waters, identify and model sources of the highest priority water quality problem(s), develop a watershed-wide BMP implementation strategy to abate highest priority water quality problems, and a monitoring strategy to evaluate BMP effectiveness and changing water quality prioritization in the watershed. The Workplan is available for review on the OC Watersheds website.[9] Work plans were also developed for the Dana Point Coastal

[8] Aliso Creek Watershed Management Plan. OC Watersheds website. Available online 2/15/2013. http://ocwatersheds.com/civicax/filebank/blobdload.aspx?BlobID=9487

[9] Aliso Creek Watershed Work Plan. OC Watersheds website. Available online 1/23/2013. http://ocwatersheds.com/programs/waterways/stormwater/documentspr

Streams, Laguna Coastal Streams, San Juan Creek, San Clemente Coastal Streams, and San Mateo Creek, as mentioned below.

In February 2010 the San Diego Regional Board adopted TMDLs for indicator bacteria to address impaired beaches and creeks in the San Diego region including Aliso Creek and its tributaries, the Aliso Creek mouth, and Aliso Beach. On April 4, 2011, the Beaches and Creeks Indicator Bacteria TMDLs received final approval from the State Office of Administrative Law. As a first step to fulfilling the future requirements of the TMDLs, the County and Watershed Permittees developed a Comprehensive Load Reduction Plan (CLRP) to address bacteria impaired segments and other 303(d) listings within the Aliso Creek Watershed, as well as the San Clemente Coastal Streams and San Juan Creek Watersheds because they currently have beaches or creeks listed for REC-1 impairments that necessitate a CLRP. This plan was submitted to the San Diego Regional Board on October 4, 2012. In addition to detailing existing and planned BMPs within the watershed the CLRP describes a series of proposed special studies to better define and optimize future watershed efforts.

As a regional project, the Comprehensive Landscape Water Use Efficiency Program will assist in meeting the water conservation and quality goals of all the watersheds throughout the region. The Project's goals and objectives assist in meeting several objectives of the Aliso Creek Watershed Workplan. Specifically, the Project meets water quality goals by establishing a regional landscape transformation from turf intensive landscapes to California Friendly landscapes that emphasize plantings that have water needs similar to our natural rainfall or 12 inches of precipitation per year. The Project also meets public education goals by incorporating signage at project locations in highly visible landscapes along major streets that have non-functional turf such as street medians, intersections, and sidewalk buffers.

3.3.1.2 Dana Point Coastal Streams Watershed

The Dana Point Coastal Streams Watershed covers 6 square miles. The main tributary of the Dana Point Coastal Streams watershed is Salt Creek, which ultimately drains into the Pacific Ocean near the northern boundary of the City of Dana Point. Dana Point Harbor is also located within this watershed.

Dana Point Coastal Streams falls under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.14). In addition to the primary Salt Creek, the Basin Plan lists San Juan Canyon and Arroyo Salado as receiving waters. The following existing beneficial uses are designated in the Basin Plan for Salt Creek, San Juan Canyon, and Arroyo Salado: agricultural supply; non-contact water recreation; warm freshwater habitat; and wildlife habitat. The potential beneficial use of contact water recreation is also designated in the Basin Plan for Salt Creek, San Juan Canyon, and Arroyo Salado.

The following existing beneficial uses are designated in the Basin Plan for Dana Point Harbor: contact water recreation; non-contact water recreation; commercial and sport fishing; industrial service supply; marine habitat; migration of aquatic organisms; navigation; rare, threatened or endangered species habitat; shellfish harvesting; spawning; reproduction and early development habitat; and wildlife habitat.

Priority concerns for the watershed are poor water quality affecting Salt Creek Beach and Baby Beach, and nuisance flows and environmental issues at the Dana Point Harbor.

The Salt Creek Ozone Treatment Facility provides advanced storm water treatment to reduce bacteria levels in Salt Creek dry-weather flows from the 4500 acre watershed. The project has significantly reduced the number of beach postings. The plant has been in operation since November 2005 and operates generally from May through October. The water quality made notable improvements and the beaches were taken off the State Water Resources Control Board's 2010 Integrated Report 303(d) List for Recreational Use. The facility captures up to 1,000 gallons per minute of surface flows (1.44 MGD), provides advanced filtration and then uses ozone to treat for bacteria and other pollutants from the runoff prior to discharging to the beach.

The North Creek Ozone Treatment Pilot Project is a prototype "package" ozone treatment system in a runoff application in Dana Point. The City of Dana Point operates the system upstream of North Creek. The system treats the runoff, reducing bacteria and some heavy metals prior to entering the creek. The system is improving the water quality and clarity, and has enhanced the natural habitat, including vegetation and wildlife.

In addition to the City's own 17 diversion systems, the Baby Beach Storm Drain Diversion and Filtration Project diverts approximately 3,000 gallons per day of dry-weather runoff from the storm drain to the sanitary sewer system. The water is then treated at the J.B. Latham treatment plant in Dana Point and then released 2.2 miles out into the ocean. The project was funded by the Dana Point Headlands Reserve LLC, as conditioned by the City of Data Point, and by the County of Orange, funded through the Proposition 40 Clean Beach Initiative Grant administered by the State Water Resources Control Board.

In past years, Baby Beach has been classified as an F grade beach, with poor grades stemming from a lack of circulation as well as runoff from multiple sources. However, the Heal the Bay 2011-2012 Annual Report , gave the four monitored regions of Baby Beach, west end, east end, buoy line, and swim area, a B average grade. Baby Beach was also delisted for "fecal coliform" (one of three tested indicator bacteria) from the State Water Resources Control Board 2010 Clean Water Act Section 303(d) List/305(b) Report (2010 Integrated Report).

The Dana Point Harbor (February 2010) Revitalization Plan has been developed with the intent of promoting Coastal Act compliance by enhancing public access opportunities, providing updated visitor-serving commercial and marine recreational amenities, providing water quality improvements and promoting coastal resource preservation throughout the harbor.

The Watershed Workplan for Dana Point Coastal Streams is developed and updated annually by the associated Watershed Permittees to comply with Directive G of the San Diego Regional Water Quality Control Board's Order (Regional Board Order No. R9-2009-0002). The Watershed Workplan describes the Watershed Permittees' development and implementation of a collective watershed strategy to assess and

prioritize the water quality problems within the watershed's receiving waters, identify and model sources of the highest priority water quality problem(s), develop a watershed-wide BMP implementation strategy to abate highest priority water quality problems, and a monitoring strategy to evaluate BMP effectiveness and changing water quality prioritization in the watershed. The Workplan is available for review on the OC Watersheds website.[10]

In addition, comprehensive Annual Progress Reports are prepared and submitted to the San Diego Regional Water Quality Control Board in November pursuant to the San Diego Regional Water Quality Control Board adopted indicator bacteria Total Maximum Daily Loads (TMDLs) for Baby Beach in Dana Point Harbor that was adopted in In June 2008,

3.3.1.3 Laguna Coastal Streams Watershed

The Laguna Coastal Streams Watershed is approximately 11 square miles and includes portions of the cities of Aliso Viejo, Laguna Beach, and Laguna Woods. It consists of the Laguna Canyon Creek watershed which runs north to south, directly through the middle of this watershed, and discharges into the Pacific Ocean in Laguna Beach. Several other smaller watersheds, including Boat Canyon, Bluebird Canyon, Rim Rock Canyon, and Hobo Canyon, also drain portions of these cities. This watershed is bound on the west by Emerald Canyon and on the east by the Aliso Creek watershed. The remaining undeveloped areas are largely within the Laguna Coast Wilderness Park and the Aliso and Wood Canyons Regional Park.

Laguna Coastal Streams falls under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.12). In addition to Laguna Canyon Creek, the Basin Plan lists Boat Canyon, Laguna Canyon, Bluebird Canyon, Rim Rock Canyon, and Hobo Canyon as receiving waters discharging to the Pacific Ocean. These receiving waters offer several beneficial uses, including agricultural supply, non-contact and contact water recreation, warm freshwater habitats, and wildlife habitats.

The Laguna Coastal Streams Watershed is within the jurisdiction of the SDRWQCB (Region 9). The Heisler Park Ecological Reserve is an ASBS located in this watershed, and protection of the reserve was completed in 2012 and included stringent coastal planning efforts between the City of Laguna Beach, City of Newport Beach, Irvine Company, the County of Orange, California State Parks and Caltrans. To protect Heisler Park, the City of Laguna Beach has implemented the *Heisler Park Marine Habitat Protection Project* Improvements project to protect the adjacent Heisler Park Ecological Reserve. The project has helped the City comply with a SWRCB mandate prohibiting runoff discharges from the urbanized watershed area to the ecological reserve. The Project is located on property owned and maintained by the City of Laguna Beach.

[10] Dana Point Coastal Streams Watershed Workplan. OC Watersheds website. Available online 1/23/2013. http://ocwatersheds.com/programs/waterways/stormwater/documentspr

The following park improvements within an area of the park to reduce runoff to the ecological reserve have been completed:

1. A controlled and efficient irrigation system;
2. Bluff-top landscape grading;
3. Surface drain and pathway improvements;
4. Storm drain improvements;
5. Installation of a surface runoff diversion system; and Coastal bluff stabilization.

To assist in watershed management planning, the Watershed Permittees completed a Watershed Workplan for Laguna Coastal Streams to comply with Directive G of the San Diego Regional Water Quality Control Board's Order (Regional Board Order No. R9-2009-0002). The Watershed Workplan describes the Watershed Permittees' development and implementation of a collective watershed strategy to assess and prioritize the water quality problems within the watershed's receiving waters, identify and model sources of the highest priority water quality problem(s), develop a watershed-wide BMP implementation strategy to abate highest priority water quality problems, and a monitoring strategy to evaluate BMP effectiveness and changing water quality prioritization in the watershed. The Workplan is available for review on the OC Watersheds website.[11]

Projects such as the Rockledge Ocean Protection Project will help to further protect the resources and beneficial uses in this watershed. The Rockledge sewer station, built more than thirty years ago, represents a significant threat to ocean water quality due to the threat of systems failure and a sewage spill. Polluted sewer water flowing untreated into the ocean impacts all beneficial uses of the Laguna Beach coastline.

Replacing the deteriorating Rockledge sewer system located above a protected marine tide pool zone will significantly reduce bacteria count in the watershed and assist protecting the beneficial uses of the watershed and Pacific Ocean. The Rockledge Ocean Protection Project will reduce the amount of indicator bacteria found in the adjacent beach zone within the City of Laguna Beach. The project will help meet receiving water objectives established in the Region 9 San Diego Basin plan as well as indicator bacteria objectives established in the Region 9 Beaches and Creeks Bacteria TMDL. The project is on-going and will be completed by Spring 2013.

3.3.1.4 San Juan Creek Watershed

The San Juan Creek Watershed is the largest watershed in the South Orange County WMA. The approximately 173 square mile watershed includes portions of the cities of Dana Point, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San

[11] Laguna Coastal Streams Watershed Work Plan. OC Watersheds website. Available online 1/23/2012. http://ocwatersheds.com/programs/waterways/stormwater/documentspr

Juan Capistrano and unincorporated areas within the County. The Arroyo Trabuco and Oso Creeks are smaller tributaries. A small western portion of the San Juan Creek Watershed extends into Riverside County. The Creek ultimately discharges into the Pacific Ocean at Doheny Beach.

San Juan Creek falls under the Mission Viejo subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.21-1.28). The Basin Plan lists Bell Canyon Creek, Cañada Gobernadora, Arroyo Trabuco (Trabuco Creek), and Oso Creek tributaries to San Juan Creek as receiving waters. The following existing beneficial uses are designated in the Basin Plan for San Juan Creek, Morrell Canyon, Decker Canyon, Long Canyon, Lion Canyon, Hot Spring Canyon, Cold Spring Canyon, Lucas Canyon, Aliso (not Creek) Canyon, Verdugo Canyon, Bell Canyon, Fox Canyon, Dove Canyon, Crow Canyon, Trampas Canyon, Cañada Gobernadora, Cañada Chiquita, Horno Creek, Trabuco (Arroyo Trabuco) Creek, Holy Jim Canyon, Falls Canyon, Rose Canyon, Hickey Canyon, Live Oak Canyon, Tijeras Canyon, Oso Creek, and La Paz Creek: agricultural supply; cold freshwater habitat; industrial; contact water recreation; non-contact water recreation; spawning habitat; warm freshwater habitat; and wildlife habitat. The following designations apply to the mouth of San Juan Creek: rare, threatened, or endangered species; non-contact water recreation; marine habitat; migratory habitat; shellfish habitat; and wildlife habitat.

San Juan Creek empties into Doheny Beach, which consistently has not met State recreational water quality standards. Three regional epidemiology studies, a component of which is an effort to identify and quantify viral pathogens, began between 2007 and 2009. This large scale epidemiology study (using over 30 microbial indicators) was led by the Southern California Coastal Water Research Project, UC Berkeley, Orange County Sanitation Districts (OCSD), and Heal the Bay. The overall study, which took place at Doheny Beach as well as Avalon Beach and Surfrider Beach, focuses on three primary questions:

1) Did water contact increase the risk of illness during the two weeks following exposure to water?

2) Among those individuals with water contact, were there associations between illness and measured levels of traditional water quality indicators?

3) Among those individuals with water contact, were there associations between illness and measured levels of non-traditional water quality indicators?

The study found that, of the three tested indicators (total coliform, fecal coliform, and *Enterococcus*) in the bacteria TMDL, only associations between *Enterococcus* and health outcomes were consistent with current concentration based objectives and only under conditions when the Creek flowed to the beach. These findings suggest that site

specific objectives for at least total and fecal coliform bacteria indicators are warranted to accurately characterize human health risks at San Juan Creek and Doheny Beach.[12]

As a follow-up to the SCCWRP Epidemiology Study, which concluded that there was a three (3%) increase in health risk for gastrointestinal ailments between swimmers and non-swimmers at Doheny State Beach, but could not identify the source of the increase health risk, the State Water Resources Control Board's Clean Beach Task Force commissioned the *Source Identification Protocol Project* (SIPP) to develop protocols for tracking and identifying bacteria sources at beaches throughout California. SCCWRP is one of four core laboratories implementing the multi-year study, which will produce a standard guidance manual for beach managers. Doheny State Beach is a site for this study. The objectives are to (1) develop protocols for source identification, (2) identify sources of beach contamination on a site-specific basis, and (3) provide recommendations for management practices that can be implemented by the local community to reduce or eliminate those sources. The City of Dana Point has taken on a stakeholder/facilitator role in the study with SCCWRP. Source evaluations, including field reconnaissance, through next summer are currently focused on eliminating any possible sewage entering the lower watershed.

As part of the Proposition 50 IRWM Implementation Grant Program funding awarded to the South Orange County IRWM in 2007, the City of San Juan Capistrano's Recycled Water Transmission System Improvements Project will be completed in 2013. The Recycled Water Transmission System Improvements Project will construct a recycled water system consisting of four reservoirs, one pump stations, and 29 pipeline projects in six segments totaling 102,000 lineal feet. This represents the next phase of improvements to the recycled water system, and shall distribute approximately 3,268 acre-feet of recycled water per year to areas in San Juan Capistrano, Dana Point, San Clemente and Mission Viejo not currently served by a recycled water source. The Transmission System Improvements Project is a component of the J.B. Latham Treatment Plant-AWT project for distribution of recycled water produced by that plant. This Project will help protect the natural resources of the watershed and expand the resources for the region.

The Gobernadora Multipurpose Basin Project was funded under Prop 50 and will also greatly assist in protecting the beneficial uses of the San Juan Creek Watershed. The Project is located along the Gobernadora Creek, which is a major tributary of San Juan Creek. The upper portion of the watershed within Coto De Caza, approximately 7.8 square miles upstream of its confluence with Wagon Wheel Creek, has been developed over the past two decades primarily as Coto de Caza, a private community with over 5,000 dwelling units and two golf courses. The lower portion of the watershed, approximately 3.4 square miles, is owned by Rancho Mission Viejo LLC (RMV) and remains indigenous. The Project is upstream of the 105-acre Gobernadora Ecological

[12] Colford, J.M., Jr.et al., *Using rapid indicators for Enterococcus to assess the risk of illness after exposure to urban runoff contaminated marine water, Water Research* (2012), doi:10.1016/j.watres.2012.01.033 (2012) Available online: www.elsevier.com/locate/watres

Restoration Area (GERA), a wetlands reserve with a conservation easement. The Project will restore Gobernadora Creek to protect the GERA, as well as effectively contribute to meeting the Basin Plan's objectives and beneficial uses for the San Juan Watershed within the San Juan Hydrologic Unit (SJHU).

The IRWM Plan also contains flood risk management projects, such as OCFCD's Channel Improvements to San Juan Creek and Trabuco Creek Channels to fortify levees to protect homes and businesses from the threat of storms similar to events in 2005. OCFCD's feasibility study, currently being prepared by the US Army Corps of Engineers, focuses on flood risk management and potential ecosystem restoration opportunities on the lower reaches of San Juan Creek Watershed with the goal to remove or reduce flood flows to containment within the channel the FEMA Special Flood Hazard Area (SFHA).

A Watershed Workplan for San Juan Creek is updated annually by the associated Watershed Permittees to comply with Directive G of the San Diego Regional Water Quality Control Board's Order (Regional Board Order No. R9-2009-0002). The Watershed Workplan describes the Watershed Permittees' development and implementation of a collective watershed strategy to assess and prioritize the water quality problems within the watershed's receiving waters, identify and model sources of the highest priority water quality problem(s), develop a watershed-wide BMP implementation strategy to abate highest priority water quality problems, and a monitoring strategy to evaluate BMP effectiveness and changing water quality prioritization in the watershed. The Workplan is available for review on the OC Watersheds website.[13]

Water quality and habitat protection are key components to planning in the San Juan Watershed. The Southern California Steelhead Recovery Plan[14] identifies San Juan Creek and San Mateo creeks as critical habitat designation for the Southern California Steelhead. Figure 3-8 shows the steelhead critical habitat. In addition, the San Juan Creek Watershed Comprehensive Load Reduction Plan (CLRP) was developed by the watershed partners in accordance with the TMDL regulations. Projects supporting water quality of our creeks and overall watershed will assist in protecting aquatic species.

A CLRP was also developed for San Juan Creek and Aliso Creek Watersheds because they currently have beaches or creeks listed for REC-1 impairments that necessitate a CLRP. The CLRP describes the approach that will be taken by the San Juan Creek Watershed Permittees (cities of Dana Point, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, and San Juan Capistrano, the County of Orange, and the Orange County Flood Control District collectively as Phase 1 MS4s) in response San Diego Regional Water Quality Control Board Resolution No. R9-2010-0001 (Amending

[13] San Juan Creek Watershed Workplan. OC Watersheds website. Available online 1/23/2013. http://ocwatersheds.com/programs/waterways/stormwater/documentspr

[14] National Oceanic & Atmospheric Agency (NOAA) Southwest Regional Office, National Marine Fisheries Service. *Final Southern California Steelhead Recovery Plan*. Long Beach, CA. January 2012. Available online: http://swr.nmfs.noaa.gov/recovery/SC_Steelhead/

the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region (Including Tecolote Creek)). As described in the amendments, development of a watershed pollutant load reduction plan is a required step in the bacteria Total Maximum Daily Loads (TMDLs). To fulfill this requirement a watershed CLRP has been developed to address bacteria pollutants and other watershed 303(d) listed constituents. Key CLRP elements include: assessing watershed conditions and setting priorities including development of a Watershed Monitoring and Assessment Program; assessing BMP candidate strategies and developing a CLRP Implementation Strategy; developing BMP Action Plans, and preparing a schedule for loading reductions to be achieved. More information on the TMDL can be found in Section 4.1.4.6.

3.3.1.5 San Clemente Coastal Streams Watershed

The San Clemente Coastal Streams Watershed is approximately 18 square miles and includes portions of the cities of San Clemente, San Juan Capistrano and Dana Point. Prima Deshecha Canada is one of two main streams that flow through the City of San Clemente, ultimately discharging into the Pacific Ocean at Poche Beach. The Prima Deshecha discharges into the Pacific Ocean at Poche Beach. The Segunda Deshecha Canada, the second main stream draining the watershed, discharges into the Pacific Ocean at North Beach.

San Clemente Coastal Streams falls under the San Clemente subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.31 and 1.32). The Basin Plan lists Prima Deshecha Canada and Segunda Deshecha Canada as receiving waters. The following existing beneficial uses are designated in the Basin Plan for the receiving waters listed above: agricultural supply; contact water recreation; non-contact water recreation; warm freshwater habitat; and wildlife habitat.

The City of San Clemente's Urban Runoff Management / Water Quality Program was created to protect and preserve the community public health and the environment through implementation of activities to reduce and eliminate surface runoff pollution from industrial, commercial, new development / construction, and residential areas that may enter the storm drain system. The Storm Water Local Implementation Plan (2003), Urban Runoff Management Plan (2001), and the Water Quality Management Plan (2003) are the City's local plans for implementing and managing a variety of activities to comply with storm water permit requirements and improve water quality within the San Clemente Watershed.

Poche Beach is located at the mouth of the Prima Deshecha Canada Channel and lies on the border between the cities of Dana Point and San Clemente. The beach has been routinely posted for exceedances of fecal indicator bacteria standard when tested in the surf zone. The Heal the Bay 2009-2010 Annual Report lists Poche Beach on its Beach Bummers list. A dry weather filtration/UV disinfection plant at the Poche Creek outlet was completed in 2009 with performance testing performed until May 2010, at which point the treatment plant became fully operational.

The City of San Clemente's Recycled Water Treatment and Distribution Project was funded under the Proposition 50 IRWM Implementation Grant Program in 2006. The Recycled Water Treatment and Distribution Project expands the City's recycled water system, which consists of a 2.2 MGD treated recycled water treatment plant expansion, 2.5 MG reservoir, pump station, booster pump, interconnection, 5 pipeline transmission main segments totaling 12,600 linear feet and onsite customer conversions. A proposed interconnection is with the Santa Margarita Water District will improve reliability and allow for the possibility of constructing a regional storage facility in the future. This Project will greatly enhance the local resources of the watershed.

A Watershed Workplan for San Clemente Coastal Streams is updated annually by the associated Watershed Permittees to comply with Directive G of the San Diego Regional Water Quality Control Board's Order (Regional Board Order No. R9-2009-0002). The Watershed Workplan describes the Watershed Permittees' development and implementation of a collective watershed strategy to assess and prioritize the water quality problems within the watershed's receiving waters, identify and model sources of the highest priority water quality problem(s), develop a watershed-wide BMP implementation strategy to abate highest priority water quality problems, and a monitoring strategy to evaluate BMP effectiveness and changing water quality prioritization in the watershed. The Workplan is available for review on the OC Watersheds website.[15]

A CLRP was developed by the San Clemente Coastal Streams Watershed Permittees (City of San Clemente and the Orange County Flood Control District collectively known as Phase 1 MS4s) in response to San Diego Regional Water Quality Control Board Resolution No. R9-2010-0001 (Amending the Water Quality Control Plan for the San Diego Basin (9) to Incorporate Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Beaches and Creeks in the San Diego Region (Including Tecolote Creek)).[16] As previously mentioned, a CLRP was also developed for the Aliso Creek and San Juan Creek Watersheds because they currently have beaches or creeks listed for REC-1 impairments that necessitate a CLRP. As described in the amendments, development of a watershed pollutant load reduction plan is a required step in the bacteria Total Maximum Daily Loads (TMDLs). To fulfill this requirement a watershed CLRP has been developed to address bacteria pollutants and other watershed 303(d) listed constituents. Key CLRP elements include: assessing watershed conditions and setting priorities including development of a Watershed Monitoring and Assessment Program; assessing BMP candidate strategies and developing a CLRP Implementation Strategy; developing BMP Action Plans, and preparing a schedule for loading reductions to be achieved.

[15] San Clemente Coastal Streams Watershed Work Plan. OC Watersheds website. Available online 1/23/2013. http://ocwatersheds.com/programs/waterways/stormwater/documentspr

[16] San Clemente Coastal Streams Watershed Comprehensive Load Reduction Plan. City of San Clemente website. Available online 3/39/13: http://san-clemente.org/sc/Meetings/CostalCom/Agendas/Download/430%20Agenda%20and%20Packet%2012.13.12.pdf

3.3.1.6 San Mateo Creek Watershed

Most of San Mateo Creek and its outlet to the Pacific Ocean, at San Onofre State Beach, are actually located in San Diego County. The San Mateo Creek Watershed within Orange County is largely unincorporated territory under the jurisdiction of the County. It covers approximately 20 square miles of southeastern Orange County including portions of the City of San Clemente in its downstream-most area.

San Mateo Creek falls under the San Mateo Canyon subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.40). The Basin Plan lists San Mateo Creek and its mouth as receiving waters. There are both existing and potential beneficial uses as described in the Basin Plan for the San Diego Basin. The following existing potential beneficial uses are designated in the Basin Plan for the receiving waters listed above: cold water habitat; rare species habitat; contact water recreation; non-contact water recreation; spawning habitat; warm water habitat; and wildlife habitat.

The City of San Clemente, the County of Orange, and the Orange County Flood Control District (the San Mateo Creek Watershed Permittees) completed a Watershed Workplan[17] for 2012 that identifies a schedule of management activities to be undertaken. This Workplan describes the approach taken by the San Mateo Creek Watershed Permittees to maintain a responsive program in compliance with Directive G, of the San Diego Regional Water Quality Control Board, Order No. R9-2009-0002.

Regional Projects proposed as part of this IRWM Plan, such as the Comprehensive Landscape Water Use Efficiency Program, will regionally assist in enhancing the water quality of beaches. Landscape irrigation is the largest demand on MWDOC's system in the South Orange County WMA. Therefore, reducing the amount of surface runoff carrying pollutants to the beaches, the Project will support meeting the beneficial uses of the San Mateo Creek Watershed.

Water quality and habitat protection are key components of the San Mateo Watershed. The Southern California Steelhead Recovery Plan identifies San Juan Creek and San Mateo creeks as critical habitat designation for the Southern California Steelhead.[18] Figure 3-8 shows the steelhead critical habitat. Projects supporting water quality of our creeks and overall watershed will assist in protecting aquatic species.

Due to its largely natural condition, the San Mateo Creek watershed essentially functions as a reference watershed for bioassessment monitoring; therefore prioritization of water quality constituents of concern and Best management Practice (BMP) implementation plans executed in other watersheds are not applicable to this watershed. However, the San Mateo Creek Watershed Permittees, which include the City of San Clemente, the County of Orange, and the Orange County Flood Control

[17] San Mateo Creek Watershed Work Plan. OC Watersheds website. Available online. 1/23/2013. http://ocwatersheds.com/programs/waterways/stormwater/documentspr

[18] National Oceanic & Atmospheric Agency (NOAA) Southwest Regional Office, National Marine Fisheries Service. Final Southern California Steelhead Recovery Plan. Long Beach, CA. January 2012. Available online: http://swr.nmfs.noaa.gov/recovery/SC_Steelhead/

District, are actively involved in collaborative BMP implementation efforts in adjacent watersheds.

3.3.1.7 Open Space

The Natural Community Conservation Planning (NCCP) program of the California Department of Fish and Wildlife (CDFW) is an unprecedented effort by the State of California, and numerous private and public partners that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An NCCP identifies and provides for the regional or area wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity.

The primary objective of the NCCP program is to conserve natural communities at the ecosystem scale while accommodating compatible land use. The program seeks to anticipate and prevent the controversies and gridlock caused by species' listings by focusing on the long-term stability of wildlife and plant communities and including key interests in the process.

The Nature Reserve of Orange County (NROC) is a 501(c)(3) nonprofit corporation that manages the Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) for the Central and Coastal Subregion of Orange County. It coordinates land management activities of public and private landowners within the 37,000 acre reserve system, conducts wildlife and habitat research and monitoring, and restores disturbed habitats. The South Orange County WMA includes a number of protected areas that form a network of interconnected and isolated biological communities within the Central and Coastal and Southern Subregion NCCP/HCP.

Central and Coastal Subregion NCCP/HCP

The Central and Coastal Subregion Natural Coastal Community Plan/Habitat Conservation Plan (NCCP/HCP) consists of the following elements:

1) A 37,378-acre reserve system;
2) Special linkages and existing use areas to enhance biological connectivity within the reserve system and subregion;
3) An adaptive management program;
4) An interim management plan;
5) Funding; and
6) A mitigation option for non-participating landowners.

The South Orange County WMA is located within the boundaries of the Central and Coastal NCCP/HCP. The following areas are included in the reserve system: Laguna Coast Wilderness Park, Mason Regional Park, Peters Canyon Regional Park, Upper Newport Bay Nature Preserve, Whiting Ranch Wilderness Park, Upper Newport Bay Ecological Reserve, and the University of California Irvine Reserve. Only the Laguna

Coast Wilderness Park is within the South Orange County WMA. The remaining areas are within the Central Orange County WMA.

Southern Subregion NCCP/HCP

The South Orange County WMA includes a number of protected areas that form a network of interconnected and isolated biological communities. The Southern Subregion NCCP/HCP consists of 132,000 acres which includes 40,000 acres within the Cleveland National Forest and 92,000 acres within the Planning Area. The Southern Subregion NCCP/HCP was prepared by the County in cooperation with the CDFW and the U.S. Fish and Wildlife Service (USFWS). The Southern Subregion NCCP/HCP focuses on long-term protection and management of multiple natural communities that provide habitat essential to the survival of a broad array of wildlife and plant species. In summary, the Southern Subregion NCCP/HCP consists of the following elements:

1) Creation of a permanent Habitat Reserve consisting of 11,950 acres owned by the County and contained within three existing County regional and wilderness parks (O'Neill Regional Park, Riley Wilderness Park and Casper's Wilderness Park) and 20,868 acres owned by Rancho Mission Viejo, at no cost to the public;

2) Formulation and implementation of a Habitat Reserve Management Program (HRMP);

3) Receipt of State and Federal regulatory coverage and provisions for the impacts of proposed Covered Activities on proposed Covered Species and CDFW Jurisdictional Areas; and

4) Execution of an Implementation Agreement and identification of funding necessary to implement the HRMP.

The Ranch Plan Monitoring Program – The Gobernadora Multipurpose Basin Project is included within the greater Rancho Mission Viejo Plan (Ranch Plan) as a key component to water quality protection and habitat preservation. The Ranch Plan supports the basin plan objectives of water quality enhancement and habitat protection. Since 1991, detailed scientific studies have been conducted in partnership with state and federal wildlife agencies for 23,000 acres of Rancho Mission Viejo. The Ranch Plan implements an aggressive overall monitoring program.

As part of the Ranch Plan's monitoring efforts, the San Diego Regional Water Quality Control Board (SDRWQCB), United States Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (ACOE), and Ranch Mission Viejo, LLC have described the baseline biology, geomorphology, hydrology, and water quality in FEIR 584 and 589, the Final Environmental Impact Statement for the Habitat Conservation Plan (HCP) and the Final Environmental Impact Report of the Special Area Management Plan (SAMP). Through implementation of adaptive management, the Ranch Plan seeks to maintain the net habitat values of Rancho Mission Viejo including GERA and the larger Gobernadora Creek ecosystem.

Three inter-related plans/programs form the core of the Adaptive Management Plan for the Ranch Plan, including: 1) Open space/Habitat Reserve – the Habitat Reserve Monitoring and Management Program (HRMP), 2) Primary stream/creeks in the open space/Habitat Reserve – the Stream Monitoring Plan and 3) Developed Planning Areas – the Water Quality Management Plan (WQMP). The HRMP monitors and manage biological resources within the Ranch Plan area. Annual compliance and effectiveness reports are written and provided to USFWS, ACOE and CDFW. The Stream Monitoring Plan will monitor and manage erosion and stream stability of major tributaries within the Ranch Plan including Projects with potential to impact the water quality of the area, such as the Gobernadora Multipurpose Basin Project.

Ongoing water quality monitoring associated with the San Juan Creek Watershed/Western San Mateo Creek Watershed Special Area Management Plan (SAMP) and Southern Subregion Natural Communities Conservation Plan (NCCP) has documented the degraded water quality of both surface runoff and storm flows. These problems are currently damaging Gobernadora Creek (tributary of San Juan Creek) and the GERA, conserved wetlands restoration area that is occupied by the least Bell's vireo and southwestern willow flycatcher, both state and federally endangered species. Projects like the Gobernadora Multipurpose Basin Project will enhance water quality throughout the San Juan Creek Watershed and provide monitoring for post storm event erosion.

Figure 3-6 Natural Community Conservation Planning shows the Natural Community Conservation Planning areas within the South Orange County WMA.

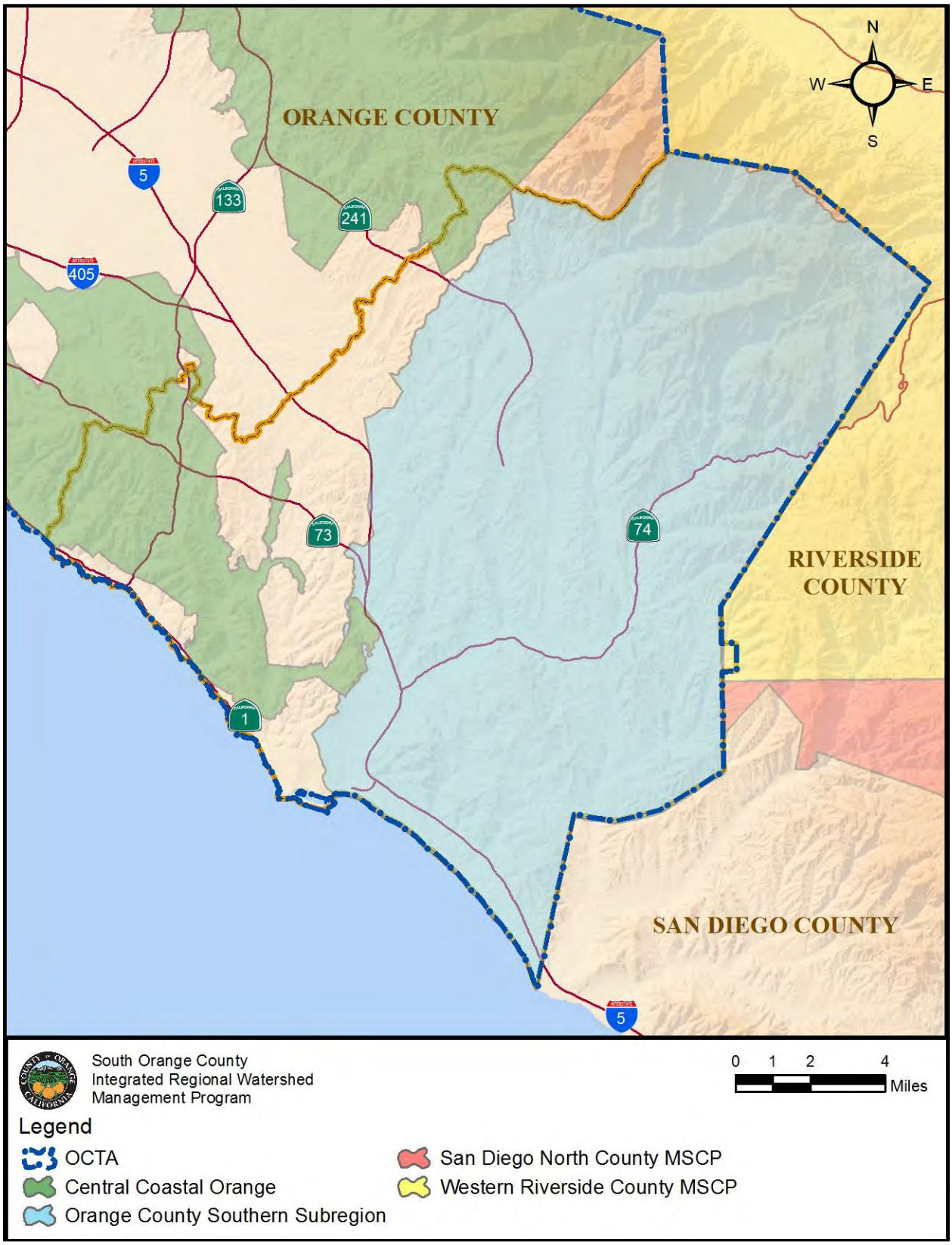

Figure 3-6: Natural Community Conservation Plan

3.3.1.8 Parks, Forests, Refuges and ASBS

As mentioned previously, the South Orange County WMA falls within the South Coast Region of the California Department of Fish and Wildlife (CDFW). Marine protected areas (MPAs) along the southern California coast (Point Conception to California/Mexico border) have been in effect in state waters since January 1, 2012. Within the South Orange County WMA, the following are MPAs identified for the Region: Laguna Beach State Marine Reserve, Laguna Beach State Marine Conservation Area, Dana Point State Marine Conservation Area, and Crystal Cove State Marine Conservation Area[19].

An Area of Special Biological Significance (ASBS) is one type of protected area that aims to support and protect natural marine ecosystems and heritage, improve the opportunities for human activities, and ensure a strong coastal economy. An ASBS differs from a MPA in the policies that are instated within each one. ASBS policies are put into place to make sure that water quality standards are met. These ASBS regulations prohibit waste from entering the protected habitat through drains and natural water outputs. The State Water Resources Control Board has designated three ASBS within Orange County: the Robert E. Badham (Newport Coast) ASBS (#32), the Irvine Coast (Crystal Cove) ASBS (#33), and the Heisler Park ASBS (#30)[20]

The Irvine Coast (Crystal Cove) Area of Special Biological Significance (ASBS) begins at Pelican Point and continues 3.4 miles along the coastline to the City of Laguna Beach. This ASBS contains the Irvine Coast State Marine Park (formerly called a Marine Life Refuge), and the overlapping Crystal Cove State Marine Conservation Area, which are administered by the California Department of Fish & Wildlife These Marine Protected Areas and the adjoining beach provide excellent tidal and offshore communities featuring tide pools, kelp beds, and dolphin birthing grounds. Despite increasing urbanization, Crystal Cove State Park (administered by the California Department of Parks and Recreation) contains some of the last undeveloped Orange County coastline.

The Heisler Park Area of Special Biological Significance (ASBS) in Orange County covers just 0.5 mile of coastline. The Heisler Park State Marine Reserve (formerly called an Ecological Reserve) and the overlapping Laguna Beach State Marine Park are administered by the California Department of Fish and Wildlife, and the adjacent Heisler Park is owned and maintained by the City of Laguna Beach. This reserve is a popular tidepooling area and can suffer from scavenging by beach visitors. Key pollution threats are urban drainage and stormwater runoff.

The designated Marine Life Refuges in the South Orange County Region are: Irvine Coast Marine Life Refuge, Laguna Beach Marine Life Refuge, South Laguna Beach

[19] California Department of Fish and Wildlife. Marine Protected Areas. Available online 3/29/13. http://www.dfg.ca.gov/mlpa/scmpas_list.asp

[20] Orange County Marine protected Area Council. Water Quality- ASBS. Available online 3/29/13. http://www.ocmarineprotection.org/asbs.html

Marine Life Refuge, Niguel Marine Life Refuge, Dana Point Marine Life Refuge, and Doheny Beach Marine Life Refuge.[21]

The Region's designated State Marine Parks include: Irvine Coast State Marine Park, Laguna Beach State Marine Park, South Laguna Beach State Marine Park, Niguel State Marine Park, Dana Point State Marine Park, and Doheny Beach State Marine Park.

The following areas are designated State Marine Conservation Areas: Crystal Cove State Marine Conservation Area, and Doheny State Marine Conservation Area. In addition, the Heisler Park Ecological Reserve, and Laguna Laurel Ecological Reserve are designated Ecological Reserves by the Fish and Wildlife Commission (California Code of Regulations, Title 14, section 630).

3.3.2 Groundwater Basins

This section discusses the groundwater basins within the South Orange County WMA. Figure 3-7 shows the Groundwater Basins in the region.

3.3.2.1 San Juan Valley Groundwater Basin

The San Juan Valley Groundwater Basin (SJVGB) underlies the San Juan Creek Watershed and several tributary valleys in South Orange County. The total water storage capacity is estimated at 90,000 AF. The groundwater basin is subdivided into three sub-basins: the upper, middle, and lower subbasins. The San Juan Valley fill alluvium, including the three sub-basins, occupies approximately 11,700 acres. San Juan Creek drains the San Juan Valley and several other creeks drain valleys tributary to the San Juan. Average annual precipitation ranges from 11 to 15 inches. Recharge of the basin is from flow in San Juan Creek, Oso Creek, and Arroyo Trabuco and precipitation to the valley floor. Water from springs flows directly from Hot Spring Canyon into San Juan Creek, adding to recharge.

A comprehensive Groundwater Management and Facility Plan for the SJVGB was prepared in 1994. Except for the Upper San Juan, the TDS of most of the groundwater in storage in the main part of the groundwater basin is too high for domestic water use. Groundwater is treated by the San Juan Basin Desalter, which increases the usability of the basin in the future. In addition, shallow groundwater limits the ability to store significant supplies[22]. A draft Groundwater Management and Facility Plan is included in this IRWM Plan as Appendix I.

[21] Region 9 – Sand Diego Regional Water Quality Control Board Basin Plan. Available online 3/29/13. http://www.swrcb.ca.gov/rwqcb9/water_issues/programs/basin_plan/docs/update082812/Chpt_2_2012.pdf

[22] Groundwater Basin Reports, Orange County Basins – San Juan Basin; http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/OrangeCountyBasins/SanJuanBasin.pdf

Figure 3-7: Groundwater Basins

3.3.2.2 San Mateo Groundwater Basin

The San Mateo Groundwater Basin underlies San Mateo Valley and Cristianitos Canyon in the southeastern portion of Orange County and northwestern San Diego County. The valleys are drained westward to the ocean by San Mateo and Cristianitos Creeks. Together, the San Mateo (including San Onofre Creek) watershed is 175 square miles. The Cristianitos Creek watershed is a little over 31 square miles. The aquifer consists of unconfined alluvium and the basin is up to 100 feet in depth with an approximate storage capacity of 6,500 AF.

Infiltration of surface water from Cristianitos and San Mateo Creeks provides most of the recharge to the aquifer. Direct precipitation and infiltration of treated wastewater also contribute to recharge.

3.3.3 Surface Water Impoundments

Surface water impoundments capture flow from nearly all the major surface water streams. Many of the major surface water impoundments are a blend of natural runoff and imported water. They include:

El Toro Reservoir: El Toro Reservoir is an earth-filled structure owned by the El Toro Water District. It is on a tributary of Oso Creek and is used as a seasonal and operational storage site for the ETWD's imported Colorado River Water. The impounded water is used for irrigation purposes. Construction was completed in 1967. It has a normal surface area of 21 acres. Its height is 106 feet with a length of 900 feet. Normal storage is 877 acre feet. It drains an area of 0.04 square miles.

Laguna Lakes: The Laguna Lakes are located in Laguna Canyon. The lakes are owned by the City of Laguna Beach and were originally formed by springs arising from a minor fault zone. Laguna Lakes are located inland along Laguna Canyon Road, approximately 6 miles north of Laguna Beach. The lakes are numbered 1 through 3 from upstream to downstream and are located on the east side of the road. Lakes 2 and 3 are connected. There are approximately 27 acres of open water in the three lakes, plus an un-quantified amount of riparian habitat. The lakes drain a watershed of approximately 5,600 acres. The lakes are filled by seasonal rains and natural and surface runoff. Lake 1 is seasonal, Lake 2 is semi-perennial and Lake 3 contains water throughout most years.

Barbara's Lake: This Lake is a 12-acre spring-fed lake in the James Dilley Greenbelt Preserve, a 173-acre parcel of land in the Laguna Coast Wilderness Park. Located in Laguna Canyon, just north of the Highway 73 toll road, the area forms the north boundary of the 38,000-acre South Coast Wilderness. Barbara's Lake is named in honor of conservationist Barbara Rabinowitsh and is the only natural lake in Orange County. The lake is rimmed with willows, cattails, and bulrush, offering habitat for coots, mallards, and grebes. West of Barbara's Lake, across Laguna Canyon Road, is Bubble's Pond. The pond was named for Lion Country Safari's escaped hippopotamus, who took up a temporary residence there. The trail winds blow through canyons and over hills en route to the south and east shores of Barbara's Lake.

Lake Mission Viejo: Lake Mission Viejo is a man-made reservoir located in northern Mission Viejo. The reservoir is formed by an earth-fill dam across the canyon of Oso Creek, which is part of the Trabuco Creek and San Juan Creek drainage basin. The reservoir is in the foothills of the Santa Ana Mountains, surrounded primarily by private residential communities, and is fed by surface runoff.

Upper Oso Reservoir Dam: Upper Oso Reservoir is located in Mission Viejo and owned by the Santa Margarita Water District. For over 30 years recycled water has been stored in winter prior to irrigation in the summer. The Upper Oso Reservoir holds up to 1.3 billion gallons of recycled water. At capacity the reservoir is 65 feet deep at its deepest point. In December 2012, the reservoir was 140 feet deep at its deepest point, based on information provided by Santa Margarita Water District. It is one of the largest recycled water reservoirs in the County.

Sulphur Creek Reservoir: Sulphur Creek Reservoir (also called the Laguna Niguel Lake) is an artificial 44-acre fishing and recreational lake in Laguna Niguel. It is fed from two sources, one of which is Sulpher Creek itself and one is a storm drain. In the 1950s, the creek was dammed to form Sulphur Creek Reservoir.

3.3.4 Water Quality

The quality of imported water is high in South Orange County. However, the WMA's transformation into urbanized spaces requires ongoing protection of its local water resources. Water pollution impacts drinking water and surface waters used for fishing, swimming and other activities. Increased stream flows may lead to erosion of riparian habitats and surface runoff carries nonpoint source pollutants into the watersheds.

Efforts to understand and mitigate the various water quality issues in the WMA are numerous. Protection and preservation of water resources in the United States is governed by the federal Clean Water Act. Passage of the 1987 Water Quality Act established regulation of polluted runoff to augment the regulation of point source pollution established by the 1972 Federal Water Pollution Control Act. Section 402(p)(2) of the 1987 regulation created the National Pollution Discharge Elimination System (NPDES) permit program to control non-point source pollution.

The Environmental Protection Agency (EPA) enforces the CWA requirements; however, in California, the State Water Resources Control Board and nine associated Regional Water Quality Control Boards ensure compliance with the CWA under the auspices of the EPA.

Since 1990, operators of municipal separate storm sewer systems (MS4s) are required to develop a stormwater management program designed to prevent or reduce harmful pollutants from impacting water resources via stormwater runoff. In Orange County, stormwater and other surface runoff enter the storm drain system from streets, curbs and gutters and travels, untreated (except in areas where BMPs have been implemented) to local water bodies or the Pacific Ocean.

As described in Section 2.3, as an MS4 operator, the County obtains and implement NPDES permits for both the Santa Ana (SARWQCB) and San Diego (SDRWQCB)

Regional Water Quality Control Board. The Orange County Stormwater Program is a cooperative of the County of Orange, Orange County Flood Control District (OCFCD), and all 34 County cities. As the Principal Permittee on both the SARWQCB and SDRWQCB NPDES permits, the County manages the development and implementation of the program, collaborating regularly with Co-permittees to ensure compliance and mitigate ocean pollution.

NPDES permits are issued for a five-year term and have generally followed a progressive pattern. The First Term (est. 1990) permit provided an opportunity for Orange County municipalities to establish a program customized to local conditions. In its earliest form, the program focused on gathering data about existing conditions and implementing an initial set of improvement measures aimed at known water quality deficiencies. Issued in 1996, the Second Term permit built upon the knowledge gained during the First Term and aimed to improve water quality incrementally over time. During this period, the County invested heavily in parallel efforts to implement a watershed approach, a comprehensive but lengthy planning tool for addressing water quality as well as habitat restoration, recreation, and flood control. Program developments in the Third Term permit (est. 2002) lead to successful Dry Weather Reconnaissance and Monitoring Programs, a diverse and recognizable public education campaign and other significant advancements.

In May and December, 2009, the SARWQCB and SDRWQCB Boards, respectively, adopted the Fourth Term NPDES permits for the County of Orange. Stormwater detention and treatment facilities will continue to be designed to improve water quality by mediating the effects of runoff pollution before drainage or percolation. Within the South Orange County WMA, the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano (collectively the San Diego Region Permittees) operate municipal storm drain systems and discharge stormwater and surface runoff pursuant to National Pollutant Discharge Elimination System (NPDES) Permits.

These Permits require that the Permittees work together to effectively prohibit non-stormwater discharges to the stormdrain system, and implement controls to reduce the discharge of pollutants in stormwater to the Maximum Extent Practicable (MEP). The Permits were first adopted in 1990 and subsequently renewed in 1996 (Second Term), 2002 (Third Term), and 2008 (Fourth Term).

Most recently, the SDRWQCB, developed a new approach for storm water regulations and adopted a “Regional” MS4 Permit covering the entire San Diego Region under one MS4 Permit. It is anticipated that the South Orange County Permittees will be enrolled in this new evolution of stormwater permits by December 14, 2014, which includes development of a Water Quality Improvement Plan.

The Orange County Stormwater Program’s accomplishments represent the culmination of the development and three years of implementation of a program that was substantially revised to meet the requirements of the Third Term NPDES Permits.

The County of Orange, the cities within Orange County, and the Orange County Flood Control District have cooperatively developed and implemented a comprehensive Drainage Area Management Plan (DAMP) to reduce pollutants, enhance water quality, educate the public, and monitor progress in improving water quality. The main objective of the DAMP is to fulfill the commitment of the Permittees to develop and implement a program that satisfied NPDES permit requirements. The specific water pollutant control elements of the Orange County Stormwater Program are documented in the DAMP which is the Permittees' primary policy, planning and implementation document for municipal NPDES stormwater permit compliance. The DAMP describes the agreements, structures and programs that:

- Provide the framework for the program management activities and plan development;
- Provide the legal authority for prohibiting unpermitted discharges into the storm drain system and for requiring Best Management Practices in new development and significant redevelopment;
- Improve existing municipal pollution prevention and removal BMPs to further reduce the amount of pollutants entering the storm drain system;
- Educate the public about the issue of urban stormwater and non-stormwater pollution and obtain their support in implementing Stormwater Program BMPs;
- Ensure that all new development and significant redevelopment incorporates appropriate Site Design, Source Control and Treatment Control BMPs to address specific water quality issues;
- Ensure that construction sites implement control practices that address control of construction related pollutants discharges including erosion and sediment control and on-site hazardous materials and waste management;
- Ensure that existing development will address discharges from industrial facilities, selected commercial businesses, residential development and common interest areas/homeowner associations;
- Detect and eliminate illegal discharges/illicit connections to the municipal storm drain system;
- Identify impacted receiving waters and produce environmental quality information to direct management activities, including prioritization of pollutants to support the development of specific controls to address these problems; and
- Assess watersheds and manage surface runoff on a watershed basis.

The need to address increasingly prescriptive permit requirements, while maintaining the beneficial and synergistic cohesion of a countywide program, has been addressed through separation of the DAMP's policy and planning areas. As a result of this separation, the DAMP includes Local Implementation Plans (LIPs). The LIPs were created by each Permittee in implementing an increasingly complex program within its jurisdiction while maintaining a single policy document that addresses two sets of permit requirements. The LIPs were updated by the San Diego Permittees in December 2010.

The requirement to overlay separate, but nonetheless, highly interrelated water quality protection and planning processes based on hydrologic rather than political boundaries was addressed through the creation of Watershed Action Plans (WAP). A WAP (see

DAMP Appendix D) was created for each of the six watersheds under the jurisdiction of the SDRWQCB in August 2003. In 2009, the County reformulated WAPs and created "Watershed Workplans" to meet Regional Board Requirements under the County's fourth term permit. Per requirements of the Regional Board, the Watershed Workplans provide additional details into specific projects and plans to address watershed pollutants.

The DAMP was prepared and is periodically updated using a consensus building process that involves public and private sector input and public review through the California Environmental Quality Act (CEQA) process.

The numerous programs and data sets generated through the cooperation of these agencies illustrate the commitment of the WMA to improve water quality. A report for each watershed in South Orange County is generated annually to monitor the collaborative progress made within each watershed's boundaries.

As discussed in detail in the previous section, BMPs implemented by the County of Orange, cities, non-governmental organizations, and the public are aimed at reducing bacteria and associated pathogens and other pollutants throughout the watershed. In addition to a comprehensive program of non-structural BMPs, such as street sweeping, weather-based sprinkler controllers and water efficient nozzles and landscape design, creek and beach cleanups, facilitating the use of pet waste bags, and public outreach and education efforts, including workshops, brochures, and advertisements, structural BMPs include but are not limited to, diversion structures, stormdrain inlet filters, trash separation units, treatment facilities such as Dana Point Salt Creek Ozone Treatment Facility and the Poche Beach UV System, and wetland BMPs such as the Wood Canyon Emergent Wetland and the Wetland Capture and Treatment (WetCAT) projects.

Advancements in BMP implementation, coordination of local and regional educational complimentary outreach programs, integrating water conservation and water quality protection efforts and cooperation and participation of South Orange County entities IRWM planning helped to improve water quality and enhance local ecosystem functions. This has resulted in significant water quality improvements as reflected in Heal the Bay's "A" grading of several South Orange County beaches in their 2012 Beach Report. South Orange County continues to update and improve IRWM planning and water quality improvement projects throughout the WMA.

3.3.4.1 Ocean Desalination Quality

Product water quality goals currently being studied are based on the primary and secondary standards set by the California Department of Health Services. The expected treatment process at an ocean desalination facility in Orange County is reverse osmosis, with pretreatment and post-treatment.

Table 3-1 lists the results of the proposed RO process. The projection is based upon Koch TFC-SS (Seawater Extra High Rejection) membranes.

Table 3-1: Ocean Desalination RO Results[23]

Ion	Ocean Water Feed	Permeate	Brine Concentration
Ca^{2+} (mg/L)	408	0.34	868
Mg^{2+} (mg/L)	1,298	1.1	2,760
Na^{+} (mg/L)	10,768	53	22,851
K^{+} (mg/L)	388	2.5	823
HCO_3^{-} (mg/L)	143	1.8	34
SO_4^{2-} (mg/L)	2,702	2	5,960
Cl^{-} (mg/L)	19,361	86	41,097
F^{-} (mg/L)	1.3	0	3
TDS (mg/L)	35,014	146	74,416
PH	7.8	4.6	5.8

As shown, the RO permeate will consist essentially of sodium and chloride – no hardness or alkalinity to speak of. This causes the water to be corrosive. These problems are corrected by contacting the water with limestone and carbon dioxide to add calcium bicarbonate hardness and alkalinity. Interaction of the calcium with carbon dioxide dissolved in the desalted water facilitates dissolution of calcium and provides the alkalinity necessary to buffer the water and reduce its corrosiveness. Limestone contact is supplied in a limestone bed providing approximately 15 minutes of contact time.

3.3.4.2 Groundwater Desalter Water Quality

The Groundwater Recovery Project operating in the San Juan Groundwater Basin pipes brackish groundwater to a reverse osmosis (RO) plant where the water is treated, micro-filtered, reverse osmosis and brought to potable water standards. The project consists primarily of two reverse osmosis treatment trains within an enclosed building;

[23] *MWDOC, 2003, Ocean Desalination Plant Feasibility Study*

three iron/manganese filters, two desanders, and two cartridge filters; bulk chemical storage tanks within a semi-enclosed building; an approximately 85,000-gallon bolted steel tank for iron/manganese filter backwash water supply; an approximately 225,000-gallon bolted steel tank for spent backwash water recovery.

The GWRP has been impacted by Methyl Tert-Butyl Ether (MTBE), cutting production in half to about 2 MGD or less since the spring of 2008. The installation of a Granular Activated Carbon Filter (GAC) allows the full 5.1 MGD production. San Juan Capistrano plans to increase the treatment capacity to 6.2 MGD by 2014.

SCWD currently owns and operates a 1 MGD Groundwater Recovery Facility (GRF) that came on-line in 2007, also known as the Capistrano Beach Desalter. The GRF was built initially for 1,300 AFY but production is currently limited to about 800 AFY by water the capacity of a single well. The plant extracts and treats brackish groundwater from the San Juan Basin using Reverse Osmosis and iron and manganese removal due to high mineral content. SCWD is in the process of expanding the GRF facilities as well as adding another well. When complete, the project is expected to extract up to 1,300 AFY from the basin. The SJBA is performing a study to evaluate the potential new well sites. SCWD will need to construct a second well in order to reach the permitted limit and construction of additional wells will be required to reach proposed potential 2,000 AFY goal.

3.3.4.3 Impaired Water Bodies

A Total Maximum Daily Load sets a limit for the total amount of a particular pollutant that can be discharged to a waterbody, such that the pollutant loads from all sources will not impair the designated beneficial uses of the waterbody. The timeframe for compliance with TMDL targets varies, but may take many years. TMDLs will often include a compliance schedule, identifying interim and final targets.

The development of a TMDL is required when a waterbody has been identified as impaired. The Section 303(d) List of the federal Clean Water Act requires states to establish a listing of all impaired waterbodies and to rank those waterbodies according to priority for TMDL development. The 303(d) list is updated every two years and is developed by the Regional and State Water Quality Control Boards and approved by the Environmental Protection Agency.

Several streams in the South Orange County WMA are listed as impaired on the 303(d) list of water quality limited segments, affecting a total of 26.7 stream miles. Figure 3-8 shows the Impaired Water Bodies for the WMA. The following TMDLs (Table 3-2) have been established or are being developed for County waterbodies (the projected adopted year is included in parentheses below)[24]:

[24] Regional Water Quality Control Board – San Diego (Region 9). California 2010 303(3) combined list table. Available online 4/2/13.
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml

Table 3-2: 303(d) List and TMDL Priority Schedule

ALISO CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
2010 303(d) List						
R	Aliso Creek	90113000	Indicator Bacteria *This listing for indicator bacteria applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy Fork, and English Canyon.*	Nonpoint Source Point Source Unknown Point Source Urban Runoff/Storm Sewers	19 miles	2005
			Phosphorus *This listing for phosphorus applies to the Aliso Creek mainstem and all the majortributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon,Dairy Fork, and English Canyon.*	Natural Sources Unknown Nonpoint Source Urban Runoff/Storm Sewers	19 miles	2019
			Selenium	Unknown Nonpoint Source Urban Runoff/Storm	19 miles	2021

ALISO CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
				Sewers		
			Total Nitrogen as N	Natural Sources Unknown Nonpoint Source Urban Runoff/Storm Sewers	19 miles	2019
			Toxicity *This listing for toxicity applies to the Aliso Creek mainstem and all the major tributaries of Aliso Creek which are Sulphur Creek, Wood Canyon, Aliso Hills Canyon, Dairy* *Fork, and English Canyon.*	Source Unknown Unknown Nonpoint Source Unknown Point Source	19 miles	2019
E	Aliso Creek Mouth	90113000	Indicator Bacteria	Nonpoint Source Point Source	0.29 acre	2019
R	English Canyon	90113000	Benzo[b]fluoranthene	Source Unknown	3.6 miles	2019
			Dieldrin	Source Unknown	3.6 miles	2019
			Sediment Toxicity	Unknown Nonpoint Source Unknown Point Source	3.6 miles	2019

ALISO CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
				Urban Runoff/Storm Sewers		
			Selenium	Source Unknown	3.6 miles	2019
C	Pacific Ocean Shoreline, Aliso HSA, at Aliso Beach - middle	90113000	Enterococcus	Nonpoint Source Point Source	0.03 mile	2021
			Total Coliform	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2021
C	Pacific Ocean Shoreline, Aliso HSA, at Aliso Creek mouth	90113000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2021
			Fecal Coliform		0.03 mile	2021
			Total Coliform		0.03 mile	2012

Notes:

1. R – River & Stream; E – Estuary; C – Coastal & Bay Shoreline; B – Bays & Harbors

DANA POINT COASTAL STREAMS						
Type	**Name**	**Calwater Watershed**	**Pollutant/ Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
2010 303(d) List						
C	Pacific Ocean Shoreline, Dana Point HSA, at Aliso Beach at West Street	90114000	Indicator Bacteria	Nonpoint Source Point Source	0.03 Mile	2005
B	Dana Point Harbor	90114000	Copper	Marinas and Recreational Boating Source Unknown Unknown Nonpoint Source Urban Runoff/Storm Sewers	119.47 Acres	2019
			Toxicity	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	119.47 Acres	2021
			Zinc	Marinas and Recreational Boating Source Unknown Unknown Nonpoint Source Urban Runoff/Storm Sewers	119.47 Acres	2019

DANA POINT COASTAL STREAMS						
Type	**Name**	**Calwater Watershed**	**Pollutant/ Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
B	Pacific Ocean Shoreline, Dana Point HSA, at Dana Point Harbor at Baby Beach	90114000	Enterococcus	Other Urban Runoff Unknown Nonpoint Source Unknown Point Source	0.03 Mile	2012
			Total Coliform	Other Urban Runoff Unknown Nonpoint Source Unknown Point Source	0.03 Mile	2012
C	Pacific Ocean Shoreline, Dana Point HSA, at Salt Creek outlet at Monarch Beach	90114000	Total Coliform	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 Mile	2021

Notes:

2. R – River & Stream; E – Estuary; C – Coastal & Bay Shoreline; B – Bays & Harbors

LAGUNA COASTAL STREAMS						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
2010 303(d) List						
R	Laguna Canyon Channel	90112000	Sediment Toxicity	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.6 miles	2019
			Toxicity	Source Unknown	1.6 miles	2019
C	Pacific Ocean Shoreline, Laguna Beach HSA, at Main Beach	90112000	Total Coliform	Source Unknown	0.03 mile	2021

Notes:

3. R – River & Stream; E – Estuary; C – Coastal & Bay Shoreline; B – Bays & Harbors

SAN CLEMENTE COASTAL STREAMS						
Type	**Name**	**CalWater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
2010 303(d) List						
C	Pacific Ocean Shoreline, Lower San Juan HSA, at North Doheny State Park Campground	90130000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2021
			Total Coliform	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2021
C	Pacific Ocean Shoreline, Lower San Juan HSA, at South Doheny State Park Campground	90130000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2021
C	Pacific Ocean Shoreline, San Clemente HA, at Poche Beach	90130000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2019
			Total Coliform	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2019

SAN CLEMENTE COASTAL STREAMS						
Type	**Name**	**CalWater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
C	Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach at Pier	90130000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2019
C	Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach, North Beach	90130000	Total Coliform	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2019
C	Pacific Ocean Shoreline, San Clemente HA, at South Capistrano Beach at Beach Road	90130000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2021
C	Pacific Ocean Shoreline, San Clemente HA, at South Capistrano County Beach	90130000	Enterococcus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.03 mile	2012
			Total Coliform	Unknown Nonpoint Source Unknown Point Source	0.03 mile	2021

SAN CLEMENTE COASTAL STREAMS						
Type	**Name**	**CalWater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
				Urban Runoff/Storm Sewers		
R	Prima Deshecha Creek	9013000	Cadmium	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.2 miles	2021
			Nickel	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.2 miles	2021
			Phosphorus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.2 miles	2019
			Turbidity	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.2 miles	2019
R	Segunda Deshecha Creek	9013000	Phosphorus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.92 mile	2019
			Toxicity	Unknown Nonpoint Source Unknown Point Source	0.92 mile	2021

SAN CLEMENTE COASTAL STREAMS						
Type	**Name**	**CalWater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
				Urban Runoff/Storm Sewers		
			Turbidity	Channelization Construction/Land Development Flow Regulation/Modification Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	0.92 mile	2019

Notes:

4. R – River & Stream; E – Estuary; C – Coastal & Bay Shoreline; B – Bays & Harbors

SAN JUAN CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
2010 303(d) List						
R	Arroyo Trabuco Creek	90120000	Diazanon	Agriculture Contaminated Sediments Source Unknown Unknown Nonpoint Source Urban Runoff/Storm Sewers	22.87 miles	2019
			Phosphorus	Natural Sources Source Unknown Urban Runoff/Storm Sewers	22.87 miles	2019
			Total Nitrogen as N	Agriculture Natural Sources Unknown Nonpoint Source Urban Runoff/Storm Sewers	22.87 miles	2019
			Toxicity	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	22.87 miles	2019
R	Oso Creek (at	90120000	Chloride	Source Unknown	1.03 miles	2019

SAN JUAN CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
	Mission Viejo Golf Course)		Sulfates	Source Unknown	1.03 miles	2019
			Total Dissolved Solids	Source Unknown	1.03 miles	2019
R	Oso Creek (lower)	90120000	Selenium	Source Unknown	4 miles	2021
			Toxicity	Unknown Nonpoint Source Urban Runoff/Storm Sewers	4 miles	2021
C	Pacific Ocean Shoreline, Lower San Juan HSA, at North Beach Creek	90120000	Enterococcus	Natural Sources Unknown Nonpoint Source Urban Runoff/Storm Sewers	0.03 mile	2021
			Fecal Coliform	Storm Sewers	0.03 mile	2021
			Total Coliform	Natural Sources Unknown Nonpoint Source Urban Runoff/Storm Sewers	0.03 mile	2021
C	Pacific Ocean Shoreline, Lower San Juan HSA, at San Juan Creek	90120000	Enterococcus	Natural Sources Source Unknown Unknown Nonpoint Source Urban Runoff/Storm Sewers	0.03 mile	2021

SAN JUAN CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
			Fecal Coliform	Natural Sources Source Unknown Unknown Nonpoint Source Urban Runoff/Storm Sewers	0.03 mile	2021
			Total Coliform	Natural Sources Source Unknown Unknown Nonpoint Source Urban Runoff/Storm Sewers	0.03 mile	2021
R	San Juan Creek	90120000	DDE	Source Unknown	1.02 mile	2019
			Indicator Bacteria	Nonpoint Source Point Source	1.02 mile	2019
			Phosphorus	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.02 mile	2021
			Selenium	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.02 mile	2021

SAN JUAN CREEK						
Type	**Name**	**Calwater Watershed**	**Pollutant/Stressor**	**Source**	**Estimated Size Affected**	**Proposed TMDL Completion**
			Total Nitrogen as N	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.02 mile	2021
			Toxicity	Unknown Nonpoint Source Unknown Point Source Urban Runoff/Storm Sewers	1.02 mile	2021
E	San Juan Creek Mouth	90120000	Indicator Bacteria	Nonpoint Source Point Source	6.29 acres	2008

Notes:

5. R – River & Stream; E – Estuary; C – Coastal & Bay Shoreline; B – Bays & Harbors

3.3.4.4 OC Watersheds Aliso Creek Directive

On March 2, 2001, the SDRWQCB issued a directive, by authority of California Water Code Section 13225, to the County of Orange, the Orange County Flood Control District, and the cities of Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, and Aliso Viejo to investigate urban runoff in the Aliso Creek watershed[25]. The directive found that the Permittees may be discharging waste with high indicator bacteria concentrations from municipal stormdrain outfalls into Aliso Creek and its tributaries.

The directive required the Permittees to:

- Conduct weekly monitoring at all major outfalls to Aliso Creek.
- Evaluate the effectiveness of structural and non-structural Best Management Practices (BMPs) currently being implemented in the watershed and identify future measures that would eliminate levels of high bacteria from outfalls.

Indicator bacteria are found in the digestive systems of humans and animals. The presence of these bacteria in surface waters is used as an indicator of human pathogens, which can cause illness in swimmers and other water contact recreational users. Bacteria have historically been used as indicators of human pathogens because bacteria are easier and less costly to measure than pathogens themselves.

Indicator bacteria can come from a variety of sources throughout the watershed including pet waste, trash, sewage spills, septic tanks, animal manure fertilizers, and natural sources such as bird and wildlife feces and decaying plant material.

[25] OC Watersheds Website, 2010. Available online 1/23/2012: https://media.ocgov.com/gov/pw/watersheds/programs/ourws/alisocreek/reportsstudies.asp

Figure 3-8: Impaired Water Bodies and Steelhead Critical Habitat

During wet weather, storm runoff can convey bacteria and pathogens off of the land and deposit them into waters through the municipal separate storm sewer system (MS4). During dry weather groundwater seepage and nuisance flows from urban land use activities can provide transport through the MS4.

From 2001-2005 water samples from over 100 monitoring sites along Aliso Creek and its tributaries were tested weekly for indicator bacteria and many new BMPs were implemented by Permittees to reduce bacteria loads in the watershed. Key projects included several treatment wetland and restoration projects along tributaries to the Creek and a sand and clay filter/ultraviolet treatment system at the J01P28 stormdrain outfall.

On October 12, 2005, the Regional Board approved a revised directive monitoring program as proposed by the Permittees. The new monitoring program was designed based upon improved knowledge about overall patterns of bacteria in the watershed and localized responses to specific BMPs. Current monitoring efforts focus on status and trends sites near the bottom of the watershed and BMP evaluation sites at high-priority drains throughout the watershed. Monitoring frequency increased relative to monitoring conducted in 2001-2005, but occurs only in summer when bacteria concentrations are highest. In December 2009 adoption of Directive G of SDRWQB Order No. R9-2009-0002 further incorporated the directive requirements into the south Orange County MS4 permit as a series of Aliso Creek Watershed Runoff Management Plan provisions.

On February 10, 2010 the SDRWQB adopted TMDLs for indicator bacteria to address impaired beaches and creeks in the San Diego region including Aliso Creek and its tributaries, the Aliso Creek Mouth, and Aliso Beach. Upon incorporation into the Orange County MS4 permit the TMDL requirements will supersede those of the previous 13225 Directive. As a first step to achieving TMDL required bacteria load reductions a draft Aliso Creek Watershed Comprehensive Load Reduction Plan (CLRP) was submitted to the SDRWQCB on October 4, 2012. This plan describes the approach that will be taken by Permittees to further address watershed bacteria pollutant loads and other water quality impairments.

3.3.4.5 Dana Point Harbor - Baby Beach TMDL

Baby Beach has been the focus of many studies and BMPs to identify and prevent sources of indicator bacteria from affecting the beach. Efforts have included studies on stormdrain seepage and groundwater, stormdrain influence and sediment contamination, recreational boat discharges, microbial source tracking, circulation, and video and dye testing of nearby sewers. BMPs included use of stormdrain plugs, increased street sweeping in surrounding parking lots and roadways, installation of bird netting under the pier, public education efforts against bird-feeding at the beach, artificial circulation of Baby Beach harbor area water, stormdrain diversion to the sanitary sewer, catch basin filter treatment systems, and removal of bird feces from exposed intertidal areas of the beach.

In June 2008, the SDRWQCB adopted indicator bacteria TMDLs for Baby Beach in Dana Point Harbor. The TMDLs were developed in response to a 2002 Clean Water

Act Section 303(d) listing of the beach. Recent monitoring data has shown that bacteria concentrations at the beach have significantly declined since that time. In 2010, the SDRWQCB adopted a decision to delist Baby Beach for fecal coliform bacteria as part of the 2010 303(d) listing cycle. Further reductions in enterococci bacteria concentrations are needed to fully achieve TMDL requirements and removal from the 303(d) list.

In December 2009 adoption of Directive I of SDRWQB Order No. R9-2009-0002 incorporated the Baby Beach indicator bacteria TMDLs requirements into the South Orange County MS4 permit. An annual water quality data assessment is provided to the SDRWQCB to assess progress toward TMDL compliance and outline existing and future BMPs and special studies needed to meet TMDL targets. .

3.3.4.6 South County Coastal Areas Beaches and Creeks

On February 10, 2010, the SDRWQCB adopted indicator bacteria TMDLs for impaired beaches and creeks in the San Diego Region (Beaches and Creeks TMDLs).[26] This includes TMDLs for over nine and a half miles of County beaches, the entire length of Aliso Creek and the lower mile of San Juan Creek.

The Beaches and Creeks TMDLs define the allowable indicator bacteria loads from the stormdrain system that will still allow attainment of water quality standards. The new TMDLs also require the development of watershed Bacteria Load Reduction Plans (BLRPs) focusing on indicator bacteria or Comprehensive Load Reduction Plans (CLRPs) addressing all watershed water quality impairments.

The impaired beaches and creeks addressed in the Beaches and Creeks TMDLs are based upon the 2002 Clean Water Act Section 303(d) list. Since 2002, water quality at many South Orange County beaches has significantly improved. This is due in part to BMPs implemented by the County, cities, non-governmental organizations, and the public in an effort to reduce bacteria and associated pathogens. These efforts have included but not limited to diversion structures, stormdrain inlet filters, treatment facilities, wetlands, irrigation controllers, beach cleanups, the use of pet waste bags, and public outreach and education.

As a first step to TMDL compliance watershed CLRPs have been developed outlining the BMPs needed to meet TMDL targets and special studies to identify sources of indicator bacteria and other listed pollutants in the watershed. In October 2012, Aliso and San Juan Creek Watershed Permittees submitted their draft CLRPs to the SDRWQCB for review. Subsequently a draft CLRP for the San Clemente Coastal Streams Watershed was submitted in December 2012.

3.3.5 Imported and Local Supply

South Orange County relies on two distinct water supply sources: 1) The imported water supply upon which the WMA is dependent; and 2) the local water supply which

[26] San Diego Region Indicator Bacteria TMDL 2010,OC Watersheds Website. Available online 1/23/2013: https://media.ocgov.com/gov/pw/watersheds/programs/waterways/tmdl/default.asp

improves the WMA's water supply and system reliability. The imported water supply accounts for more than 90 percent of the WMA's potable water supply, and is obtained through the regional wholesale agencies. The local water supply, though smaller in amount, is in many ways much more critical in that it involves not only developing a usable supply to improve overall water supply reliability but also requires maintaining and protecting the area's ecological functions dependent on the availability of high quality surface water and groundwater. Table 3-3 shows the target levels of new supply to be developed within the WMA between 2005 and 2030 in acre-feet per year (AFY).

The following discussion briefly describes the current circumstances of imported and local water resources in South Orange County.

Table 3-3: South Orange County Region Potential New Supplies[27]

Local Supply	Actual AFY (FY-04-05)	Projection AFY (2035)	Increase AFY 2005-2035 (rounded)
Water Use Efficiency (1)			23,000
Recycling (2)	12,017	29,725	17,708
Potable Groundwater	4,041	10,504	6,463
Ocean Desalination (3)		28,000	28,000
Total	16,058	68,229	75,171

(1) WUE is really a demand reduction, but is presented as a supply in this comparison. Estimate by MWDOC based on SBx 7-7 compliance by 2020 and projection to 2030.

(2) Recycled wastewater plus some local runoff and groundwater.

(3) Approximately 16,000 AFY from South Orange Coastal Ocean Desalination project plus approximately 12,000 AFY supply delivered from Poseidon Huntington Beach desalination plant. These are preliminary planning estimates.

(4) Gross Demand is consumptive demands plus increase in WUE from 2010.

3.3.5.1 Imported Water Supply

Making the necessary investments to provide an adequate water supply to meet demand remains a critical requirement for the WMA. Population changes, economic conditions, and hydrologic conditions influence water demand in South Orange County. As the WMA is rapidly expanding its housing base, the population, although successful water use efficiency efforts and decrease in agricultural land uses are expected to abate the growth rate of water demand. Nevertheless, imported water will continue to be

[27] Data provided by Lee Jacobi, MWDOC, 2/14/2013.

principal source of supply to the WMA in the foreseeable future, while efforts to develop alternative local sources will alleviate some of the WMA dependency on imported water. Table 3-4 shows projected water demand in for South Orange County for the 20-year planning horizon.

Table 3-4: South OC Water Demand Projections

Water Agency		Water Demand Projection [2] (AFY)					
	Actual 2004-05	Actual 2009-10	2015	2020	2025	2030	2035
El Toro WD	10,922	8993	9,500	9,750	10,000	10,000	10,000
Laguna Beach CWD	4,490	4,067	4,827	4,420	4,456	4,483	4,505
Moulton Niguel WD	38,632	36,366	40,600	38,000	38,500	39,000	39,500
City of San Clemente	10,253	9,645	10,650	10,840	10,920	10,925	10,975
City of San Juan Capistrano	9,218	8,783	9,400	9,650	9,900	10,150	10,400
Santa Margarita WD	32,860	34,169	40,102	43,991	47,883	48,081	48,081
South Coast WD	8,048	6,903	8,208	8,495	8,605	8,736	8,736
Trabuco Canyon WD	3,822	3,519	4,615	4,650	4,778	4,900	5,018
Total	118,245	113,445	127,902	129,796	135,042	136,275	137,215

1. Water that will be consumed. Includes potable water and recycled/non-potable waters.

2. Source: MWDOC 2013.

Direct use water supply sources are in five distinct categories: imported water, groundwater, surface water, recycled water and desalted water. Existing and projected non-imported potable supply source quantities for each South Orange County water agency are listed in Table 3-5. Recycled (non-potable) water supply projections are shown in Table 3-6.

Table 3-5: South OC Non-Imported Potable Water Supply Projects

Water Agency	Non-Imported Potable Water Supply Projections (AFY) [1]						
	2004-05	2009-10	2014-15	2019-20	2024-25	2029-30	2034-35
El Toro WD	-	-	-	-	-	-	
Laguna Beach CWD	-	-	-	-	-	-	
Moulton Niguel WD	-	-	-	-	-	-	
City of San Clemente	428	619	500	500	500	500	500
City of San Juan Capistrano	2,654	1,980	7,450	7,450	7,450	7,450	7,450
Santa Margarita WD	90	65	100	116	116	116	116
South Coast WD	-	634	1,000	2,200	2,200	2,200	2,200
Trabuco Canyon WD	869	318	238	238	238	238	238
Total	4,041	3,616	9,288	10,504	10,504	10,504	10,504

Source: MWDOC Agency Projections, February 2013.

[1] Does not include a portion of Irvine Ranch Water District that lies within RWQCB - Region 9 area.

Table 3-6: South OC Non-Potable (Recycled) Supply Projections

Water Agency	Non-Imported Non-Potable Water Supply Projections (AFY) [1]						
	Actual 2004-05	Actual 2009-10	2015	2020	2025	2030	2035
El Toro WD	605	418	800	1,350	1,350	1,350	1,350
Laguna Beach CWD	-	-	200	200	200	200	200
Moulton Niguel WD	6,402	6,858	8,500	8,700	8,900	9,000	9,100
City of San Clemente	328	473	725	1,830	1,830	1,830	1,830
City of San Juan Capistrano	357	424	1,950	1,950	1,950	1,950	1,950
Santa Margarita WD	2,503	6,027	7,439	9,603	12,350	12,860	12,860
South Coast WD	714	826	1,000	1,200	1,300	1,400	1,400
Trabuco Canyon WD	850	809	1,035	1,035	1,035	1,035	1,035
Total	11,759	15,835	21,649	25,868	28,915	29,625	29,725

Source: MWDOC Agency Projections, provided 2/20/13.

[1] Does not include a portion of Irvine Ranch Water District that lies within RWQCB - Region 9 area that has non-potable supplies of approximately 400 AF in 2005 and projected to grow to about 600 AF by 2030.

Since South Orange County imports a predominant amount of its water needs from outside of the area, it is not surprising that the southern part of the county is concerned about either planned or emergency outages of the import system that could be caused by natural or man-made events resulting in a disruption of water supply. Supply concerns could be caused specifically by:

- Planned shutdowns for imported delivery and treatment system maintenance and upgrades
- Emergency shutdowns or outages of facilities such as Metropolitan's Diemer Water Filtration Plant or major supply pipelines;
- Prolonged droughts on the State Water Project and/or Colorado River Aqueduct imported water systems; or
- Delays in the development of other planned local water projects.

One of the goals of the IRWM Plan is for all of the South Orange County agencies to work together to make the necessary investments to mitigate or minimize impacts from

these types of events. Implementation of water use efficiency programs and development of local supply sources, regional interconnections and lined and covered reservoir storage will help to protect the South Orange County system. Water transfers from outside of the WMA will also be beneficial to add a layer of insurance with respect to future droughts on the State Water Project or Colorado River system.

3.3.5.2 Local Water Supply

MWD and MWDOC have both developed complementary strategies to help insure the continued delivery of high-quality imported water supplies. Water remains a valuable resource and it is imperative that Southern California continues to develop and implement alternative strategies to meet the demands of a growing population. The IRWM Plan is consistent with the strategies of these regional water agencies, and like them, emphasizes a diversification of supplies.

- Water Use Efficiency practices focus on the 5 Best Management Practices (BMPs) for urban water use efficiency in California and include Utility Operations (Conservation Coordinator, Water Loss Control, Metering With Commodity Rates, and Retail Conservation Pricing), Education Programs (Public Information and School Education), Residential (home water surveys, low-flow showerhead and toilet retrofits), Commercial, Industrial and Institutional (Technical Assistance and Incentives, Landscape(Irrigation Budgets and Incentives). These BMPs offer cost-effective opportunities to moderate the amount of imported and local water supplies required by municipal and industrial users. These programs are offered both regionally by MWDOC and Metropolitan and also locally by individual retail water agencies.
- Recycling already occurs at a significant level in South Orange County, but efforts can be extended to satisfy additional needs, particularly non-domestic demands for irrigation uses. Local recycling systems require upgrades and expansions to continue to maximize and increase supplies.
- Groundwater recovery has begun on the San Juan Groundwater Basin.
- Stormwater and dry-weather runoff capture for irrigation is also being incorporated into the overall water supply portfolio that also includes ecosystem, surface and ocean water quality benefits
- Ocean water desalination processes continue to decrease in cost, making potential use more fiscally appealing.

Surface water capture and treatment for potable and non-potable supply, groundwater basin recharge, and improved riparian habitats is also considered a minimal aspect of local water supply, and efforts to improve surface water quality are progressing through the use of BMPs.

Orange County is privileged with almost 40 miles of coastal shoreline, which means an abundant source of water, with a high salinity, is accessible to much of the county. Desalination is particularly important to South Orange County as a means to reduce dependence on imported water. The two types of processes for removing salinity from

water within South Orange County include ocean desalination and groundwater desalters.

3.3.5.3 Ocean Desalination Supply

MWD's use of membrane technology and improved plant siting strategies have reduced costs for desalination, and may make seawater desalination a potential supply option for the region. In 2001, the Metropolitan Water District of Southern California developed a Seawater Desalination Program (SDP) to provide incentives for development of new seawater desalination projects in Metropolitan's service area. Under the SDP, Metropolitan provides incentives up to $250 per acre-foot for locally produced seawater desalination projects that reduce the need for imported supplies. To qualify for the incentive, proposed projects must replace an existing demand or prevent a new demand on Metropolitan's imported water supplies. Desalination of ocean water provides a potentially unlimited supply of water if it can be desalinated and delivered at competitive costs. To date, there is one project, with a capacity of 56 TAF, within the Metropolitan service area that is currently under construction, which represents 37% of the 150 TAF desalination goal discussed in Metropolitan's 2004 Integrated Water Resources Plan (IRP) Update.[28]

Previously, three desalination project sites were considered by MWDOC studies specifically for Orange County: Huntington Beach, San Juan Creek, and San Onofre. Both the Dana Point (San Juan Creek) and the San Onofre sites are in close proximity to the end users in South Orange County, providing greatly improved supply reliability for the supply. The treatment process at the desalination facility is expected to be reverse osmosis (RO). It is anticipated that the potable water recovery rate would be about 45%-50% of the raw ocean supply rate.

The Municipal Water District of Orange County and its five Project Partners – Laguna Beach County Water District, Moulton Niguel Water District, City of San Clemente, City of San Juan Capistrano, and South Coast Water District – are working diligently to improve local water reliability in south Orange County through the investigation and development of the *South Orange Coastal Ocean Desalination Project* (SOCOD).[29] This project would decrease the area's dependence upon imported drinking water supplies, as the South Orange County participating agencies rely on imported water from northern California and the Colorado River to meet approximately 95 percent of their potable demands.

The proposed ocean desalination facility would be located north of Doheny State Beach in Dana Point, adjacent to San Juan Creek on the inland side of Pacific Coast Highway on property being reserved for the project by the South Coast Water District. It would produce approximately 15 million gallons per day of high quality drought-proof water

[28] Municipal Water District of Orange County, 2010 Regional Urban Water Management Plan. DRAFT - 4/28/2011.

[29] Municipal Water District of Orange County website. "Ocean Desalination". Available online 5/8/13. http://www.mwdoc.com/pages.php?id_pge=68

supply or about 16,000 acre-feet per year. The project would provide up to 25% of the participant's potable water demand. This new, local water supply would also benefit the area during emergencies and outages of the regional imported water delivery system. The projected SOCOD project construction cost is $155 million, and the cost of water would be $1,450/acre-foot – with the cost being reduced to $1,200/acre-foot with incentives from Metropolitan Water District of Southern California.

A unique element of the project is the use of slant wells to pull in filtered ocean water from the alluvial channel extending offshore of San Juan Creek. The slant wells avoid marine impacts such as impingement and entrainment and also protect against ocean water quality upsets such as red tides, spills and stormwater discharges. Moreover, the use of slant wells will provide seawater intrusion control to the San Juan Basin groundwater through the creation of a pumping cone of depression along the coastline which will prevent the ocean water from moving inland, which otherwise occur with the planned full development of the San Juan Basin brackish groundwater resource. Potential use of recycled water for injection to reduce the draw on the basin groundwater will also be considered for the project to mitigate its impacts and develop additional local supply. The project would also be able to utilize brines from the two groundwater desalters for feedwater supply to the project. This will further enhance the overall beneficial use of local water resources in the area.

Two phases of project feasibility testing have been conducted successfully at Doheny Beach since 2005. The project entered Phase 3: Extended Pumping & Pilot Plant Testing in early 2010 and was completed in May 2012. The Phase 3 results are promising and the participating agencies are reviewing options to move the project forward. The next phase in the implementation of the project is working out the best approach for mitigation of the project impacts on the groundwater basin and conducting the pre-design steps over the next 3 to 4 years. The pre-design work includes environmental baseline monitoring, offshore geophysics and geochemical modeling, preliminary engineering, environmental documentation and permitting. Successful adoption of the EIR and the receipt of all necessary permits from all appropriate regulatory agencies would be the next steps prior to project implementation and the initiation of design and construction. As planned, the project would be constructed and operational within three years after receipt of permits, and water deliveries would begin in 2020.

NOAA Fisheries works with MWDOC to identify potential impacts to steelhead within the project area. Figure 3-8 shows the steelhead critical habitat. MWDOC and the Project Partners are working collaboratively with the following environmental organizations to ensure that the project is eco-sensitive:

National Oceanic and Atmospheric Administration

Orange County Coastkeeper

Surfrider Foundation

Trout Unlimited

3.3.5.4 Groundwater Desalter Water Supply

The San Juan Basin Authority, in conjunction with the City of San Juan Capistrano, initiated a desalter project utilizing the groundwater for domestic water supply. The San Juan Basin Desalter was constructed by the City of San Juan Capistrano pursuant to the terms of the 1998 San Juan Basin Desalter Project Groundwater Recovery Program Agreement between Metropolitan, MWDOC, and the SJBA, and as modified by First Amendment dated October 15, 2002. The San Juan Basin Desalter was completed in December 2004. The plant is currently supplied by six wells located in the Lower San Juan subbasin. The brackish water from these wells is conveyed to the plant where it is treated by reverse osmosis (County of Orange, 2006). Approximately 4,800 AF was produced from the six operating wells during the period December 2004 through December 2005. Currently, the GWRP has been impacted by Methyl Tert-Butyl Ether (MTBE), cutting production in half to about 2 MGD or less since the spring of 2008. The installation of a Granular Activated Carbon Filter (GAC) allows the full 5.1 MGD production. San Juan Capistrano plans to increase the treatment capacity to 6.2 MGD by 2014. [30]

SCWD currently owns and operates a 1 MGD Groundwater Recovery Facility (GRF) that came on-line in 2007, also known as the Capistrano Beach Desalter. The GRF was built initially for 1,300 AFY but production is currently limited to about 800 AFY by water the capacity of a single well. The plant extracts and treats brackish groundwater from the San Juan Basin using Reverse Osmosis and iron and manganese removal due to high mineral content. SCWD is in the process of expanding the GRF facilities as well as adding another well. When complete, the project is expected to extract up to 1,300 AFY from the basin[31]. The SJBA is performing a study to evaluate the potential new well sites. SCWD will need to construct a second well in order to reach the permitted limit and construction of additional wells will be required to reach proposed potential 2,000 AFY goal. [32]

3.3.6 Water Supply Infrastructure

The resource mix for meeting South Orange County's total demand includes local groundwater, recycled water, surface water, and imported water from MWD. The South OC WMA collaborates to develop local supplies

Orange County depends on imported water from Northern California through the State Water Project and the Colorado River for approximately 50 percent of the County's total supply. The other half comes from several sources: a large groundwater basin

[30] MWDOC, Chapter IV – Groundwater Basin Reports Orange County Basins - San Juan Basin. Available online 12/20/12. http://www.mwdh2o.com/mwdh2o/pages/yourwater/supply/groundwater/PDFs/OrangeCountyBasins/SanJuanBasin.pdf

[31] South Coast Water District, Groundwater Recovery Facility (GRF). Available online. 2/15/13. http://www.scwd.org/projects/grf.asp

[32] Municipal Water District of Orange County, Regional Urban Water Management Plan, 2010.

underlying the northern half of the County, recycled wastewater produced by several local water agencies, and several small groundwater basins. The County anticipates that the percentage of its supply from each source will remain approximately the same for the next 25 years, with 45% of its supplies from imported water and 55% of its supplies from local sources in 2035, even with projected growth occurring. The large groundwater basin that underlies the northern half of the County provides about 75 percent of that area's needs. South Orange County is 90 percent dependent on imported water.

An extensive infrastructure network makes the delivery of water possible in South Orange County. Figure 3-9 shows the Regional Imported Water Distribution System and Water Agencies. The Metropolitan Water District of Southern California (MWD) is the regional wholesaler of imported water. South Orange County purchases water from MWD through MWDOC. MWD's imported water system that serves South Orange County comes primarily from the Colorado River and from the East Branch of the California Aqueduct South Orange County's imported water supply is treated at the Diemer Filtration Plant in Yorba Linda, and transported through two major pipelines to the southern portion of the county; the East Orange County Feeder No. 2 and the Allen McColloch Pipeline. Local delivery is then facilitated primarily through the Aufdenkamp Transmission Main, the Joint Transmission Main, and the South County Pipeline. Water supplies then move into each local water supplier's infrastructure, which includes distribution mains, pump stations, reservoirs, wells, and other system components. The coastal communities in South Orange County also receive a small supply from the Orange County Feeder, which is fed from the Weymouth Filtration Plant and at times from the Jensen Filtration Plant[33].

IRWD Interconnection Project - This project became operational in 2009 and involved construction of a permanent interconnection and pumping facilities between the IRWD potable water distribution system and the Joint Regional Transmission Main (JRTM) and the Aufdenkamp Transmission Main (ATM) that conveys water into South Orange County. The project has the ability to transfer up to 30 cfs of supplies during emergency situations only.

SMWD Upper Chiquita Reservoir Project - SMWD constructed the Upper Chiquita Reservoir with a capacity of 244 MG, near Oso Parkway and the 241 Toll Road. The reservoir will act as a large-scale emergency potable water supply during planned or unplanned service disruptions for South Orange County agencies. Construction began in 2009 and was completed in October 2011. The Upper Chiquita Reservoir is located on the western slope of Chiquita Canyon, just north of Oso Parkway in the City of Rancho Santa Margarita. The 244-million gallon Upper Chiquita Reservoir is the largest domestic water reservoir built in South Orange County in nearly 45 years.

San Juan Capistrano Recycled Water – The City of San Juan Capistrano is currently working with its neighboring agencies SMWD and MNWD to make arrangements to use

[33] South Orange County Water Reliability Study – Phase 2 System Reliability Plan, September 2004

recycled water, when available from these agencies. Plans for a local recycled water treatment plant at SOCWA's Latham Plant have been indefinitely delayed.

ETWD Recycled Water Distribution Capacity Expansion – ETWD is expanding its recycled water distribution capacity. The project will construct a new recycled water distribution piping supplied by imported tertiary treated recycled water from MNWD and IRWD. The proposed project, expected to be in service by 2015 will increase ETWD's recycled water supply by as much as 750 AFY.

The WMA has many projects proposed on the IRWM Priority Project List included in Appendix F of this report. Appendix F includes a Priority Project List for projects to have an opportunity for funding, and a Funded Project List for projects that have received funding and are in progress. The following provides a sample of some of the projects that would contribute to water supply.

Baker Water Treatment Plant - The proposed Baker Pipeline Regional Water Treatment Plant is a 25 MGD proposed regional project that will be built at the existing IRWD Baker Filtration Plant site in the City of Lake Forest. The Plant will treat untreated water from the Santiago Lateral and Irvine Lake through the Baker Pipeline. The project is intended to provide increased water supply reliability to South Orange County by increasing local treatment capability from multiple water supply sources, including imported water and local surface water from Irvine Lake. Project partners include Irvine Ranch Water District, El Toro Water District, Moulton Niguel Water District, Santa Margarita Water District, and Trabuco Canyon Water District. The project is proceeding with construction in 2013.

SCWD Aliso Creek Streamflow Recovery Facilities Project - SCWD has conducted a preliminary investigation of a project to intercept and treat a portion of the surface runoff flows in Aliso Creek to supplement SCWD's potable water system. This would provide a significant quantity of locally produced potable water through the existing potable water distribution system. The proposed project can be done separately or in conjunction with the Aliso Creek Harvesting Project. The project would produce up to 2 MGD of product water to SCWD's potable water distribution system or for blending with the recycled water supply.

3.3.7 Wastewater and Recycled Water Systems

South Orange County's wastewater is managed by the South Orange County Wastewater Authority (SOCWA). SOCWA serves 10 member agencies, including the majority of the cities in the WMA as well as special districts. Figure 3-10 Wastewater Boundary & Transmission Lines shows SOCWA's service area, the agencies it serves, and the wastewater system and facilities. SOCWA's purpose it to plan for, acquire, construct, maintain, repair, manage, operate and control facilities for the collection, transmission, treatment and disposal of wastewater, the reclamation and use of wastewater for beneficial purposes, and the production, transmission, storage and distribution of non-domestic water for the mutual benefit of SOCWA's ten member agencies and the general public in South Orange County. Specifically, SOCWA's service area encompasses the Aliso Creek, Salt Creek, Laguna Coastal Streams and

San Juan Creek Watersheds (approximately 220 sq. mi) and is represented by the following member agencies:

- City of Laguna Beach
- City of San Clemente
- City of San Juan Capistrano
- El Toro Water District
- Emerald Bay Service District
- Irvine Ranch Water District
- Moulton Niguel Water District
- Santa Margarita Water District
- South Coast Water District
- Trabuco Canyon Water District

Figure 3-9: Regional Imported Water Distribution System & Water Agencies

Figure 3-10: Wastewater Boundary & Transmission Lines

SOCWA operates facilities for the collection, transmission, treatment and disposal of wastewater, the reclamation and use of wastewater for beneficial purposes, and the production, transmission, storage and distribution of non-domestic water. SOCWA operates four regional wastewater treatment plants, two ocean outfalls, and a treated effluent pipeline:

- Coastal Treatment Plant
- Aliso Creek Ocean Outfall
- Regional Treatment Plant
- 3A Plant
- San Juan Creek Ocean Outfall
- Jay B. Latham Treatment Plant
- Effluent Transmission Main

SOCWA Coastal Treatment Plant - SOCWA's Coastal Treatment Plant (CTP) located in the City of Laguna Niguel has a maximum influent capacity of 6.7 MGD. Effluent has been treated to secondary or tertiary levels dependent upon disposal or reuse of the wastewater for recycling. Recycled water is treated to applicable Title 22 standards. Treated effluent that is not recycled is disposed through the Aliso Creek Outfall Ocean Outfall. In 2010, 4,400 acre-feet of dry weather flows were collected and treated on average of which 900 acre-feet was used as recycled water.

SOCWA Joint Regional Treatment Plant - The Joint Regional Treatment Plant (JRTP) with a maximum influent capacity of 12 MGD lies within the City of Laguna Niguel and is operated by SOCWA. Effluent has been treated to secondary or tertiary levels dependent upon disposal or reuse of the wastewater for recycling. Recycled water is treated to applicable Title 22 standards. Non-recycled effluent is conveyed to the Aliso Creek Ocean Outfall via the SOCWA Effluent Transmission Main. In 2010, the JRTP received and treated an average dry weather flow of 10,420 acre-feet with 6,721 acre-feet treated to recycled water standards.

SOCWA Plant 3A - Plant 3A is located within the City of Laguna Niguel and is operated by SOCWA. The maximum influent capacity is 6 MGD. Effluent has been treated to secondary or tertiary levels dependent upon disposal or reuse of the wastewater for recycling. Recycled water is treated to applicable Title 22 standards. Unused effluent is conveyed to the San Juan Creek Outfall via the 3A Effluent Transmission Main. On average, in 2010 Plant 3A received and treated 2,352 acre-feet of dry weather flows of which 1,266 acre-feet were treated to recycle water standards.

SOCWA J. B. Latham Treatment Plant - SOCWA's J. B. Latham Treatment Plant is the largest plant in the service area with a design capacity of 13 MGD. This plant is located in the City of Dana Point. Effluent is currently treated to secondary levels. Effluent is conveyed directly to the San Juan Creek Outfall. In 2010, the average dry weather flows collected and treated were 10,977 acre-feet. None of the treated effluent currently meets recycled water standards.

On a contract basis, two member agencies operate additional SOCWA facilities on behalf of the participating project committee members:

- North Coast Interceptor (contracted to City of Laguna Beach)
- San Clemente Land Outfall (contracted to City of San Clemente)

Collected wastewater receives full secondary treatment at the organization's four wastewater facilities, and the organization also has active water recycling, industrial waste pretreatment, biosolids management and ocean/shoreline monitoring programs to meet the needs of its members and the requirements of the applicable regulatory permits.

Recycled water is an important part of the WMA supply system. The following projects reflect the current recycled water systems in the Region.

The MNWD Phase 5 Recycled Water Distribution Expansion Project – The MNWD Phase 5 Recycled Water Distribution Expansion Project includes the construction of pipelines, reservoirs, pump stations, and service connections. Participating cities include the cities of Laguna Niguel, Aliso Viejo, Mission Viejo and Laguna Hills. This project is part of the MNWD Recycled Water Distribution System and was started in 2012.

The Salt Creek Treatment Plant Facility Re-use Project –South Coast Water District in cooperation with the City of Dana Point, is proposing this project to re-use the treated creek water for irrigation purposes adjacent to Salt Creek at Pacific Coast Highway. This project is a follow-on project to the Salt Creek Ozone Treatment Facility which currently treats dry weather surface runoff before it flows to the beach.

ETWD Recycling Plant - El Toro Water District Water Recycling Plant is operated by El Toro Water District and is located in the City of Laguna Wood. The plant has a maximum influent capacity of 6 MGD. Wastewater is treated to a secondary to Title 22 standards depending upon the ultimate use of the effluent. In 2010, 4,220 acre-feet of secondary treated effluent is disposed via the SOCWA Effluent Transmission Main to the Aliso Creek meeting Title 22 standards and is sent to the recycled water distribution system.

SMWD Chiquita Water Reclamation Plant - Chiquita Water Reclamation Plant (CWRP) is operated by Santa Margarita Water District and is located in Chiquita Canyon. Wastewater is treated to a tertiary level with recycled water treated to Title 22 standards. CWRP has a maximum design capacity of 8 MGD with plans to increase its size to 10 MGD by 2025. In 2010, approximately 2,511 acre-feet was recycled, with the majority of the effluent, 7,569 acre-feet, disposed via the Chiquita Land Outfall with a connection to the San Juan Creek Ocean Outfall.

SMWD Oso Creek Water Reclamation Plant - Oso Creek Water Reclamation Plant (OCWRP) is located along Oso Creek and is operated by Santa Margarita Water District. At this facility, wastewater is treated to a secondary level with recycled water treated to Title 22 standards. A bypass facility allows for excess wastewater to be sent to the previously discussed J.B. Latham Treatment Plant as OCWRP has no outfalls.

Without the ability to discharge treated effluent, excess flows beyond recycled water demands are required to be sent to J.B. Latham Treatment Plant. OCWRP has a maximum design capacity of 3 MGD. In 2010, approximately 1,496 acre-feet, is treated and recycled. OCWRP is a clipping plant that removes wastewater from the main sewer trunk line.

SMWD Nichols Institute Water Reclamation Plant - The Nichols Institute Water Reclamation Plant is operated by Santa Margarita Water District and owned by a private company that owns property within SMWD's boundaries. This small facility treats approximately 34 AFY. No outfall is available for this facility. Therefore, all wastewater is treated to Title 22 standards for recycling purposes. Since this facility is remote from the existing water and wastewater facilities, SMWD is not obligated to provide an alternate source of water in the event the Nichols facility becomes inoperable or unusable.

San Clemente Water Reclamation Plant - The City of San Clemente owns and operates the San Clemente Water Reclamation Plant located within the city. The San Clemente Water Reclamation Plant has a design capacity of 7 MGD and treats wastewater to secondary or tertiary levels dependent upon if the water will be recycled or disposed. In 2010, approximately 900 acre-feet were recycled. Any water in excess of the plant's recycling limit is conveyed to the San Juan Creek Ocean Outfall via the San Clemente Land Outfall. Recycling capacity is currently 2.2 MGD with plans to expand to 4.4 MGD.

IRWD Los Alisos Water Reclamation Plant - Los Alisos Water Reclamation Plant (LAWRP) is operated by IRWD and is located in the City of Lake Forest. LAWRP has a capacity of 5.5 MGD. Wastewater is treated to a secondary or tertiary level dependent upon the ultimate use of the effluent. In 2010, approximately 1,470 acre-feet were recycled. When excess water beyond its tertiary treatment capacity is received, it is conveyed to the SOCWA Effluent Transmission Main for disposal via the Aliso Creek Ocean Outfall.

IRWD Michelson Water Reclamation Plant - Michelson Water Reclamation Plant (MWRP) is located in the City of Irvine and is operated by IRWD. MWRP currently has a maximum influent capacity of 18 MGD but is under construction to expand its capacity to 28 MGD. Wastewater is treated to a tertiary level with advanced treatment in the form of nitrification/denitrification. All effluent meets Title 22 standards for unrestricted use, except for potable water consumption. All effluent produced by the plant is conveyed to the recycled water distribution system. In 2010, approximately 20,150 acre-feet were recycled.

TCWD Robinson Ranch Water Reclamation Plant - Robinson Ranch Water Reclamation Plant (RRWRP) is operated by Trabuco Canyon Water District and is located in Trabuco Canyon, an unincorporated area of Orange County. RRWRP has a maximum capacity of 0.85 MGD. In 2010, average dry weather flows collected and treated were 809 acre-feet. Wastewater is treated to a secondary level and Title 22 standards. All of the wastewater is recycled as the plant is not permitted to have stream discharges, and it is unfeasible to connect to the existing outfalls in the SOCWA service area.

Proposed Projects

IRWD Michelson Water Reclamation Plant Expansion - Michelson Water Reclamation Plant (MWRP) currently has a maximum influent capacity of 18 MGD. To keep up with a growing demand for non-potable water applications, IRWD will increase the capacity from 18 MGD to 28 MGD. Design of this project started in September 2006 and was completed in March 2009. Construction began in September 2009 and is anticipated to be completed in 2013.

San Clemente Water Reclamation Plant Expansion - The San Clemente Water Reclamation Plant located within the City currently has a capacity of 2.2 MGD. The City of San Clemente plans to expand the plant to 4.4 MGD. The expansion will include nearly 9 miles of pipelines, conversion of a domestic water reservoir to recycled water storage, and a pressure reducing station as well as an interconnection with SMWD. Design of this project was completed in spring 2010 and construction is estimated to begin in the fall of 2011 with the first phase of new recycled water customers to come online in 2013.

SMWD Chiquita Water Reclamation Plant Expansion - Chiquita Water Reclamation Plant (CWRP) currently has a capacity of 8 MGD. SMWD plans to expand the plant to 10 MGD by 2025. The expansion will increase total production and reduce dependency on imported water.

SCWD Aliso Creek Urban Runoff Recovery, Reuse, and Conservation - SCWD is constructing a project to intercept and treat a portion of the surface runoff in lower Aliso Creek to supplement the recycled water system. This would improve the quality of the recycled water supply to make it more attractive for irrigation users. Treatment would include filtration and reverse osmosis facilities near SOCWA's CTP. SCWD would treat 300,000 to 800,000 gallons per day of urban runoff in the creek based on customer demand and the amount of creek flow. The District's permits to use water from Aliso Creek require monitoring of potential environmental impacts and a sufficient bypass flow rate (4.7 cubic feet per seconds) to ensure protection of fish and plants and continued flows into the lagoon at the mouth of the creek. The Project is anticipated for completion in 2013.

3.3.8 Flood Control Facilities

Flood Control Infrastructure is essential for the protection of lives and properties. The OCFCD is tasked with the ultimate goal of protecting the County from the threat of floods by designing and constructing channels, storm drains, dams, pump stations and other drainage related facilities. The OCFCD Regional Backbone Flood Control Infrastructure provides the primary flood control protection for the County and is comprised of channels, dams, retarding basins, pump stations and levees. Figure 3-11 shows the regional flood infrastructure, and includes more than the OCFCD owned facilities and other local facilities owned by cities or private (not shown). The OCFCD designs, constructs, and maintains channels, storm drains, retarding basins, dams and pump stations to reduce the risk of flooding during rain storms. OCFCD's goal is to provide 100-year storm event protection to its Regional Flood Control Infrastructure.

The County and cities through their planning process manage development in the floodplains consistent with FEMA's National Flood Insurance Program (NFIP) regulations. Building policies are enhanced to provide thresholds above NFIP regulations. This includes preserving and/or reclaiming properties in the FEMA Special Flood Hazard Area (also known as 100-year floodplain) and beyond as open space and prohibit development in perpetuity.

Additionally, OCFCD seeks implementing natural channels as an alternative along with other environmental features within the flood control system where feasible. Natural systems require much wider channels and a significant budget for future maintenance and right-of-way acquisition which may include existing development resulting in relatively high costs therefore yielding an unfeasible alternative.

There are many flood control channels and associated facilities within the South Orange County WMA. There are approximately 380 miles of concrete, rock lined, and earthen flood control facilities in the entire County that are owned, operated and maintained by OCFCD; however, there are more miles of channel that are unaccounted for that are privately owned. Flood control is provided by a system of levees, canals, and pump stations. All stormwater runoff is conveyed by gravity through a system of drainage lines and channels. Some of this water is conveyed into the suction bays of various pump stations then pumped to a higher elevation into larger levees or the ocean. The pump station operators are responsible for the operation and maintenance of 7 pump stations, 3 ultra violet / filtration systems and 4 urban runoff diversions containing 46 pumps throughout the County watershed area.

The OCFCD continues to upgrade the regional backbone flood control infrastructure to provide protection from the 100-year storm event. The highest priority improvement to the flood control system in Orange County includes the improvement programs for the San Juan Creek and Trabuco Creek channels.

The County has placed a top priority on predicting flood events and reacting in a timely manner to areas of flooding and severe soil erosion. The ALERT (Automatic Local Evaluation on Real Time) Flood Detections System consists of a network of over 100 rainfall and flood control and reservoir water level sensors strategically located throughout the County. The ALERT system transmits data via radio transmission to the County's base station computer which allows for real time monitoring of storm conditions. The ALERT network is supported by satellite and radar storm tracking provided by the National Weather Service (NWS), the National Oceanic and Atmospheric Association (NOAA) and a contract meteorologist.

Flood control facilities may at times present a great opportunity for multiple joint-uses such as recreation, water conservation, water quality improvement, and environmental enhancement.

Figure 3-11: Flood Control Infrastructure (new)

3.3.9 Recharge Facilities

The San Juan Basin is located in southern Orange County within the San Juan Creek Watershed and is comprised of four sub-basins: Upper San Juan, Middle San Juan, Lower San Juan and Lower Trabuco. The basin is bounded on the west by the Pacific Ocean and otherwise by tertiary semi-permeable marine deposits. San Juan Creek drains the San Juan Valley, and several other creeks drain valley tributaries to the San Juan. The primary water-bearing unit within the Basin is Quanternary alluvium – a heterogeneous mixture of sand, silt, and gravel in the eastern portion of the basin to coarse sand near the center to fine-grained lagoonal sediments in the western portion of the basin. Thickness of the alluvium average about 65 feet and may reach more than 125 feet. The total storage capacity has been estimated to be 90,000 AF. Wells typically yield from 450 to 1,000 gpm. Recharge of the Basin is from flow in San Juan Creek, Oso Creek, and Arroyo Trabuco, as well as rainfall infiltration and subsequent deep percolation to the water table, deep percolation of applied water from landscape and agricultural irrigation, and subsurface inflow from the tributary alluvial stream areas. Water from springs flows directly from Hot Spring Canyon into San Juan Creek adding to recharge.[34]

San Juan Basin recharge consists of streambed percolation from the mainstream San Juan and Arroyo Trabuco Creeks. There are no spreading basins in the San Juan Basin. In the San Mateo Basin, recharge is derived from percolation of runoff derived from rainfall and effluent from a wastewater treatment plant. The infiltration is through natural reaches and five spreading basins in the stream channel of San Mateo Creek.[35]

3.4 Political/Jurisdictional Boundaries

Federal, state, and local agencies have jurisdiction within the South Orange County WMA. On a federal level, Region 9 of the United States Environmental Protection Agency includes the South Orange County WMA. The Clean Water Act requires the states or the U.S. Environmental Protection Agency to set standards for surface water quality, mandate sewage treatment and regulate wastewater discharges into the nation's surface waters. Rather than operate separate state and federal water pollution control programs in California, the State assumed responsibility for implementing the Clean Water Act. This involved melding state and federal processes together for activities such as setting water quality standards, issuing discharge permits and operating the grants program. The State Water Resource Control Board, and its nine Regional Water Quality Control Boards assume these responsibilities.

On a state level, the South Orange County WMA is within the SDRWQCB and the Southern District of the Department of Water Resources (DWR). The SDRWQCB is tasked with protecting and enforcing the many uses of water within the WMA, including

[34] Municipal Water District of Orange County, 2010 Regional Urban Water Management Plan. 4/28/2011.

[35] Department of Water Resources, California's Groundwater Bulletin 118, "Hydrologic Region South Coast - San Mateo Valley Groundwater Basin" (10/1/03). Available online 1/26/13: http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/9-2.pdf

the needs of industry, agriculture, municipal districts, and the environment. Figure 3-12 (Regional Water Quality Control Board) shows the boundaries of the RWQCBs Regions 8 and 9. The DWR manages the water resources of California, in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

Figure 3-12: Regional Water Quality Control Board

The South Orange County WMA falls within the South Coast Region of the California Department of Fish and Wildlife (DFW). The Mission of the DFW is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. DFW's Marine Region encompasses Crystal Cove State Marine Conservation Area, Laguna Beach State Marine Reserve, Laguna Beach State Marine Conservation Area, and Dana Point State Marine Conservation Area.[36]

The Irvine Coast Area of Special Biological Significance (ASBS) begins at Pelican Point and continues 3.4 miles along the coastline to the City of Laguna Beach. This ASBS contains the Irvine Coast State Marine Park (formerly called a Marine Life Refuge), and the overlapping Crystal Cove State Marine Conservation Area, which are administered by the California Department of Fish & Wildlife These Marine Protected Areas and the adjoining beach provide excellent tidal and offshore communities featuring tide pools, kelp beds, and dolphin birthing grounds. Despite increasing urbanization, Crystal Cove State Park (administered by the California Department of Parks and Recreation) contains some of the last undeveloped Orange County coastline.

The Heisler Park Area of Special Biological Significance (ASBS) in Orange County covers just 0.5 mile of coastline. The Heisler Park State Marine Reserve (formerly called an Ecological Reserve) and the overlapping Laguna Beach State Marine Park are administered by the California Department of Fish and Wildlife, and the adjacent Heisler Park is owned and maintained by the City of Laguna Beach. This reserve is a popular tidepooling area and can suffer from scavenging by beach visitors. Key pollution threats are urban drainage and stormwater runoff.

On a local level, the County of Orange, eleven cities, and nine special districts have jurisdictional boundaries with authority for land use, water resources, habitat protection, water quality, flood control, and recreation facility management.

The County of Orange is governed by the Orange County Board of Supervisors (BOS). The BOS oversees the management of County government and many special districts. The County is divided into five supervisorial districts with governing Boards. A Board of Supervisors is elected by the voters in the five districts to four-year terms. Each district varies in geographical size; however, the populations are equal at approximately 600,000 residents. The South Orange County WMA is primarily within the boundaries of the Fifth District. The Supervisor for the Fifth District is the Honorable Patricia C. Bates. The Fifth District includes all the South Orange County Cities that make up the South Orange County WMA. Each City includes a City Council to oversee City-specific issues.

3.5 Regional Demographics

South Orange County supports a major portion of Southern California's growing population. As real and projected populations continue to increase, appropriate

[36] California Department of Fish & Wildlife. *Guide to Southern California Marina Protected Areas*. Available online 3/29/13: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=43293&inline=true

management of the South Orange County WMA's water and other natural resources is essential. The IRWM Plan addresses regional demographics through effective management of its precious resources.

The South Orange County WMA includes a total population of 550,000.Table 3-7 shows the population served by the South Orange County WMA water agencies is approximately 559,524 and Table 3-8 shows the population served by SOCWA as 520,000. Table 3-9 reflects the City populations as approximately 583,268. Figure 3-13 Population Information by Tract provides the population information by tract while Figure 3-14 Median Household Income provides the Median Household Income for the South Orange County WMA. Some areas receive water and wastewater services from agencies outside the South Orange County WMA such as the Orange County Water District and Orange County Sanitation District (OCSD).

Within the South Orange County WMA there are several areas determined to be disadvantaged communities with median household incomes of less than $61,632[37]. Figure 3-15 Disadvantaged Communities shows the disadvantaged communities' locations within local service area boundaries.

[37] 2007-2011 CA census data: median household income of $61,632; http://quickfacts.census.gov/qfd/states/06000.html. Disadvantaged communities are defined as households with less than 80% of state annual median household income.

Table 3-7: Water Service Agency Population

Water Agency	2010 Population Served[38]
El Toro Water District	52,170
Laguna Beach County Water District	24,900
Moulton Niguel Water District	166,964
San Clemente Utilities Division	59,000
San Juan Capistrano Water Services Department	37,233
Santa Margarita Water District	150,000
South Coast Water District	40,000
Trabuco Canyon Water District	14,907
IRWD[39]	14,250
Total	**559,524**

Table 3-8: Wastewater Service Agency Population

Water Agency	2004 Population Served
South Orange County Wastewater Authority	520,000
Total	**520,000**

[38] Information provided by each agency

[39] Reflects the portion of IRWD that serves the City of Lake Forest located within South Orange County. Population is based on 4,750 dwelling units in SWRCB Region 9 that IRWD serves and assumes 3 people per unit, equaling approximately 14,250 people.

Table 3-9: City Populations

South Orange County City	2010 Population[40]
City of Aliso Viejo	49,477
CDP of Coto de Caza	14,866
City of Dana Point	33,863
CDP of Ladera Ranch	22,980
City of Laguna Beach	23,105
City of Laguna Hills[41]	30,703
City of Laguna Niguel	64,065
City of Laguna Woods[42]	16,500
CDP of Las Flores	5,971
City of Lake Forest[43]	78,501
City of Mission Viejo	94,824
City of Rancho Santa Margarita	48,550
City of San Clemente	64,542
City of San Juan Capistrano	35,321
Total	583,268

Many factors affect future demands for water such as population growth, economic conditions, and hydrologic conditions. Historical water demand in Orange County is strongly related to land use and population. In general, as population increased, water

[40]Numbers published by the State Department of Finance, except for CDPs which include numbers provided by City.

[41] 82.23% of total population is in South Orange County Region.

[42] 48.03% of total population is in South Orange County Region.

[43] California Department of Finance. January 1, 2012. Approximately 30% of City land area within the SDRWQCB jurisdiction includes a population of approximately 23,411. Portion of total population in South Orange County Region.

demand increased. From 1970 to 1995, population increased 82% and water demand increased 55%. From 1995 to 2000, population increased an additional 10%, resulting in an overall growth from 1970 to 2000 of 101%. Water demand use increased 13% between 1995 and 2000, for an overall growth from 1970 to 2000 of 79%. The slower growth in water demand is primarily due to a change in land use from agriculture to urban/suburban and successful conservation efforts. Table 3-10 on the following page reflects historical population growth data obtained from the Center for Demographic Research (CDR).

Table 3-10: South Orange County Historical Population Growth[44]

South Orange County City	2000	2001	2002	2003	2004	2005
City of Aliso Viejo		-	42,705	44,162	45,197	45,302
City of Dana Point	35,110	35,161	35,208	35,034	34,906	34,550
City of Laguna Beach	23,727	23,757	23,779	23,769	23,696	23,497
City of Laguna Hills	31,178	32,046	31,962	31,833	31,676	31,421
City of Laguna Niguel	61,891	62,312	62,569	63,588	63,667	63,310
City of Laguna Woods	16,507	17,718	17,594	17,447	17,263	16,998
City of Lake Forest	75,997	75,753	76,157	76,678	76,835	76,635
City of Mission Viejo	93,102	95,256	96,134	96,583	96,232	95,427
City of Rancho Santa Margarita	47,214	47,695	47,998	48,078	48,063	47,822
City of San Clemente	49,936	52,676	56,046	59,066	60,842	62,286
City of San Juan Capistrano	33,826	33,940	34,161	34,370	34,706	34,497

South Orange County City	2006	2007	2008	2009	2010	2011
City of Aliso Viejo	45,382	45,604	46,131	46,751	47,814	48,320
City of Dana Point	34,090	33,829	33,616	33,485	33,336	33,429
City of Laguna Beach	23,250	23,061	22,900	22,826	22,718	22,792

[44] Center for Demographic Research, Population Data for Orange County Cities as of January 2012. Available online: http://www.fullerton.edu/cdr/city.asp. 1/9/13.

City of Laguna Hills	31,096	30,818	30,656	30,494	30,341	30,410
City of Laguna Niguel	62,946	62,661	62,721	62,878	62,953	63,228
City of Laguna Woods	16,723	16,492	16,327	16,190	16,191	16,224
City of Lake Forest	76,390	76,346	76,582	76,817	77,257	77,490
City of Mission Viejo	94,566	93,958	93,709	93,458	93,297	93,483
City of Rancho Santa Margarita	47,536	47,728	47,764	47,723	47,849	47,947
City of San Clemente	62,749	63,063	63,318	63,510	63,494	63,743
City of San Juan Capistrano	34,255	34,234	34,438	34,428	34,567	34,734

As discussed in Section 3.3.5, by estimating water demands over the next 20 years, water suppliers are ensuring that reliable and economic sources of water are available to their customers while protecting the watersheds, groundwater resources, surface water, and the ocean.

3.6 Disadvantaged Communities

The IRWM Plan includes projects and programs aimed at protecting the population as a whole including residents who represent the disadvantaged population of the area.

For example, El Toro Water District's Recycled Water Distribution System Expansion was funded by Proposition 84 Round 1 Implementation Grant and consists of constructing a new recycled water distribution system to serve the El Toro Water District Service Area that includes disadvantaged communities in the City of Laguna Woods. The project would result in the conversion of approximately 75 existing potable water dedicated irrigation meters to recycled water. The conversions would reduce the amount of potable water imported by the District by as much as 300 acre feet per year. This Project would directly benefit disadvantaged community members.

Additionally, addressing water quality issues in areas of recreational use, the IRWM Plan incorporates environmental justice in a way that provides every resident an equal opportunity and fair treatment in the regional water planning process. To further substantiate the importance of including regional minority communities, the South Orange County IRWM Group has collaborated with Juaneno Band of Mission Indians and Hispanic community groups, including the National Hispanic Environmental Council to ensure their active involvement in the IRWM Plan.

South Orange County includes two areas where the average median household income is less than 80 percent of the statewide annual median household income. The City of

Laguna Woods includes a retirement community called Laguna Woods Village that meets the state's disadvantaged community criteria.[45]

[45] Department of Water Resources website defines a disadvantaged community as: A MHI of less than $48,706 is the DAC threshold (80% of the Statewide MHI). Available online 1/30/13. http://www.water.ca.gov/irwm/grants/resourceslinks.cfm

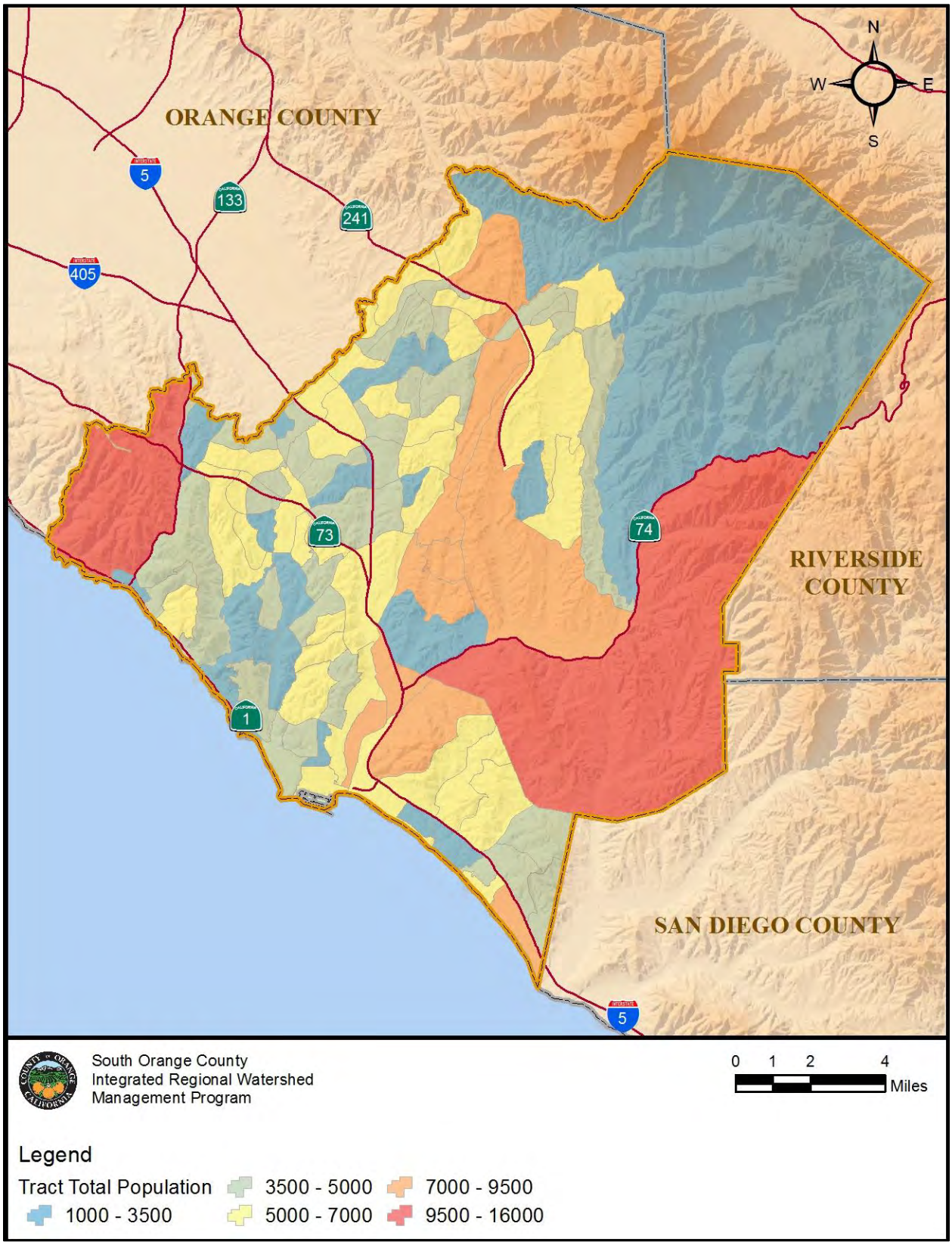

Figure 3-13: Population Information by Tract

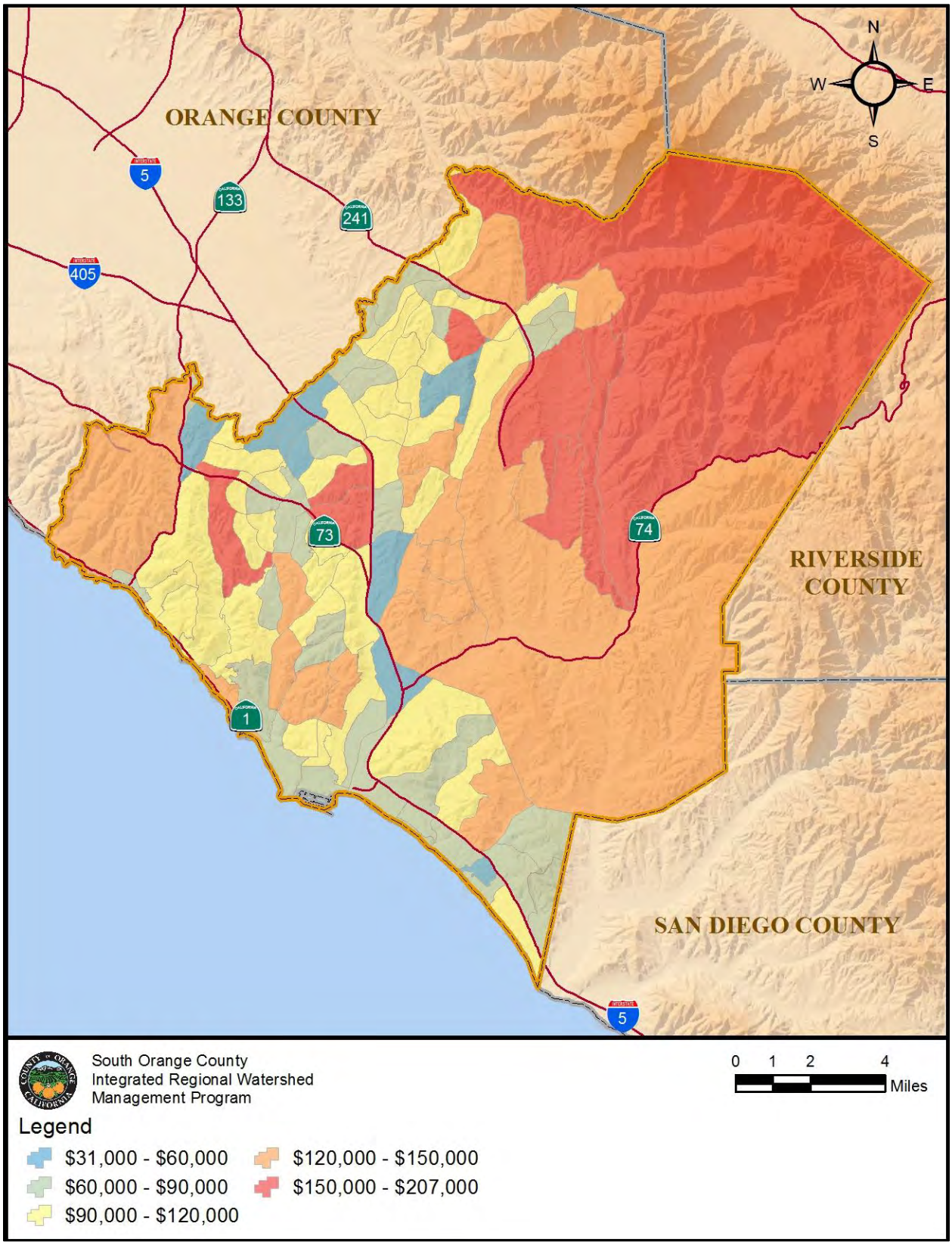

Figure 3-14: Median Household Income

Figure 3-15: Disadvantaged Communities

In addition to the City of Laguna Woods, there are several areas of low cost housing and subsidized housing that service South Orange County's disadvantaged communities. The majority of this socioeconomic population is Hispanic. One clear measure of this community is that the Camino Health Center in San Juan Capistrano provides affordable, quality primary medical and dental care. The Center serves over 100,600 visits annually through its medical clinic, mobile medical vans, pediatric dental clinic, and Women, Infants and Children program of which the majority were Hispanics whose income is in line with the State's formula for disadvantaged populations.

Of the 558,000 residents in South Orange County, it is estimated that 2.4% of the population are disadvantaged and live at or below the poverty level. The IRWM Plan includes several projects to address the cause of water pollution for beaches within the WMA. It is particularly important to address water quality in order to protect the health and safety of the entire population in the area, especially for the disadvantaged residents that do not have the means to travel to other areas of the state or country.

3.7 Water Management Issues

3.7.1 History of South Orange County IRWM Efforts

Orange County was settled around areas of surface water. San Juan Creek supplied the Mission at San Juan Capistrano. Santa Ana River supplied the early cities of Anaheim and Santa Ana. The Santa Ana River also provided water to a large aquifer underlying the northern half of the County. For 200 years, South Orange County epitomized California's rancho days, with cattle on the hills and orchards in the valleys. The Mission San Juan Capistrano was a center point, flanked by a stunning coastline to the west and the Cleveland National Forest to the east.

By the early 1900s, Orange County residents understood that their water supply was limited. In 1928 the cities of Anaheim, Santa Ana, and Fullerton joined with 10 other Southern California cities to form the MWD. Their objective was to build an aqueduct to the Colorado River to provide the additional water necessary to sustain the growing Southern California population.

Soon other parts of the Orange County also saw the need for supplemental supplies. A severe drought in the late 1940s further emphasized the need. In 1948, coastal communities from Newport Beach south to the San Diego county line formed the Coastal Municipal Water District as a way to join in the benefits provided by MWD. In 1951, MWDOC was formed by County voters under the Municipal Water District Act of 1911. In January 2001, the Coastal Municipal Water District became a part of MWDOC, a move that streamlined local government and allowed MWDOC to more efficiently provide wholesale water services. Today, MWDOC is MWD's third largest member agency, providing and managing the imported water supplies used in Orange County.

Since the early 1960s, the region has transitioned to one of the fastest growing areas of urban development in the State. Cities, once only sleepy rural communities, have become burgeoning urban centers. And the population, which once numbered a few thousand residents, has now exploded to more than 500,000. Homes, recreational facilities and master-planned retail areas cover the coastline. And South Orange

County's last remaining portion of undeveloped inland property, still a vivid reminder of the rancho days, is slated for development over the next 20 years.

Water supply reliability has allowed the area to thrive; responsible water resource management will allow it to continue. This is the basic premise on which the South Orange County IRWM Plan was developed. The entities that have developed the plan – South Orange County Cities, water and wastewater agencies, the County of Orange, and stakeholders represent half a million people working across seven major watersheds and two groundwater basins.

In June 2003, per direction from the Orange County Board of Supervisors, the OC Public Works Department, formerly the Resources and Development Management Department, led a task force of city managers and special district general managers, to develop a countywide Water Quality Strategic Plan. The task force proposed a new governance model for water quality programs based on three geographic sub-areas of the County: the North, Central, and South Orange County WMAs.

From this water quality strategic planning effort, the County was designated to serve as a regional program administrator. The WMA concept formalizes a partnership between the County, the Orange County Flood Control District, Orange County municipalities, and water and wastewater agencies and builds on years of working individually and collaboratively to develop and integrate regional water management strategies to protect communities from drought, enhance local water supply and system reliability, ensure continued water security, optimize watershed and coastal resources, improve water quality throughout the watersheds and safeguard habitat.

In August 2004, the County, South Orange County Cities and water and wastewater districts within the jurisdiction of the San Diego Regional Water Board formed the South Orange County IRWM Group (See Section 2.1 for a complete listing) to continue this collaborative effort and to more efficiently coordinate their efforts through the development of an IRWM Plan. To further solidify this collaborative effort the South Orange County IRWM Group has established a Cooperative Agreement amongst its members. The Agreement provides a framework for planning and implementing water management strategies in the South Orange County WMA.

3.7.2 Regional Water Management

The South Orange County IRWM Group focuses on identifying the long-term water supply and water quality issues facing the South Orange County WMA. All project categories within the IRWM Plan are essential for maximizing limited water resources, protecting water quality, and enhancing the environment. This integrated approach allows local agencies to access a wealth of regional resources, diversifying water supply sources over a broad range of projects. The following describes how the South Orange County IRWM Group has addressed the regional water management issues affecting the South Orange County WMA.

3.7.2.1 Water Supply

Providing an adequate water supply remains a critical requirement for the South Orange County WMA. Imported water supply accounts for approximately 90 percent of the

South Orange County WMA's potable water supply, and is obtained through the regional wholesale agencies. The local water supply, though smaller in amount, is in many ways much more critical in that it involves not only developing a usable supply to improve overall water supply reliability, but it also requires maintaining and protecting the area's ecological functions that are dependent on the availability of high quality surface water and groundwater.

As population changes, economic conditions, and hydrologic conditions influence water demand in South Orange County. As the WMA is rapidly expanding its housing base, the population and business base will dictate the future water needs. Thus, as South Orange County is heavily reliant on imported water, the demand for imported supply is estimated to expand with the population, although successful conservation efforts and a decrease in agricultural land uses are expected to abate the rate of growth of water demand.

It is imperative that South Orange County continue to develop and implement alternative strategies to meet the demands of a growing population. The South Orange County IRWM Plan supports the development and implementation of projects and programs to build diverse water supplies.

The MWD imported water system that serves South Orange County is principally supplied from the Colorado River Aqueduct and from the East Branch of the California Aqueduct. MWD serves South Orange County with imported water through untreated and treated water distribution systems. South Orange County receives nearly all of its treated supply from the Diemer Filtration Plant located in Yorba Linda. This water is delivered primarily through the Allen McColloch Pipeline and the East Orange County Feeder No. 2. A small portion, approximately 4,346 AFY of raw water, is treated by Trabuco Canyon Water District.

As the principal importer of water in Southern California, MWD's primary goal is to provide reliable water supplies to meet the water needs of its service area at the lowest possible cost. As existing imported water supplies from the Colorado River and State Water Project face increasing challenges, the reliability of deliveries from these sources continues to decline.

To address these challenges, MWD and its member agencies developed an Integrated Water Resources Plan (IRP) in 1996. The outcome was a "Preferred Resource Mix" which would ensure MWD and its member agencies would meet their full service retail demands without interruption through the year 2020.

The 1996 IRP Preferred Mix called for a diverse portfolio of imported supplies and locally developed resources. At first glance, local resources development may appear to benefit only the areas that directly receive the produced water supply. However, they are in fact regional resources that provide benefits by offsetting regional imported water demands and making the net additional imported water available to the entire service area.

The subsequent 2004 IRP Update, had three objectives:

1. To review the goals and achievements of the 1996 IRP
2. To identify changed conditions for water resource development
3. To update the resource targets through 2030

MWD's IRP has helped maintain a reliable water supply for all of Southern California by anticipating needs and providing additional water resources to address changing conditions. Imported sources will remain important baseline supplies but conservation and new local supplies such as recycling and ocean desalination will provide water for growing needs. Through regional planning, education and diversification, MWD and its member agencies plan to continue to provide reliable service of imported water.

To achieve a balanced mix, the IRP set targets and committed funding and implementation plans for development of member agency wastewater recycling, and groundwater recovery supplies. MWD currently funds recycling and groundwater recovery projects through the Local Resources Program (LRP). The LRP provides funding for the development of water recycling and groundwater recovery supplies that replace an existing demand or prevent a new demand on MWD's imported water supplies either through direct replacement of potable water, or increased regional groundwater production. MWD seeks development of 174,000 AFY of yield to meet a regional goal of 779,000 AFY by year 2025.

MWD's IRP report is updated approximately every five years. The 2010 IRP has been approved and released by MWD.[46]

3.7.2.2 Water System Reliability

Since South Orange County imports a predominant amount of its water supply from outside of the area, it is not surprising that South Orange County is concerned about either planned or emergency outages of the import system that could be caused by natural or man-made events resulting in a disruption of water supply service. To ensure continued water service reliability for South Orange County, 11 County agencies, MWD and the U.S. Bureau of Reclamation joined together to fund the South Orange County Water Reliability Study (SOCWRS) - Phase 2 System Reliability Plan. Heading these efforts was MWDOC.

MWDOC's purpose in studying the system reliability issues were to:

1) Identify risks, including earthquakes, that pose the greatest threat to the regional water treatment and distribution infrastructure that serves the project area
2) Identify ways to bolster source-of-supply and regional distribution systems, building on earlier engineering investigations and studies

[46] Metropolitan Water District 2010 Integrated Water Resources Plan http://www.mwdh2o.com/mwdh2o/pages/yourwater/irp/index.html 1/9/2013.

3) Develop a list of projects that accomplish the above objectives, and identify appropriate investments
4) Allow for flexibility in phasing. Most notably project operational dates and sizing should be flexible to account for changes in local resource development through construction of Local Resources Projects (LRPs).
5) Develop and implement projects to improve system reliability. The planning work took into consideration a number of prior studies, including: SOCWRS Phase 1, which served as the foundation for this effort; MWD's Central Pool Augmentation Project; SMWD's Lined and Covered Reservoir investigations to increase local storage for emergency needs; Irvine Ranch Water District's Water Resources Master Plan Update and Planning Area-6 Sub-Area Master Plan; and various Orange County Water District plans and groundwater basin operations studies.

To determine the economic impacts of water shortages, MWDOC retained the services of the Orange County Business Council. The economic impacts were found to range up to $1.7 billion, depending on shortage scenario. Even a relatively short 10-day outage of 20% carries a projected impact of over $60 million. These numbers illustrate the tremendous potential cost to the watershed from water system outages. Longer-term drought impacts were also evaluated in the analysis and resulted in even larger impacts.

One of the goals of the South Orange County IRWM Plan is for all of the South Orange County agencies to work together to make the necessary investments in order to mitigate or minimize impacts from these types of events. Development of local supply sources, regional interconnections and lined and covered reservoir storage will help to protect the South Orange County system. Water transfers from outside of the WMA will also be beneficial for adding a layer of insurance with respect to future droughts on the State Water Project or Colorado River system.

3.7.2.3 Water Conservation

Responsible water management must include water conservation. Currently, MWDOC has one of the best water efficiency programs in the country. Its program includes water efficiency education, rebate programs for installation of hardware such as low flow toilets and shower heads, and landscape irrigation programs designed to maximize commercial, residential, and governmental water efficiency. MWDOC also provides technical assistance on water efficiency matters to all area water agencies.

In October 2004, MWDOC, in cooperation with its 29 member agencies, began a pilot implementation program known as the SmarTimer Rebate Program. The Program offered commercial landscape owners and single-family homeowners rebate incentives to replace their antiquated irrigation timers with smart timers that automatically adjust the irrigation schedule as weather changes throughout the year.

In 2006, the program was expanded to include the South Orange County WMA. The expanded program offered rebates to owners of single-family homes and commercial landscape sites including but not limited to Homeowner Associations, city parks and street medians, schools and other public facilities.

MWDOC's South Orange County Water Smart Landscape Project is a project implemented by this IRWM Plan. The project involves the installation of a water smart landscape program. A rebate type format will be utilized to facilitate the installation of up to 960 residential smart irrigation timers, 1,104 commercial smart irrigation timers, 37,200 high efficiency irrigation rotating spray heads, and cause the reduction of up to 300,000 square feet of high-water-using plant material with low-water-using 'California Friendly' plant material. The project includes developing and distributing educational marketing material, installing water efficiency devices; conducting dry-weather runoff flow monitoring and water quality testing; performing a statistical evaluation on data collected in connection with the project to quantify changes in dry-weather runoff volume and water quality, and irrigation water use.

Other water use efficiency incentives have been initiated by MWDOC. Since MWDOC's Ultra Low Flush Toilet Rebate Program's inception, over 24,000 rebates have been processed, totaling over $3 million. Approximately 17,000 high efficiency washers have been rebated, totaling over $1.7 million[47]. Starting in September 2009, a limited number of rebates have been made available through the SoCal WaterSmart program for Southern California customers.

MWDOC received funding under the Proposition 50 IRWM Grant Program for its Water Use Efficiency Program Expansion. This program is currently being implemented and will significantly contribute to water conservation in the South Orange County WMA by enhancing the existing rebate program for water conservation practices to the level of standard implementation for all single-family homes and commercial landscapes, and would further improve overall watershed and coastline ecosystem health.

In 2006, the State legislature enacted AB1881 which requires local agencies to adopt the State Model Ordinance or a local ordinance that is at least effective as the State Model Ordinance by January 1, 2010. Guiding principles of the Local Ordinance are to:

1. Protect local control and mitigate the creation of increased layers of government and oversight.
2. Ensure as much simplicity, efficiency, and flexibility as possible.
3. Provide for as much consistency among County cities as possible.
4. Minimize the complexity and cost of compliance.

In 2009, the Orange County Model Water Efficient Landscape Ordinance was developed and adopted. Participants included: Orange County Division League of Cities Members, City Council Members, City and County Planners, Water Agency Directors and Staff, Building Industry Association, City Attorneys, Orange County Fire Authority and City Fire Departments, Parks and Recreation, and Green Industry.

SBx7-7, The Water Conservation Bill of 2009, was signed into law on February 3, 2010, as part of a comprehensive water legislation package. The bill sets a

[47] Viewtech. Rebate System. Available online: www.viewtechfinancialservices.com/MDWOCRebate.htm

goal of achieving a 20% statewide reduction in urban per capita water use, and directs urban retail water suppliers to develop targets to meet a 20% reduction in per capita water use by 2020, and an interim 10% reduction by 2015. Water suppliers receive partial credit for past efforts in conservation and deductions for recycled water. As a result not all agencies need to reduce demand by 20% in order to comply with the legislation. A retail agency that does not comply with the requirements of SBx7-7 will not be eligible for a water grant or loan from the state on and after July 16, 2016.

As a wholesaler, MWDOC is committed to developing and implementing regional water use efficiency and water conservation programs on behalf of its retail water agencies and their customers. This regional approach enables economies of scale, ensures a consistent message to the public, and assists in the acquisition of grant funding for program implementation.

To facilitate the implementation of Best Management Practices (BMPs) throughout Orange County, MWDOC focuses its effort on the following three areas[48]:

- Regional Program Implementation: MWDOC develops, obtains funding for, and implements regional BMP programs on behalf of all retail water agencies in its service area.
- Local Program Assistance: Upon request, MWDOC assists retail agencies in developing and implementing local programs within their individual service areas. MWDOC provides assistance with a variety of local programs including, but not limited to: Home Water Surveys, Landscape Workshops (residential and commercial), Public Information, School Education, Conservation Pricing, and Water Waste Prohibitions.
- Research and Evaluation: An integral component of any water use efficiency program is the research and evaluation of potential and existing programs. In the past five years, MWDOC has conducted research that allows agencies to measure the water-savings benefits of a specific program and then compare those benefits to the costs of implementing the program. This cost/benefit analysis enables individual agencies to evaluate the economic feasibility of a program prior to its implementation.

Additionally, MWDOC includes a Water Use Efficiency Department that provides programs to assist residential homeowners, commercial/industrial business owners, and professional landscapers in reducing the daily amount of water used. Several programs are administered by the Water Use Efficiency Department to assist in the effort of saving water, including the rebate programs for the following: High Efficiency Clothes Washer (HECW), High Efficiency Toilet (HET), Weather-Based Irrigation Controller (SmarTimer), Rotating Nozzles, Turf Removal, and Water Smart Landscape. MWDOC expanded the pilot rebate program in 2007 to target approximately 30% or 4,862 acre-

[48] Municipal Water District of Orange County. 2010 Regional Urban Water Management Plan. 4/28/11.

feet per year of the maximum savings potential. The program now provides rebates to residential homeowners, commercial/industrial business owners, and professional landscapers for reducing the daily amount of water used.

Implementation of two small scale pilot projects similar to the proposed project have been successfully completed including the SmarTimer and Edgescape Evaluation Project (SEEP, 2007) and the Reserve Study (2009-10). A third larger scale project designed to refine program implementation methodologies is currently being implemented in anticipation of the proposed region wide program.

MWDOC's Residential Runoff Reduction Study and the SmarTimer and Edgescape Evaluation Study have both demonstrated water conservation and water quality benefits. Water conservation benefits taken from the studies include an 18% reduction in residential and a 22% reduction in commercial landscape water use. Water quality benefits include a significant reduction in both dry-weather runoff volume and non-point source pollutants entering local creeks ultimately leading to the Pacific Ocean. The Residential Runoff Reduction Study quantified a 50% reduction in dry-weather runoff and non-point source pollutants with a ten percent penetration of landscape improvements. Follow-up studies, 5-years post installation, are verifying that water savings have remained persistent.

Other water conservation programs continue to be implemented by the individual water districts as well. For example, South Coast Water District's Targeted Water Conservation Program focuses on the largest water users (largest demand) within their service area to offer targeted rebates to them. This project builds upon, expands and complements the water conservation, Public outreach, Water Use Efficiency programs offered by MWDOC. In this way, their program expands the success of MWDOC's programs in a way that directly addresses their service area.

Educational classes and literature are made available to consumers in each school district. Examples of programs include water conservation workshops for homeowners, rebate programs for installation of water saving technologies, and professional landscape training and certification classes. Future potable water use efficiency in South Orange County will reduce water demand and the level achieved will be the result of several factors, including program investments, consumer acceptance, advancements in technology, etc.

3.7.2.4 Recycled Water

Water recycling has long been regarded as a cost-effective water supply alternative in South Orange County. Recycled water in the County is used to irrigate nursery crops, golf courses, parks, schools, business landscapes, residential lawns, and is also used for some industrial uses. Local water recycling projects involve the collection of wastewater being discharged within the service area, treating that water to applicable standards for specific uses, and substituting the recycled water for existing or future potable water demands. The local agencies have pursued regionalization of the recycled systems to increase the use of recycled water and increase reliability.

Several projects, programs, and efforts to study and enhance the use of recycled water throughout the WMA are described below:

- The Bureau of Reclamation, in cooperation with 8 state and local agencies, participated in the Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS) from 1992 through 1999. This $6 million study evaluated the feasibility of creating a long-range strategy for more effective development of water reuse programs in southern California's coastal and inland valley areas. The study covered a 6 county area, included over 7,300 demand points and all wastewater supplies in its databases. This data is being used to explore options to link available reclaimed water supplies with various demand points throughout southern California.

  The SCCWRRS analyzed 15 geographical areas for short term project implementation, two of which were located in South Orange County. The Upper Oso short term implementation plan, as described by the study, indicates a need for regional agencies to continue to expand and connect the recycled water distribution systems as a collaborative effort. These agencies would include SMWD, ETWD, MNWD, and SOCWA. Sensitivity analyses for the Upper Oso region demonstrated that this implementation plan would result in robust benefits remaining positive across a wide range of assumptions for estimated project costs or the avoided wastewater and water supply costs. The second region identified in the study was the San Juan region, which includes the recycled water systems of the cities of San Clemente, San Juan Capistrano, the SMWD and the SOCWA. This region is also recommended to expand and connect the recycled water systems of the area to create a more reliable water supply.

  The SCCWRRS also identified a long term strategy for the County. The long term analysis for the County consisted of increasing reuse at six of the wastewater treatment facilities and one of the reservoirs in the area. This increased flow is expected to satisfy approximately 52,500 AFY of new demand by 2040. This goal is being used as a guideline for implementation of the local long-term strategy described in the report to establish connections between the seven treatment facilities and reservoirs located in South Orange County to create one regional system.

- *H.R. 637 - South Orange County Recycled Water Enhancement Act*

  On 2/24/2009 the U.S. House of Representatives past H.R. 637, the South Orange County Recycled Water Enhancement Act, without amendment. H.R. 637 would amend the Reclamation Wastewater and Groundwater Study and Facilities Act (Public Law 102-575, 43 U.S.C. 390h et seq.), commonly called Title XVI, to authorize the Secretary of the Interior to participate in the design, planning, and construction of permanent facilities needed to reclaim, reuse, and treat wastewater in the southern part of Orange County, California. H.R. 637 would authorize the projects under Title XVI for Federal funding not to exceed 25 percent or $18.5 million for the San Juan Capistrano project or $5 million for the San Clemente project, whichever is less.

  The bill was recently under consideration of the U.S. Senate Energy and Natural Resources Committee Subcommittee on Water and Power. During Subcommittee hearings held on April 27, 2010, Kira L Finkler, Deputy

Commissioner for External and Intergovernmental Affairs, Bureau of Reclamation, U.S. Department of the Interior, appeared before the Subcommittee regarding H.R. 637. Ms. Finkler stated that Reclamation cannot support H.R. 637 because "this project would compete for funds with other needs within the Reclamation program…", and "it is critical that the competitive Title XVI grants be directed at those projects that will do the most to reduce present or anticipated water conflicts." No major actions have occurred regarding H.R. 637 since hearings held on April 27, 2010.

Once completed, the San Juan Capistrano Recycled Water System will provide up to 2,900 acre-feet of reclaimed water per year. The project will use water treated at the J.B. Latham Treatment Plant to meet the demand for non-potable water in the City. As a result, the project will enable the City to reduce its need to import water.

The second funded project is the San Clemente Reclaimed Water Project which expands San Clemente's reclaimed water infrastructure by doubling its production capacity. In 1991, the City completed a state of the art water reclamation plant that produces 2.2 million gallons of reclaimed water per day. The plant was designed so that its capacity could easily be expanded to 4.4 million gallons per day. The legislation authorizes the expansion of the system to utilize the unused capacity of the current reclaimed water facilities and to expand them to 4.4 million gallons per day.

3.7.2.5 Recycled Water Quality

Recycled water processes in the Region are designed and operated in accordance with the requirements of Title 22 of the California Administrative Code (Water Reclamation Criteria) to treat the water to the appropriate level for the intended final use.

Agencies are monitoring for the continued use of recycled water in the future by analyzing the quality of recycled water as it relates to the amount of salts in the water, specifically chlorides. Salts are a natural byproduct of the reclamation process based on the salinity of the potable water. Normal wastewater treatment processes do not remove the salts. Elevated salt levels in recycled water are not deleterious to human health considerations. However, elevated salt levels (chlorides above 125 mg/l) may be harmful to certain plant materials, notably citrus trees, avocados, and certain turf grasses. The effects of recycled water with higher levels of salts can be mitigated through a variety of means. These can include periodic flushing of the soil with rain or the application of potable water, proper soil preparation to promote adequate drainage, and utilization of plant materials more tolerant of salt buildup.

Higher levels of salt content can affect the formation of Disinfection Byproducts. These higher levels of salt present in the potable water will also contribute to higher levels of residual salts in sewage and in the recycled water after treatment. Salinity increases tend to be higher where specific commercial or industrial processes add brines or with the use of water softeners that add salt to the discharge stream or where brackish groundwater is infiltrating into the sewer system. In addition, concern for the water

quality in groundwater basins may lead to restrictions on the application of recycled water on lands overlying those basins.

These issues are exacerbated during times of drought, when the salinity of imported water supplies may increase, causing increased salinity in wastewater flows and recycled water. Basin management plans and recycled water customers may restrict the use of recycled water at a time when its use would be most valuable if it were of sufficient quality. For effective use of recycled water projects, therefore, it is important to control the salinity level of the Region's potable water sources and wastewater flows.

3.7.2.6 Groundwater Management

With the South Orange County WMA's dependence on imported water to serve water demands, the need for local storage intensifies. One of the most effective forms of storage in a dry and arid climate is conjunctive use, wherein water is stored underground during wet periods and pumped out during dry or drought periods. Limitations to such storage include available resources such as basin storage capacity, pumping capacity, recharge capacity, water quality and institutional constraints. Despite these challenges, conjunctive use storage is a far less expensive and non-intrusive alternative to surface water storage.

The total calculated storage capacity of the San Juan Creek Groundwater Basin is estimated to be 90,000 acre-feet. Some of the storage capacity cannot be used because of potential sea water intrusion, economic reasons, and poor water quality. The San Juan Basin is a shallow basin that has been categorized as an underground flowing stream which also limits storage capabilities.

Groundwater supplies are highly desirable in terms of water quality, cost, utilization of local energy resources, and they also contribute to the WMA being less dependent on imported water supplies. However, they are subject to interruption during drought conditions and, therefore projects dedicated to recharge efforts and groundwater quality measures are of particular significance to the regional water supply. The groundwater within the lower San Juan Basin generally requires treatment for potable use.

The San Juan Basin Desalter Project was initiated by the City of San Juan Capistrano and the SJBA. The desalter project is located in the City of San Juan Capistrano and provides 5.14 MGD of brackish groundwater treatment. A draft Groundwater Management and Facility Plan is included in Appendix I.

3.7.2.7 Water Quality Management

Orange County's potable water supply consistently meets and exceeds federal and state water quality standards. The quality reflects a high standard of service among the water retailers in the county. However, there is concern over the potential for contamination of imported water sources through various means.

Orange County's rapid urbanization has placed considerable stress on the quality of its local water resources. With the paving of earthen surfaces and the building of roads and parking lots, surface water has significantly increased in quantity and decreased in quality. Surface runoff and pollutant discharge permitting, discussed in more detail

below, became the responsibility of local government jurisdictions as a part of the National Pollutant Discharge Elimination System (NPDES) permit process of the Clean Water Act in 1990. Since that time, the County of Orange, the cities within Orange County, and the Orange County Flood Control District have cooperatively developed and implemented a comprehensive Drainage Area Management Plan (DAMP) to reduce pollutants, enhance water quality, educate the public, and monitor the progress in improving water quality. This effort produced a three tiered approach to protecting and enhancing Orange County's water resources: pollution prevention, source controls, and treatment controls. This tactical program is designed to comprehensively improve the quality of surface water, which directly influences the quality of local groundwater supplies and ocean water. The many programs and information generated through the cooperation of the co-permittees illustrates the commitment of the region to dramatically increase regional water quality.

Efforts to understand and mitigate the various water quality issues have been ongoing. One advance is in weather-based irrigation controllers. These devices receive information regarding the climate and adjust the timing of the station runs automatically to apply the appropriate amount of water ultimately resulting in less runoff that can transport sediments and pollutants into water ways. MWDOC's SmartTimer Rebate Program promotes the use of these devices. Due to the success of implementation of weather-based irrigation controllers and rebate programs, other high efficient landscape irrigation system components, such as nozzles and drip systems, as well as water–efficient landscape design concepts are also being promoted and implemented.

As previously discussed in detail in Section 3.3.5, the County of Orange, County cities, and the OCFCD have cooperatively developed and implemented a comprehensive DAMP to reduce pollutants, enhance water quality, monitor progress in improving water quality, and educate the public. The numerous programs and data sets generated through the cooperation of these agencies illustrate their commitment to improving water quality. A report for each watershed in South Orange County is generated annually to monitor the collaborative progress made within each watershed's boundaries.

In June 2008, the SDRWQCB adopted indicator bacteria TMDLs for Baby Beach in Dana Point Harbor. The TMDLs require 82.7-96.2% (dependent upon specific indicator bacteria) waste load reductions from the stormdrain system. Dry weather reductions must occur by September 2014 and wet weather reductions must occur by September 2019.

On February 10, 2010, the SDRWQCB adopted indicator bacteria TMDLs for impaired beaches and creeks for over nine and a half miles of County beaches, the entire length of Aliso Creek and the lower mile of San Juan Creek. Dry weather reductions must occur by December 2014 and wet weather reductions must occur by December 2019. The watershed partners are working together to monitor, and implement BMPs in order to meet the reductions. An annual progress report is prepared and submitted to the San Diego Regional Water Quality Control Board pursuant to the adopted TMDL.

Orange County Stormwater Program

Education is the foundation of the Orange County Stormwater Program. Changing perspectives and behaviors is not easy, especially in an area as diverse as Orange County. Since the third-term NPDES permits were issued in 2002, an advertising media campaign has been in full swing, including public announcements featuring rubber ducks to link activities at home to ocean pollution, and newspaper ads showing how common activities such as car washing can contaminate the ocean. A materials campaign and a school campaign have also been developed and implemented across Orange County to help initiate the behavioral change required to improve water quality. These activities have continued under the fourth-term NPDES, initiated in 2009.

The Orange County Stormwater Program also initiated municipal, commercial, industrial, and construction inspections to ensure the implementation of both Pollution Prevention and Source Control Best Management Practices (BMPs). The BMPs were specifically designed for categories of businesses, such as auto repair shops, restaurants and nurseries, and are provided as fact sheets of practices that will reduce pollutants entering local waterways.[49] The County of Orange, the Cities, and the Orange County Flood District have also completed a study to identify regional BMP retrofitting opportunities to further pursue regional projects for water quality improvement. In the 2004 report, 18 opportunities for BMP retrofits were recognized in the South Orange County region. They include seven projects on County land, six in Mission Viejo, one in Lake Forest, one in San Juan Capistrano, and one in Laguna Niguel.[50]

A number of treatment controls, including BMPs such as vegetated swales, detention basins, constructed wetlands, infiltration trenches, and media filters have been implemented in Orange County over the last several years. In the 2003-2004 Stormwater Progress Report, a number of activities were initiated, marking the first year of full implementation of the program that was substantially revised to meet the requirements of the Third Term NPDES Permits. Notable programmatic accomplishments that occurred during the 2003-2004 reporting period include:

- Implementation of a re-aligned management framework, including a new Trash and Debris Task Force, and major resource commitments to advancing stormwater science.
- Commencement and completion of special planning studies to evaluate the effectiveness and applicability of various treatment BMPs.
- Implementation of new program requirements for New Development/Significant Redevelopment Program.
- Development of enhanced cooperative local agency procedures and practice for sewage spill response.

[49] Orange County Stormwater Program, 2003, *Progress in 2002-2003 Annual Report.*

[50] Orange County Stormwater Program, 2004, *Identification of Regional BMP Retrofitting Opportunities Draft.*

- Full implementation of the Third Term Permit water quality monitoring program
- Development and implementation of the DAMP/Watershed Chapters in the San Diego Regional Board area.
- Development and implementation of formalized training elements across a number of program areas.

The third term-permit requirements that were implemented in the 2003-2004 Stormwater Progress Report continue to be required under the fourth-term permit, implemented in 2009, particularly local regulations of existing development, public education and outreach, and environmental monitoring. Notable programmatic accomplishments in the 2011-2012 Program Effectiveness Assessment Report include:

- Continuing implementation of Baseline BMPs and further implementation of the Program's Integrated Pest Management (IPM) policy
- APWA recognition of the Orange County Stormwater Program's Project Pollution Prevention Public Education website as a "model practice"
- The production of nearly 196 million public education impressions, compared to 127 million public education impressions in the prior reporting period (Section C-6.0);
- Delivery of six educational workshops for various residential and business sectors
- Implementation of an Interim Hydromodification Standard for South Orange County
- Submittal of a new Model Water Quality Management Plan (HMP) to the San Diego Regional Water Quality Control Board
- Updating of infiltration feasibility and hydromodification susceptibility mapping
- Completion of a LID Cost Study

While direct evidence of the connection between programmatic activities and improving environmental condition remains elusive, the Permittees believe that there is strong evidence of increasing program effectiveness. Indeed, compared to the previous reporting period, the 2012 Program Effectiveness Assessment[51]shows:

- Significantly increased participation by the Permittees in the General Permittee Committee and supporting management framework.
- A significant increase in program investment (up from a reported $54.4 million in the prior reporting period to $64.8 million in 2003-2004) by the Permittees.

[51] Orange County San Diego Region Unified Progress Report, Project Effectiveness Assessment 2011-2012.

- A 35% increase in the amount of household hazardous waste (up from 4,238,534 pounds to 5,741,522 pounds) taken to collection centers.
- A reduction in the total amount of nitrogen fertilizer applied to public land (down from 413,000 pounds to 407,000 pounds of nitrogen).
- The achievement of 45,000,000 impressions in the Countywide public education effort compared to the 37,000,000 impressions in the 2002-2003 reporting period.
- Marked increases in enforcement activity arising from the inspection of industrial and commercial premises.
- Marked increases in the number of complaints investigated by the Permittees and use of the enforcement tools provided by the Permittees' local Water Quality Ordinances.[52]

The quality of surface water within the South Orange County watersheds is a significant contributor to the regional ecosystem. Pollutant loads in the watersheds resulting from surface runoff jeopardize the stability of native species, contribute to human health risks, and reduce the potential for potable and non-potable water usage. As runoff flows over urban areas, it can convey harmful pollutants such as pathogens, sediment, fertilizers, pesticides, heavy metals, and petroleum products. These pollutants often become dissolved or suspended in surface runoff and are conveyed and discharged to receiving waters such as streams, lakes, lagoons, bays and the ocean. Clearly, a comprehensive effort to improve surface water quality is vital to the region, as many of the projects discussed in Chapter 4 reflect.

Each of the watersheds in South Orange County is within the jurisdiction of the San Diego Regional Water Quality Control Board. The term "Watershed Permittees" refers to the County of Orange, the Orange County Flood Control District, and the respective cities located within each watershed. NPDES permits are issued for a five-year term and have generally followed a progressive pattern. During the second permit term, Orange County invested heavily in parallel efforts to implement a watershed approach, a comprehensive planning tool for addressing water quality as well as habitat restoration, recreation, and flood control. In the third term, further improvements have been made to the stormwater program. Due to the complexity of the third term permits, Local Implementation Plans were created to provide for a jurisdiction-specific plan within the broader policy and program framework of the DAMP. A more extensive monitoring effort was developed as well. [53]

[52] Orange County Stormwater Program, 2004, *Unified Annual Progress Report (San Diego Region).*

[53] Orange County Stormwater Program, 2004, Unified Annual Progress Report (San Diego Region).

Wet Weather Monitoring Program

Details on development and implementation of the wet weather monitoring program are included in DAMP Section 11.0 - Exhibit 11-I. The Third Term Permit wet weather monitoring program includes the following components:

- Urban stream bioassessment -Using a "triad" of indicators (bioassessment, chemistry, toxicity), describe impacts on stream communities and the relationship of impacts to runoff, based on comparisons with reference locations on a year-to-year time frame;
- Long-term mass loading -Using measurements of key pollutants, measure loads over a time frame of years to decades to compare with past and present levels;
- Coastal storm drains -Using a suite of bacterial indicators at high priority drain outfalls, track compliance with regulatory standards and any improvements due to BMP implementation; and
- Coastal receiving waters -Using measurement of runoff plume characteristics and extent, as well as measures of a suite of physical, chemical, and biological indicators, improve understanding of the impacts of runoff plumes on near-shore ecosystems.

Dry Weather Monitoring Program

Details on development and implementation of the dry weather monitoring program are included in DAMP Section 11.0 - Exhibit 11-II. The Third Term Permit dry weather monitoring program includes the following three main components:

- A set of randomly located stations intended to characterize the average area wide conditions in surface runoff;
- A set of rotating targeted stations intended to provide additional information about specific sites thought to have a high potential for contaminated runoff and to provide coverage of the entire MS4 system over the period of the permit term; and
- A set of criteria that will trigger focused ID/IC (illegal discharge and illicit connection) studies by the Permittees when the monitoring data indicate the presence of a problem.[54]

It should be noted that currently, surface waters in South Orange County watersheds are rarely utilized as sources of potable or non-potable water. Nevertheless, as the region diversifies its water sources in the future, surface water may play an increasingly important role in water supply.

[54] Orange County Stormwater Program, 2004, *Watershed Annual Report*

3.7.2.8 Flood Management: Orange County Flood Control District (OCFCD)

Orange County Public Works (OC Public Works) provides for the planning, development, operation and maintenance of public works in the unincorporated area of the County including those which are the responsibility of the OCFCD throughout the County.

The OCFCD program is developed with assistance from the City Engineers Flood Control Advisory Committee (CEFCAC), a subcommittee of the League of California Cities, Orange County Division.

OCFCD staff establishes and updates the 7-year Flood Control Capital Improvement Program annually to plan for and secure funding for future construction projects. The Flood Control Division Manager heads an advisory committee, City Engineers Flood Control Advisory Committee (CEFCAC) composed of City Engineers representing cities within each of the County's five supervisorial districts. They meet annually to identify and prioritize construction projects to be included in the 7-year Flood Control Capital Improvement Program.

OC Public Works will accomplish its Flood Control Program goals through an integrated process under which they conduct feasibility, hydraulic, deficiency, floodplain and value-engineering studies, collect and analyze data on an on-going basis, and design and build projects. They also respond to citizen concerns, flood emergencies and operate and conduct our annual planned maintenance of flood control facilities. Additionally, they are responsible for reviewing development proposals in the unincorporated Orange County areas and providing construction inspection services for developer's flood control related construction projects.

The County of Orange prepared a South Orange County Hydromodification Management Plan (December 2011) per San Diego California Regional Water Quality Control Board (SDRWQCB) Permit Order R9-2009-0002 (Permit), which requires a Hydromodification Management Plan (HMP) to manage increases in runoff discharge rates and durations from all Priority Development Projects.[55] Where receiving stream channels are already unstable, hydromodification management can be thought of as a method to avoid accelerating or exacerbating existing problems. Where receiving stream channels are in a state of dynamic equilibrium, hydromodification management may prevent the onset of erosion, sedimentation, lateral bank migration, or impacts to in-stream vegetation. The Permit contains certain requirements that strongly influence the methodology chosen in development of the HMP. The Permit requires the Permittees to develop an HMP for all Priority Development Projects (with certain exemptions) and develop a performance standard including a geomorphically significant flow range that ensures the geomorphic stability within the channel. Supporting

[55] County of Orange. South Orange County Hydromodification Management Plan, December 2011. Available online 3/29/13. http://www.waterboards.ca.gov/rwqcb9/water_issues/programs/stormwater/docs/oc_permit/updates_031212/South_Orange_County%20HMP.pdf

analyses must be based on continuous hydrologic simulation modeling. Similarly, the loss of sediment supply due to the development must be considered.

The SDRWQCB jurisdiction area covers the southern portion of Orange County. The northern portion of Orange County is under the jurisdiction of the Santa Ana Regional Water Quality Control Board (SARWQCB) and is not subject to this HMP. MS4 Permittees or dischargers directly or indirectly discharging runoff into waters of the United States within the San Diego Region include the Cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and

San Juan Capistrano, as well as the County of Orange and the Orange County Flood Control District. It should be noted that the HMP has in large part been based on the San Diego HMP, which was developed by the County of San Diego and the Permittees for San Diego County. The San Diego HMP was approved by the San Diego Regional Board and served as the starting point for development of the South OC HMP.

3.7.2.9 Wastewater System: South Orange County Wastewater Authority (SOCWA)

Through a consolidation of its governance structure, the SOCWA was created on July 1, 2001 as a Joint Powers Authority and the legal successor to the Aliso Water Management Organization (March 1972), South East Regional Reclamation Authority (March 1970) and South Orange County Reclamation Authority (1991). The principal operating revenues of the SOCWA are charges to the member agencies for services.

The mission of SOCWA is to collect, treat, beneficially reuse, and dispose of wastewater in an effective and economical manner that respects the environment, maintains the public's health and meets or exceeds all local, state and federal regulations. Collected wastewater receives full secondary treatment at one of the organization's four wastewater facilities, and the organization also has active water recycling, industrial waste (pretreatment), biosolids management and ocean/shoreline monitoring programs to meet the needs of its members and the requirements of the applicable regulatory permits.

3.7.3 Competing Interests of IRWM Group

In developing the objectives, the South Orange County IRWM Group considered long-term regional planning conflicts and issues including identification of enhanced local water supplies to offset reduction of imported water to meet demands during times of drought. Though many projects are planned over the next 10 to 20 years to help achieve this goal, much more long-term planning, as well as implementation of integrated projects in all categories included in this IRWM Plan, is necessary to reach that goal.

As mentioned above, the IRWM Group has major water-related issues and conflicts related to water supply, water system reliability, water conservation, recycled water, groundwater management, water quality management, flood management, wastewater system, and environmental stewardship. The IRWM Group considered these conflicts as well as the Water Quality Control Plan of the San Diego Basin (Basin Plan) Objectives, the 20X2020 Water efficiency goals, and IRWM Planning Minimums.

Additionally, competing interest arise with South Orange County's effort to use its local groundwater resources. South Orange County has implemented several water resource projects to maximize the use of the San Juan Creek groundwater basins as a potable water supply. Conflicting interests including flood management, runoff management, natural resource preservation and land use policies are competing for the use of the same resources. The groundwater resource could be enhanced by groundwater recharge projects.

Current efforts in surface runoff management encourage retention and infiltration of surface runoff. These facilities capture some of the worst quality surface runoff, i.e. street runoff, irrigation runoff, and place it in infiltration basins with the goal of infiltrating into the groundwater basins.

San Juan Valley Groundwater basins' recharge consists of streambed percolation from the mainstream San Juan and Arroyo Trabuco Creeks, rainfall infiltration and subsequent deep percolation to the water table, deep percolation of applied water from landscape and agricultural irrigation, and subsurface inflow from the tributary alluvial stream areas. Since the San Juan Valley Groundwater basins are very shallow basins, little or no treatment takes place in the soil profile before percolating surface runoff from retention/percolation facilities reaches the groundwater. Therefore, infiltration of surface runoff must be carefully considered prior to placement near shallow basins to ensure adequate retention/percolation time for treatment.

Natural resource and habitat preservation conflict with the potable use of groundwater by encouraging the planting and reestablishing of habitat. Phreatophyte water use can account for as much as 25% of the yield of the groundwater basin during the summer months. Other projects are encouraging the reestablishments of fish populations. It remains to be seen how much this will reduce the amount of groundwater extractions available for potable water use.

Land use practices have conflicted with water resource use. As an example, portions of the San Juan Basins have been contaminated by gas stations and dry cleaners leakage or spills. There is still a great amount of agriculture in the watershed including citrus, field crops, and livestock (horse stables). Much has been done to eliminate contamination from runoff from these activities but they still contribute salts to the groundwater basins.

This IRWM Plan includes implementation strategies and projects that assist in providing resolution to water-relates conflict within the region. For example, the City of Laguna Beach's Rockledge Ocean Protection Project will assist in resolving conflicts within the region and between adjacent regions. The Rockledge Ocean Protection Project will improve and replace the City of Laguna Beach's sewer collection system in the Rockledge neighborhood. This will assist in protecting the residents and adjacent marine protected area from potential sewer spills. The existing Rockledge sewer system affects a marine reserve, which is currently part of the Laguna Beach State Marine Conservation Area (SMCA), including tidepools that are a complete no take zone. Conflicts may arise by local residents, beach goers, and adjacent jurisdictions charged to meet water quality standards set forth by the Basin Plan. This project would help to protect this State Marine

Conservation Area and assist the South Orange County WMA in meeting state water quality objectives.

The Shadow Rock Detention Basin Project Facility Urban Water Recovery Project being implemented by Trabuco Canyon Water District addresses conflicts related to enhancing local water supplies to offset imported water supplies, meeting water quality requirements, and increasing recycled water. The Project addresses these by capturing low-flow runoff for reuse, creating a less vector-prone site, increasing nutrient removal, assisting in meeting the NPDES permit requirements, and adding to the recycled water supply shared with the Rancho Santa Margarita Water District. In addition, conflict over flood control is addressed by the Project, as the existing Shadow Rock Detention Facility Basin has long served to provide flood control and temporary storage of wet weather flows, thus mitigating the impact of storm events to the City of Rancho Santa Margarita's existing storm drain system. The intent of implementing this IRWM Plan is to address regional conflicts and provide resolution.

3.8 Potential Climate Change Impacts to WMA

Changing climate is expected to shift precipitation patterns and raise sea level, with impacts on water resources and ecosystems. The areas of concern for California include the reduction in the Sierra Nevada and Rocky Mountain snowpack, increased intensity and frequency of extreme weather events, and rising sea levels leading to increased risk of coastal flooding and levee failure in the Sacramento-San Joaquin Delta, a major source of water supply to the planning region. Changes in global climate can affect average temperature, evaporation, and the amount, frequency, and intensity of precipitation in southern California, as well as sea temperature and level of the Pacific Ocean. The following discussion provides an overview of the Climate Change Impacts on the WMA. Refer to Section 12. Climate Change for a more detailed discussion.

Changes in hydrological conditions due to climate change most likely to affect the South Orange County WMA's water planning include:[56]

1. Sea level rise
2. Warmer temperatures leading to loss in mountain snowpack storage and snowmelt earlier in the season
3. Changes in precipitation and temperature affecting average runoff volume
4. Changes in drought persistence
5. Higher water temperature in streams and reservoirs
6. Potential increase in in water demands for landscape use due to higher temperatures

[56] Adapting California's Water Management to Climate Change, November 2008, as found in California Water Plan Update 2009, Volume 4 Reference Guide.

7. Increased flood flows and flood frequencies

Sea Level Rise

Rising sea level has implications not only for coastal areas but also for the management of the Sacramento-San Joaquin Delta. The Delta region is a critical component of South Orange County's current water supply system. Sea level rise may increase the potential of salt water intrusion in the Delta and will require higher freshwater outflows. Sea level rise, combined with winter storms, will increase the risk of levee failure and adversely affect the water quality in the Delta. Water supply effects of sea level rise are also likely in some coastal aquifers, although these are not major sources of water supply in South Orange County. Sea level rise could increase coastal erosion and impact coastal infrastructure and ecological resources such as estuaries and tidal wetlands.

Changing Mountain Snowpack Runoff

Rising average temperatures throughout California will ultimately reduce the amount of mountain snowpack as more precipitation will fall as rain instead of snow and warmer weather will cause more snowpack to melt earlier in the year. Mountain snowpack act as natural water storage reservoir, releasing water gradually throughout the warmer periods of the year as snow melts. Reservoirs and groundwater basins that lie downstream of the mountains will likely experience inflows different from historical patterns and operational rules may need to be modified to adapt to the variability.

Changes in Precipitation and Temperature

The effects of climate change on overall precipitation and runoff are less clear, but of great potential importance. The existing amount of surface storage on most major streams and water storage reservoir in southern California provides a fair amount of capacity to accommodate shifts in inflows for most years. However, any reduction of annual runoff volumes due to declines in precipitation or increase in evapotranspiration in reservoirs or the broader watersheds would directly reduce water supplies.

Changes in Drought Persistence

Droughts differ from typical emergency events such as floods or forest fires, in that they occur slowly over a multiyear period. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline. Droughts in the western U.S. are often persistent. The 2009 Water Year (October 1, 2008 – September 30, 2009) was the third consecutive year of below average precipitation for the state. Annual statewide precipitation totaled 76 percent, 72 percent, and 63 percent of average for Water Years 2009, 2008, and 2007, respectively[57]. South Orange County's reliance on imported water from throughout the state makes drought awareness one of the WMA's highest concerns.

[57] California Department of Water Resources, Drought Conditions webpage: www.water.ca.gov/drought/conditions/

High Stream and Reservoir Temperatures

Higher temperatures overall will increase water temperatures throughout the system, including inflows into reservoirs, water stored within reservoirs, and water flowing downstream. Such increases will significantly affect ecosystem uses of the water system. Most species have evolved to survive within a specific temperature range. Increased water temperature can also reduce the amount of dissolved oxygen that it holds, affecting aquatic organisms.

Increased Water Demands

Higher temperatures, and associated higher evapotranspiration rates, are likely to also change water demands throughout the state, although this will likely be limited by available supplies. The most important effect is likely to be on agricultural water demands and landscape irrigation demands in urban areas. Agricultural demands constitute nearly 80% of the state's water demand, and landscape irrigation accounts for half or more of residential water use in southern California.

Increased Flood Flows and Flood Frequencies

Increased intensity and frequency of major storms, another anticipated effect of climate change, would further augment flood problems in southern California. With continued increases in floodplain urbanization and the associated increase in damage potential, flooding costs from climate change could exceed those of water supply. The effects of changes in flood flows on ecosystems are less well studied but could be significant.

Summary of Climate Change Impacts

The South Orange County IRWM Group is committed to addressing the effects of climate change on the region's water supply by incorporating climate change considerations into resource management strategies. The region's water supply, flood-protection infrastructure, and aquatic habitats are affected by the amount, intensity, timing, quality, and variability of runoff and recharge, as well as on water imported from outside the region. The effects of climate change to the region and how the IRWM Group plans to address these concerns are described in more detail in Section 12 Climate Change.

4 OBJECTIVES

4.1 Regional Vision

The South Orange County IRWM Plan focuses on the South Orange County WMA vision of total watershed efficiency. The Plan primarily builds upon the projects and plans of the member agencies, with an emphasis on water supply and water reliability. The key challenges facing the South Orange County WMA are reflected in each of the individual member agencies' responsibilities. Figure 4-1 shows the IRWMP process for developing the Vision, Mission, Goals, and Objectives for the South Orange County WMA.

Figure 4-1: IRWM Plan Process

The regional vision was developed through a stakeholder process and evolved to include a mission and goals for the region, including:

- Vision: An Integrated, Healthy and Balanced Watershed.
- Mission: To improve water quality, increase water supply and reliability, promote water use efficiency, integrate flood management, and restore and protect natural resources.
- Goals: Improve Water Quality, Increase Water Supply and Reliability, Promote Water Use Efficiency, Integrate Flood Management, Protect and Restore Natural Resources

4.1.1 Statewide Priorities

The SWRCB and DWR established Statewide Priorities that include the following:

- Drought preparedness
- Use and Reuse Water More Efficiently
- Climate Change Response Actions
- Expand Environmental Stewardship
- Practice Integrated Flood Management
- Protect Surface and Water and Groundwater Quality
- Improve Tribal Water and Natural Resources
- Ensure Equitable Distribution of Benefits

Efforts to meet Statewide Priorities and improve water quality conditions have been underway in the Region for many years, and have continually advanced as new technologies and resources have become available. The South Orange County IRWM Group reviewed the statewide priorities for relevance to the region. All the statewide priorities are applicable to the South Orange County WMA and the projects included on the Project List in Appendix F support the statewide priorities. Below is an overview of the statewide priorities and discussion on how they are applicable to South Orange County WMA:

4.1.1.1 Drought Preparedness

The South Orange County WMA embraces Drought Preparedness as a Regional Priority. This IRWM Plan contains projects that effectively address long-term drought preparedness by contributing to sustainable water supply and reliability during water shortages. Drought preparedness projects do not include drought emergency response actions, such as trucking of water or lowering well intakes. Drought preparedness projects will achieve one or more of the following:

- Promote water conservation, conjunctive use, reuse and recycling
- Improve landscape and agricultural irrigation efficiencies
- Achieve long term reduction of water use
- Efficient groundwater basin management
- Establish system interties

This IRWM Plan includes project such as the South Orange County Water Smart Landscape Project that will address drought preparedness by reducing imported water demand for irrigation. As the imported water supplier for South OC WMA, MWDOC significantly contributes to drought preparedness by reducing irrigation demand, the largest demand on imported water. The projects are discussed in more detail in Section 6.

4.1.1.2 Use and Reuse Water More Efficiently

The South Orange County WMA includes projects that implement water use efficiency, water conservation, recycling and reuse to help meet future water demands, increase water supply reliability and adapt to climate change.

This IRWM Plan includes projects that:

- Increase urban and agricultural water use efficiency measures such as conservation and recycling
- Capture, store, treat, and use urban stormwater runoff (such as percolation to usable aquifers, underground storage beneath parks, small surface basins, domestic stormwater capture systems, or the creation of catch basins or sumps downhill of development) or projects outlined in PRC §30916 (SB 790)
- Incorporate and implement low impact development (LID) design features, techniques, and practices to reduce or eliminate stormwater runoff

Water use and reuse is an important part of the South Orange County WMA water management strategy. Reducing surface runoff, capturing surface runoff and reusing runoff are all measures incorporated into the region's watershed plans. Several projects in this IRWM Plan exemplify this. The Shadow Rock Detention Basin Project captures and reuses dry weather runoff. The existing detention basin has become a vector breeding ground, whereby runoff ponds and the stagnant water lends itself to a vector habitat. Proposed detention basin modifications will capture and reuse runoff more efficiently by diverting pollutant-carrying dry season runoff for treatment and reuse. The project will connect to Trabuco Canyon Water District's recycled water system, which also supplies Santa Margarita Water District. Therefore, the Project would increase the recycled water supply for the benefit of both districts within the South Orange County WMA. Refer to Section 6 Projects for more discussion on projects. Projects in this IRWM Plan assist in meeting the SBx 7-7 20% by 2020 water savings goals and support this statewide priority.

4.1.1.3 Climate Change Response Actions

As discussed in Section 12. Climate Change, the South Orange County WMA is committed to implementing Climate Change Response Actions. A Climate Change Analysis Plan is incorporated into this IRWM Plan. This IRWM Plan includes water management actions that will address the key Climate Change issues of:

- Adaptation to Climate Change
- Reduction of Greenhouse Gas (GHG) Emissions through lower Energy Consumption

Projects in this IRWM Plan, when implemented, may address adaptation to climate change effects in an IRWM region. Desirable proposals include those that:

- Advance and expand conjunctive management of multiple water supply sources
- Use and reuse water more efficiently

- Water management system modifications that address anticipated climate change impacts, such as rising sea-level, and which may include added protection to wastewater treatment plants and outfalls
- Establish migration corridors, re-establish river-floodplain hydrologic continuity, re-introduce anadromous fish populations to upper watersheds, and enhance and protect upper watershed forests and meadow systems

South Orange County WMA projects will reduce GHG emissions compared to alternate projects that achieve similar water management contributions toward IRWM objectives, including projects that:

- Reduce energy consumption of water systems and uses
- Use cleaner energy sources to move and treat water

Some projects reduce not only water demand but wastewater loads as well, and can reduce energy demand and GHG emissions. Such project types include:

- Water use efficiency
- Water recycling
- Water system energy efficiency
- Reuse Runoff

As described in Section 6 Projects, the South Orange County WMA has several projects that contribute to the Climate Change Response Actions in the form of energy reduction. The projects are associated with enhanced landscape water use efficiency (MWDOC) and water conservation (SCWD), wetland construction to improve water quality, manage peak flows and enhance groundwater recharge (Dairy Fork Watershed), habitat restoration (Audubon Starr Ranch Sanctuary), construction of BMPs for a major storm drain (trash and dry weather flow diversion management BMPs) in the San Juan Creek watershed, support for the design and construction of the Baker Treatment Plant (Irvine Ranch Water District), and the Oso Creek Multi-Use Trails Project, replacing roadway pavement with permeable bikeway and walking surfaces and native landscaping areas. In aggregate, the projects have the potential to save about 17,000 metric tons of CO2-equivalent emissions, nearly 18% of the total water sector emissions in South Orange County. Much of the decrease is associated with the assumption that the Baker Water Treatment Plant will utilize up to 50% of local supplies as its feedwater.

4.1.1.4 Expand Environmental Stewardship

This IRWM Plan includes projects that practice, promote, improve, and expand environmental stewardship to protect and enhance the environment by improving watersheds, floodplains, and instream functions and to sustain water and flood management ecosystems. As discussed in Section 11. Stakeholder Involvement, the region has an aggressive outreach program that embraces environmental stewardship. Projects like MWDOC's South Orange County Water Smart Landscape Project incorporate environmental stewardship by implementing a comprehensive landscape

improvement program targeting publicly owned and other commercial landscapes properties throughout the South Orange County WMA. The Project will emphasize participation of highly visible landscapes along major streets that have non-functional turf such as street medians, intersections, and sidewalk buffers. The Project is designed to begin establishing a landscape transformation paradigm from turf intensive landscapes to California Friendly landscapes that include plantings that have water needs similar to our natural rainfall or 12 inches of precipitation per year. These sites will serve to demonstrate California Friendly landscapes to the thousands of private and public property owners who will pass by the newly designed areas. As part of the Project monitoring, signage will be placed at each project site during and after the renovations to educate the public about the landscape improvements along with the many benefits that will be realized. At the conclusion of each landscape improvement project, MWDOC will take photos to document the success of the program for the public via postings on the MWDOC website. The Project will assist in meeting the regional need for public education in the stewardship of watershed resources. Moreover, the Project will fill educational purposes and demonstrate environmental benefits. The Project will inspire broad implementation of water quality and water conservation improvements across the community.

4.1.1.5 Practice Integrated Flood Management

The South Orange County WMA's commitment to Flood Management is demonstrated by its effort to complete a Floodplain Management Plan and incorporating it into this IRWM Plan. As shown in Section 3.7.2.8 Flood Management, South Orange County WMA's Orange County Flood Control District program establishes and updates the 7-year Flood Control Capital Improvement Program annually to plan for and secure funding for future construction projects. As part of the IRWM Plan, a Floodplain Management Plan (Appendix H) was developed. This is an integrated effort among several other entities in Orange County. As such, the results of this effort are flood control projects that promote and practice integrated flood management that would provide multiple benefits including:

- Better emergency preparedness and response
- Improved flood protection, be removing FEMA Special Flood Hazard Area and certifying levees.
- More sustainable flood and water management systems
- Enhanced floodplain ecosystems
- LID techniques that store and infiltrate runoff while protecting groundwater
- Preserve and/or reclaim properties in the FEMA Special Flood Hazard Area (also known as 100-year floodplain) and perhaps beyond this boundary as open space and prohibit development in perpetuity.
- Manage development in the floodplain thru the planning process to retain existing channel flow and not to increase flow.

In addition to supporting the OCFCD program, many projects in this IRWM Plan support implementation of the County of Orange Drainage Area Management Plan (DAMP), which focuses on effective flood and watershed management. Specifically, the Audubon Starr Ranch Sanctuary's Riparian Invasion Control, Restoration, Monitoring, and Education Project will greatly preserve one of the last pristine riparian corridors in Southern California and provide open space for floodplain management.

The Shadow Rock Detention Basin Project includes modifying an existing detention basin with a new pump station to improve flood management and reduction of instream erosion and sedimentation, and capture 77 AF of dry season runoff for reuse resulting in less surface runoff filtration into groundwater system. The South Orange County Water Smart Landscape Project proposes to implement Low Impact Development Techniques of removing non-functional turf and replacing it with California friendly landscaping. Using water efficient landscape irrigation technology, low impact development will assist with integrated flood management.

4.1.1.6 Protect Surface and Groundwater Quality

South Orange County WMA is dedicated to protecting its surface and groundwater quality. Section 3.3.4 Water Quality of this IRWM Plan describe the current and planned water quality management approaches. Also refer to Appendix G for the complete Salt and Nutrient Management Plan. Projects that support this statewide priority include:

- Protecting and restoring surface water and groundwater quality to safeguard public and environmental health and secure water supplies for beneficial uses
- Salt/nutrient management planning as a component of an IRWM Plan

The Salt and Nutrient Management Plan and Groundwater Management and Facility Plan are incorporated into this IRWM Plan. These plans are support by several projects in this IRWM Plan, including the Rockledge Ocean Protection Project which directly addresses fecal coliform bacteria exceedances (Bacteria TMDL) in surface waters by preventing sewer spills into the ocean at Laguna Beach. The Rockledge project is designed to reduce and/or eliminate the risk of a sewer spill interfering with the designated beneficial uses in the critical habitat areas surrounding the lift station. The Rockledge Ocean Protection Project prevents a potential 1000+ gallon sewer spill from occurring, which would impact all beneficial uses in the Rockledge area, the most sensitive of which are shellfish harvesting (SHELL) and full contact recreation (REC-1), by discharging fecal coliform bacteria and solid waste materials directly into the tidepool environment. In addition, the South Orange County Water Smart Landscape Project addresses water quality by capturing and naturally treating runoff through landscape improvements. Surface runoff will also be reduced through the installation of efficient landscape irrigation devices that will prevent over watering and pollutant-carrying surface runoff.

The South Orange County Water Smart Landscape Project will help to reduce/eliminate landscape runoff, and associated pollutants, such as fertilizers and pesticides, from entering the watersheds throughout the South Orange County WMA and will therefore contribute to protecting the water quality of the watersheds. The Shadow Rock Detention Basin Project will significantly protect water quality by capturing and treating surface

runoff, increasing nutrient removal, and assist in meeting the City of Rancho Santa Margarita (where the Project is located) NPDES permit requirements. The Shadow Rock Detention Basin Project will prevent pollutant-carrying surface runoff from flowing into the San Juan Creek Watershed by diverting and sending the runoff to its recycled water system. The Project improves water quality for downstream receiving waters in the South Orange County WMA, including the discharge point at Dana Point into the Pacific Ocean.

Audubon Starr Ranch Sanctuary's Riparian Invasion Control, Restoration, Monitoring, and Education Project will enhance and monitor the water quality and native plant and animal communities of Bell Creek, one of the last pristine riparian corridors in southern California. The specific goals of the project are to 1) remove invasive non-native species and restore open space with natives, 2) monitor riparian wildlife for ecosystem restoration and protection, and 3) implement a water conservation program with the adjacent golf course community to reduce non-point source pollution entering the corridor.

Protecting surface water quality in turn protects the groundwater quality of the South Orange County WMA. The region's groundwater basins include the San Juan Valley and San Mateo Creek. These basins will be protected through the implementation of this IRWM Plan.

4.1.1.7 Improve Tribal Water and Natural Resources

The region embraces improving tribal water and natural resources for South Orange County. This includes incorporating planning measures and soliciting projects that include the development of Tribal consultation, collaboration, and access to funding for water programs and projects to better sustain Tribal water and natural resources.

During the 2005 South Orange County IRWM Plan completion, the IRWM Group implemented a comprehensive stakeholder involvement process, which includes the *Juaneño Band of Mission Indians,* based in South Orange County. They have been engaged as a stakeholder and provided a letter of support for our efforts. The South Orange County IRWM Group will continue to actively involve the Juaneño Band of Mission Indians to ensure their active involvement and representation in the IRWMP process.

As part of the IRWM Plan Update process, the South Orange County IRWM Group considers ways to improve tribal water and natural resources by their involvement in the stakeholder process. Refer to Section 11 Stakeholder Involvement for more detail. The IRWM Group understands the importance of Native American Tribe Notification and incorporates this process throughout the IRWM Plan Update and CEQA review for each Project. The IRWM Group conducts ongoing outreach to tribal representatives throughout the region. The IRWM Group also solicits local tribes as part of the public outreach process. The public workshops specifically aim to engage tribal representatives in identifying the major issues and priorities of their lands, and how the priority projects may impact them.

4.1.1.8 Ensure Equitable Distribution of Benefits

This South Orange County IRWM Plan aims to ensure equitable distribution of benefits to all members of the region. Environmental Justice brings to light the fact that minority members of the community tend to disproportionately endure environmental pollution

and unhealthy conditions. South Orange County is a leader in including such members of the community in the IRWM Planning process to spread the benefits of IRWM Plan and Project implementation to all. Specifically, the region has prioritized projects that:

- Increase the participation of small and disadvantaged communities in the IRWM process.
- Develop multi-benefit projects with consideration of affected disadvantaged communities and vulnerable populations
- Contain projects that address safe drinking water and wastewater treatment needs of DACs
- Address critical water supply or water quality needs of California Native American Tribes within the region

As previously explained, the water quality protection benefits of this IRWM Plan and its projects significantly protect the recreational beaches and waterways in the South Orange County WMA that many members of DACs from other regions frequently use. The Projects included in this Plan are all multi-benefit and include water quality components to ultimately protect DACs from polluted waterways. The South Orange County WMA has an established public outreach process. All stakeholders, including DAC members such as the Hispanic population and California Native American Tribes, are incorporated in project planning and implementation, with the benefits effectively tracked and posted on the OC Watersheds website.

Equitable distribution of benefits results from educational and public outreach activities. These activities increase residents' understanding and appreciation of watersheds and other areas of significance, including human interaction impacts on habitat areas and other natural resources. Projects like the proposed South Orange County Water Smart Landscape Project will fill educational and recreational purposes, and provide demonstrated environmental benefits. The projects will inspire broad implementation of water quality and water conservation improvements across the community.

4.1.2 Regional Goals

In order to develop Regional Goals, the statewide priorities were carefully reviewed, as described above, for relevance to the South Orange County WMA. The South Orange County IRWM Group also considered the region's major water-related issues and conflicts. By reviewing and assessing the statewide regional priorities and the South Orange County WMA regional water-related issues/conflicts, the South Orange County IRWM Group Regional Goals are shown below and summarized in Figure 4-2:

- Integrate Flood Management
- Improve Water Quality
- Increase Water Supply and Reliability
- Promote Water Use Efficiency
- Protect and Enhance Natural Resources

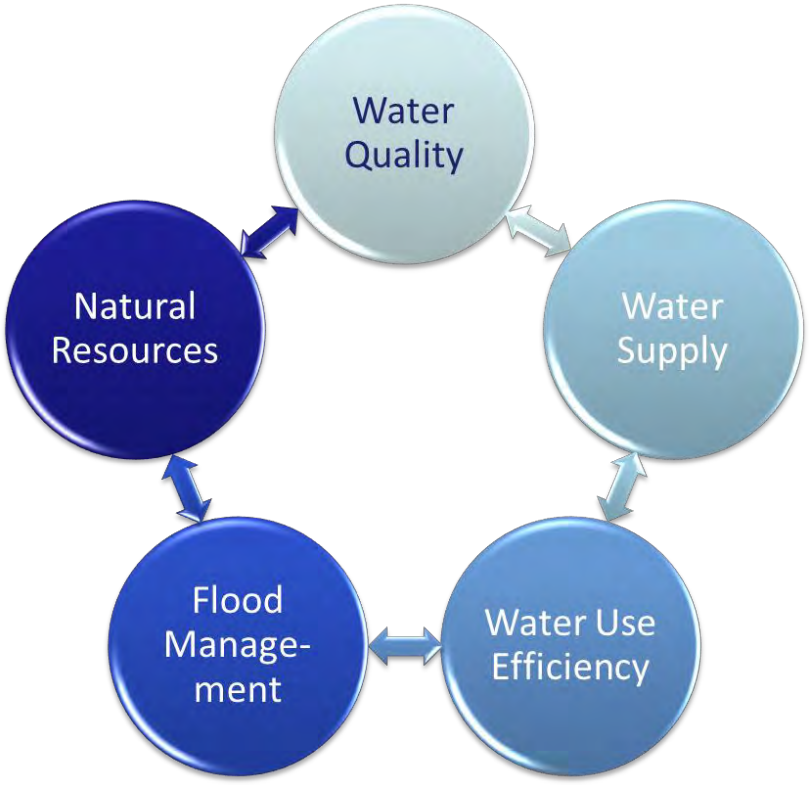

Figure 4-2: South Orange County IRWMP Goals

These Regional Goals were subsequently used as the foundation to develop regional objectives, which are described below.

4.2 Development of WMA Objectives

The IRWM Plan considers long-term regional planning for flood management, water quality, water supply and reliability, water use efficiency and natural resources facing the WMA over the next 20 to 50 years. These approaches to watershed planning reflect the regional goals of the South Orange County WMA, as described above, and set the foundation for developing regional objectives.

Through Executive Committee meetings (3 times per year) and Management Committee meetings (monthly), and stakeholders workshops the participants developed IRWM Plan objectives. In developing the objectives, the South Orange County IRWM Group considered Regional Conflicts, Basin Plan Objectives, California's 20x2020 Water Conservation Plan, and IRWM Planning Minimums. Measurable goals were identified for each strategy that were subsequently used to score and prioritize projects for the 2013 plan and for Round 2 Implementation Grant Funding. Ongoing work is being performed by the IRWM members to further refine the strategies and objectives to develop overarching measurable goals for the objectives that can be directly associated with each project to allow for a more clear assessment of the progress. This effort will be complete in 2013 and used in the next update of the IRWMP as well as in the prioritization of projects considered for Round 3 Implementation Grant Funding. The

revised objectives and measurable goals are currently available in draft form and are included in Appendix K.

4.2.1 Regional Issues/Challenges

In developing the objectives, the stakeholders considered long-term regional planning conflicts and issues including identification of enhanced local water supplies to offset reduction of imported water to meet demands during times of drought. Though many projects are planned over the next 10 to 20 years to help achieve this goal, much more long-term planning, as well as implementation of integrated projects in all categories included in this IRWM Plan, is necessary to reach that goal. The stakeholders does not have any major water-related issues/ conflicts related to water supply, water system reliability, water conservation, recycled water, groundwater management, water quality management, flood management, wastewater management, and climate change.

The SOC IRWM Plan focuses on the SOC WMA vision of total watershed efficiency. The Plan primarily builds upon the projects and plans of the member agencies, with an emphasis on water supply and water reliability. The key challenges facing South Orange County are reflected in each of the individual member agencies' responsibilities. Similar to other regions, the South OC IRWM Group continues to collectively collaborate on the areas identified in Table 4 -1 below:

Table 4-1: South Orange County WMA Issues/Challenges

- Water Supply
- Water System Reliability
- Water Conservation
- Recycled Water
- Groundwater Management
- Water Quality Management
- Flood Management
- Wastewater System
- Environmental Stewardship

The South Orange County IRWM Group considered these issues and potential conflicts as well as the Water Quality Control Plan of the San Diego Basin (Basin Plan) Objectives, the 20X2020 Water efficiency goals, and IRWM Planning Minimums.

Competing interests could potentially arise with South Orange County's effort to use its local groundwater resources. Conflicting interests including flood management, surface runoff management, natural resource preservation and land use policies are competing, or in some way impeding the use of the same resources.

Natural resource and habitat preservation could potentially pose a conflict with the potable use of groundwater by encouraging the planting and reestablishing of habitat. Phreatophyte water use can account for as much as 25% of the yield of the groundwater basin during the summer months. Other projects are encouraging the reestablishments of fish populations. It remains to be seen how much this will reduce the amount of groundwater extractions available for potable water use.

Land use practices can also conflicted with water resource use. As an example, portions of the San Juan Basins have been contaminated by gas stations and dry

cleaners leakage or spills. There is still a great amount of agriculture in the watershed including citrus, field crops, and livestock (horse stables). Much has been done to eliminate contamination from runoff from these activities but they still contribute salts to the groundwater basins.

4.2.2 Tri-County FACC Issues/Conflicts

The Tri-County FACC is a formal partnership established in April 2009 through joint adoption of an MOU outlining measures for inter-regional coordination. The efforts of the Tri-County FACC are intended to enhance the quality of water resource planning and to improve the quality and reliability of water in the Funding Area. This partnership is a unique opportunity to collaborate with neighboring planning regions to address common objectives, issues, and conflicts. Of particular significance, the Santa Margarita River watershed has been subject to over 80 years of water rights litigation, studies, and hearings. In 1990, the "Four Party Agreement" between Rancho California Water District (RCWD), Fallbrook Public Utility District (FPUD), Eastern MWD, and Camp Pendleton attempted to address the conflict through discharge of recycled water to the Santa Margarita River for groundwater recharge. However, the ongoing conflict now involves uncertainty about meeting Regional Board effluent standards, which dictates the ability of RCWD to discharge into the watershed. The new partnership between San Diego and Riverside county agencies via the Tri-County FACC is helping to address those conflicts.

4.2.3 Basin Plan Objectives

The Basin Plan is the Regional Board's plan for achieving the balance between competing uses of surface and groundwaters in the San Diego Region. The Basin Plan establishes or designates beneficial uses and water quality objectives for all the ground and surface waters of the Region. This South Orange County IRWM Plan incorporates the Basin Plan in its objectives to Improve Water Quality (WQ): WQ-1 - Comply with Clean Water Act and Porter-Cologne and WQ-2 - Protect beneficial uses of receiving waters.

The South Orange County WMA includes the area that encompasses the San Juan Hydrologic Unit (SJHU) in South Orange County, California, as defined in the San Diego Basin Plan.

4.2.4 20X2020 Water Efficiency Goals

California's 20x2020 *Water Conservation Plan* sets forth a statewide road map to maximize the state's urban water efficiency and conservation opportunities between 2009 and 2020, and beyond. It aims to set in motion a range of activities designed to achieve the 20 percent per capita reduction in urban water demand by 2020. These activities include improving an understanding of the variation in water use across California, promoting legislative initiatives that incentivize water agencies to promote water conservation, and creating evaluation and enforcement mechanisms to assure regional and statewide goals are met.

The South Orange County IRWM Group considered California's 20X2020 Water Conservation Plan in identifying the long-term water supply and water quality issues facing the WMA over the next 20 to 50 years. All project categories within this plan are essential to maximizing limited water resources, including enhancing water efficiency and conservation. The water supply (WS) and water conservation (WC) objectives reflect the WMA's effort to meet the 20X2020 water efficiency goals.

As discussed in MWDOC's 2010 Regional Urban Water Management Plan, MWDOC in collaboration with all of its retail agencies as well as the cities of Anaheim, Fullerton, and Santa Ana, has created the Orange County 20x2020 Regional Alliance in an effort to create flexibility in meeting the per capita water use reduction targets required under SBx7-7. This Regional Alliance will allow all of Orange County to benefit from regional investments such as the GWRS, recycled water, and water use efficiency. The members of the Orange County 20x2020 Regional Alliance are shown below:

Members of Orange County 20x2020 Regional Alliance

Anaheim	Moulton Niguel Water District
Brea	Newport Beach
Buena Park	Orange
East Orange County Water District	San Clemente
El Toro Water District	San Juan Capistrano
Fountain Valley	Santa Ana
Fullerton	Santa Margarita Water District
Garden Grove	Seal Beach
Golden State Water Company	Serrano WD
Huntington Beach	South Coast Water District
Irvine Ranch Water District	Trabuco Canyon Water District
La Habra	Tustin
La Palma	Westminster
Laguna Beach County Water District	Yorba Linda Water District
Mesa Consolidated Water District	

Within a Regional Alliance, each retail water supplier will have an additional opportunity to achieve compliance under both an individual target and a regional water use target.

If the Regional Alliance meets its water use target on a regional basis, all agencies in the alliance are deemed compliant. If the Regional Alliance fails to meet its water use target, each individual supplier will have an opportunity to meet their water use targets individually. Individual water suppliers in the Orange County 20x2020 Regional Alliance will state their participation in the alliance, and include the regional 2015 and 2020 Urban Water Use Targets in their individual UWMPs. The Orange County 20x2020 Regional Alliance Regional Water Use target for 2015 is 177 GPCD and for 2020 is 159 GPCD; these targets are based on 2010 consensus data. Refer to MWDOC's 2010 Regional Urban Water Management Plan for individual supplier targets.

As the reporting agency for the Orange County 20x2020 Regional Alliance, MWDOC has documented the calculations for the regional urban water use reduction targets. MWDOC will also provide annual monitoring and reporting for the region on progress toward the regional per capita water use reduction targets.

4.2.5 IRWM Planning Minimums

The South Orange County IRWM Group included Section 105409 (c) of the California Water Code in developing the WMA's objectives, including the IRWM Planning Minimums as listed below:

- Protection and improvement of water supply reliability, including identification of feasible agricultural and urban water use efficiency strategies.
- Identification and consideration of the drinking water quality of communities within the area of the plan.
- Protection and improvement of water quality within the area of the plan consistent with relevant basin plan.
- Identification of any significant threats to groundwater resources from overdrafting.
- Protection, restoration, and improvement of stewardship of aquatic, riparian, and watershed resources within the WMA.
- Protection of groundwater resources from contamination.
- Identification and consideration of water-related needs of disadvantaged communities in the area within the boundaries of the plan.

The South Orange County IRWM Group used these planning minimums as guides in developing the WMA objectives.

4.3 WMA Objectives

The Objectives Standard requires that objectives must be measurable. A measurable objective means there must be some metric the WMA can use to determine if the objective is being met as the IRWM Plan is implemented. IRWM Plans are implemented through project implementation, which are associated with relevant measurable objectives. Metrics must apply to projects which in turn relate back to Plan objectives. Objectives are measured quantitatively or qualitatively, as appropriate. The South Orange County 2013 IRWMP objectives were reviewed by the IRWM Group for

relevance to the WMA. Input from the Cities, water and wastewater districts, and the County was instrumental in updating the objectives to reflect current watershed, land use, and natural resources management plans for the WMA. Based on feedback, appropriate refinement to the objectives were made by Subgroup representatives and presented back to the IRWM Group for final approval. Figure 4-3 shows the goals and approved objectives that help meet each goal.

As mentioned in section 4.2, ongoing work is being performed by the IRWM members to further refine the objectives to include measurable goals. This effort will be complete in 2013 and used in the next update of the IRWMP as well as used in the prioritization of projects considered for Round 3 Implementation Funding. The revised objectives and measurable goals are currently available in draft form and are included in Appendix K. Overall targets will also be considered for inclusion in the Objectives & Strategies.

Goals Objectives	Weight
Goal: Integrate Flood Management	
FR-1 - Enhance Flood protection for public safety and property	**3.6**
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	3.2
Goal: Improve Water Quality	
WQ-1- Comply with Clean Water Act and Porter-Cologne	4.4
WQ-2- Protect beneficial uses of receiving waters	4.1
Goal: Increase Water Supply and Reliability	
WS-1-Improve planning and awareness of water supply reliability issues related to imported water into So.OC	2.7
WS-2-Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	3.5
WS-3-Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	3.5
WS-4-Increase capture and utilization of surface runoff for irrigation purposes	3.5
WS-5-Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	3
WS-6-Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	3.5
WS-7-Manage and improve the supplies available to South Orange County for the collective benefit	3.7

of the area	
Goal: Promote Water Use Efficiency	
WC-1 -Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	3
WC-2-Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	3.8
WC-3-Maximize Efficiency of Utility Based Operations	3.1
WC-4-Promote use of low impact design for new and existing developments	3.4
Goal: Protect Natural Resources	
NR-1- Enhance the functioning of regional aquatic ecosystems	3.1
NR-2-Reduce impacts from surface runoff	4
NR-3- Eradicate invasive species throughout the watershed	3
NR-4- Minimize impacts to air, energy, land, materials and habitat resources	3.1

Figure 4-3: Goals and Objectives

For each objective a series of strategies were developed to identify appropriate ways that objective could be met. The following sections identify the specific strategies identified for each objective. A unit of measure was associated with each strategy (as shown on tables in the following sections). Based on that measurement a score (0-5) was associated with the relative benefit attained by the strategy. Those strategy scores were used to rate how a project would meet the objective. Higher objective scores indicate an improvement in that objective. Section 6.1.2 further explains the scoring process. The following sections describe the objectives and strategies for each goal.

4.3.1 Integrate Flood Management Objectives and Strategies

To address flood management, Orange County's Flood Control Program implements an integrated process under which they conduct feasibility, hydraulic, deficiency, floodplain and value-engineering studies, collect and analyze data on an on-going basis, and design and build projects. The essential purpose of the Orange County Flood Control program is to protect Orange County life and property from the threat and damage of floods.[58] Specific strategic goals include: planning, designing, constructing, operating, and maintaining flood management infrastructure; and eliminating the need for residents to pay costly flood insurance by improving flood control systems and removing

[58] County of Orange, 2010: RDMD Business Plan: http://www.ocpublicworks.com/Docs/2008_RDMDBusinessPlan-FINAL.pdf

properties from FEMA floodplains. With the Orange County Flood Control Division's current budget to implement its regional infrastructure to provide the current protection threshold (100-year storm event), it will take 90 years and cost more than $2.5 billion (2010 value) to achieve this goal. Historically the budget was expended entirely on capital improvement projects. However, less of today's budget goes towards capital improvement projects as an increased portion of the budget has been going towards the rising cost of maintenance and mitigation.

The following objectives and supportive regional strategies were developed for the WMA to provide adequate flood control throughout Orange County:

- ***FR-1: Enhance Flood protection for public safety and property.***

Strategy	**Unit**
Strategy: FR-1-S1 - Stabilize streambeds to improve flood capacity	Acres of Streambed
Strategy: FR-1-S2 - Improve flood conveyance systems	Acres Protected
Strategy: FR-1-S3 - Improve infrastructure to enhance flood control protection	Acres Protected
Strategy: FR-1-S4 - Remove as many properties as possible from FEMA designated floodplains by 2020	Acres Removed from Floodplain
Strategy: FR-1-S5 - Remove invasive species from stream channels to improve capacity and flood control protection	Acres Removed from Channel
Strategy: FR-1-S6 - Preserve floodplains in open space areas	Acres Preserved
Strategy: FR-1-S7 - Increase stormwater and surface runoff capture for re-use	Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8 - Retrofit hydromodification controls on existing development to reduce storm flows	Acres Retrofitted
Strategy: FR-1-S9 - Increase stormwater on-site capture	Acre-Feet Captured, per 85% Storm

- ***FR-2: Implement economically and technically feasible multiple uses for flood control facilities***:

Strategy	**Unit**
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection	Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection	Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection	Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection	Acres Enhancement Opportunity
Strategy: FR-2-S5-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels	Acres Where LID Applied
Strategy: FR-2-S6-Convert hardened ditches and channels to soft bottoms (where feasible)	Acres of Soft Bottom Created

OC Flood Control will respond to citizen concerns, flood emergencies and operate and conduct our annual planned maintenance of flood control facilities. The program is additionally responsible for reviewing development proposals and providing construction inspection services of developer's construction projects.

4.3.2 Improve Water Quality Objectives and Strategies

Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality limited segments. These waters do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water quality impairment on the list and develop action plans, referred to as Total Maximum Daily Loads (TMDL), to improve water quality. In South Orange County, the SWRCB and the Regional Board staff have evaluated each addition, deletion, and change to section 303(d) based on all the data and information available for each water body and pollutant.[59] As described in Section 3.3.4 of this plan, the following TMDLs have been established or are being developed for Orange County waterbodies and are identified on the approved 2010 303(d) list:[60]

- Aliso Creek Indicator Bacteria
- Dana Point Harbor - Baby Beach Indicator Bacteria
- San Juan Creek Indicator Bacteria
- South County Coastal Areas Indicator Bacteria

The following Water Quality objectives and supportive regional strategies build upon the WMA's established goal of enhancing water quality:

[59] County of Orange, 2003, *Drainage Area Management Plan*

[60] California State Water Resources Control Board, 2006, http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml

- ***WQ-1:Comply with Clean Water Act and Porter-Cologne***

Strategy	Unit
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020	Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030	Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit	YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards	YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4	Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4	Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4	Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading	Acres Affected
Strategy: WQ-1-S9-Implement LID measures	Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading	Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather surface runoff flow	Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents	Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4	Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters	Acres Affected

- ***WQ-2: Protect beneficial uses of receiving waters:***

Strategy	Unit
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020	Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030	YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020	Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters	Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development	Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts	Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures	Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures	Acres Affected

Improvement projects proposed by local agencies in the IRWM Plan suggest both direct and indirect solutions to water quality problems. The County of Orange leads an aggressive watersheds Program which focuses on protecting the WMA's watersheds and coastal resources by accomplishing the following:

- Water Quality Planning: directs and develops the TMDL programs in Orange County.
- Monitoring Programs: collects and manages regional water quality compliance efforts including special studies.
- Environmental Data Management: maintains water quality, hydrologic, and telemetry weather databases for Orange County's Stormwater Program.

- Stormwater – Internal: coordinates NPDES compliance efforts for all County agencies.
- Stormwater – External: implements the NPDES OC Stormwater program as Principal Permittee
- Environmental Engineering: manages the Watershed Management Areas and capital improvement projects

Numerous projects throughout the WMA support these tasks. Constructed wetlands and watershed restoration plans simultaneously contribute to improved water quality and riparian habitats. Stormwater detention and treatment facilities are designed to improve water quality by mediating the effects of runoff pollution before drainage or percolation. Installation filters and catch basins also reduce pollutant loads carried through the watersheds. More than thirty water quality-related projects are currently being planned within South Orange County. Projects such as these are essential to the quality concerns facing the WMA.

Stormwater detention and treatment facilities will continue to be designed to improve water quality by mediating the effects of runoff pollution before drainage or percolation. Within the South Orange County WMA, the cities of Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano (collectively the San Diego Region Permittees) operate municipal storm drain systems and discharge stormwater and surface runoff pursuant to National Pollutant Discharge Elimination System (NPDES) Permits.[61]

These Permits require that the Permittees work together to effectively prohibit non-stormwater discharges to the stormdrain system, and implement controls to reduce the discharge of pollutants in stormwater to the Maximum Extent Practicable (MEP). The Permits were first adopted in 1990 and subsequently renewed in 1996 (Second Term), 2002 (Third Term), and 2008 (Fourth Term).

The Orange County Stormwater Program's accomplishments represent the culmination of the development and three years of implementation of a program that was substantially revised to meet the requirements of the Third Term NPDES Permits. Notable programmatic accomplishments include:

- Completion of the 2003 DAMP including 34 jurisdictional Local Implementation Plans (LIPs), a formal training program, a program effectiveness assessment strategy, and 6 Watershed Action Plans (WAPs);
- Establishment of 2 (SARWQCB and SDRWQCB) highly interdependent, planning processes targeting the control of pollutants in urban runoff and completion of studies to evaluate the effectiveness and applicability of various source control and treatment control Best Management Practices;

[61] County of Orange, 2010: http://www.ocwatersheds.com/ReportsDocuments.aspx

- Validation, through independent administrative and trial court review, of the robustness of the Permittees' local legal authority for DAMP implementation;
- Development and implementation of (1) a Model Municipal Activities program at 2,302 municipal facilities, (2) Model Integrated Pest Management Guidelines which have reduced municipal fertilizer and pesticide use, and (3) an Established BMP performance reporting program that has indicated the increased effectiveness of street sweeping and trash and debris collection practices;
- Development and implementation of a public education program that has created over 160,000,000 media impressions and produced measurable and positive changes in public awareness and behavior;
- Development and implementation of a Model Water Quality Management Plan (WQMP) based program for new development, and redevelopment the approval of over 1,400 project WQMPs, and the creation and ongoing development of a web-based expert system to support coastal urban wetland management;
- Development and implementation of a Model Construction Program under which 6,570 enforcement actions were taken within a pattern of increasing levels of compliance in the most recent annual reporting period;
- Development and implementation of a Model Industrial/Commercial Program under which over 31,000 facilities have been subject to local regulatory review and 7,266 enforcement actions were taken within a pattern of increasing levels of compliance in the most recent annual reporting period;
- The investigation of 8,866 complaints regarding illegal discharges or illicit connections, increased use of a telephone hotline for the reporting by the public of water quality concerns, and implementation of enhanced cooperative local agency procedures and practices for sewage spill response;
- Development and approval of the Third Term Permit water quality monitoring program and development and implementation of a sophisticated environmental data management system (Labtrack), and
- Implementation of the DAMP/Watershed Action Plans (WAPs) in the San Diego Regional Board area, and significant progress toward completion of WAPs for the Newport Bay and Santa Ana River watersheds.

The County's 2003 Drainage Area Management Plan (DAMP) was developed to implement the requirements of the stormwater discharge permits issued through the San Diego RWQCB. Stormwater BMPs for urban development and redevelopment are outlined, and programs for development provide a framework for incorporating watershed protection and stormwater quality principles. The DAMP is implemented by

the County of Orange, Orange County Flood Control District and incorporated cities (Permittees). The DAMP has been formulated with the following objectives in mind[62]:

- Address the requirements of the Fourth Term Permits;
- Ensure effective public participation and support;
- Focus on problems identified through monitoring;
- Utilize available resources effectively;
- Implement public education as a central program component;
- Detect and eliminate illicit connections/illegal discharges;
- Evaluate opportunities and implement projects for retrofitting existing structures as identified through the watershed planning process;
- Verify Best Management Practice (BMPs) designs and effectiveness through experience, research and demonstration projects; and
- Develop plans on a watershed basis.

Private and public sector representatives participate in developing the stormwater pollutant control programs described within the DAMP. Through the DAMP, the Permittees intend to continue to improve existing stormwater quality management practices and, where necessary, to address identified problems and to implement new practices.

The last few years have seen a dramatic increase in efforts to curb the impacts of surface runoff through collaborative planning processes and regulatory and legislative mandates.[63] OC Flood and OC Watersheds work closely to implement long lasting positive changes. The Orange County Flood Control Division uses a variety of best management practices (BMPs) in its flood control system to improve water quality. Low flow diversion systems are used in its channels to divert water pollutants to the sanitary sewer system for treatment. Trash booms are used to trap floatables before they reach Orange County's beaches. The OC Flood coordinates with www.ocwatersheds.com to implement water quality and watershed planning, and coastal resources management.

Additionally, in 2005 & 2006 Dana Marina Inn and Dana Point Marina East & West, were designated “Clean Marinas” by the Clean Marinas California Program (www.cleanmarina.org).In 2011 the Dana Point Yacht Club received the certification while the other marinas were re-certified in 2010 & 2011. Today the four facilities continue to exceed the program’s requirements. The Harbor strictly enforces the Environmental Protection Agency’s Best Management Practices and has also increased education and awareness efforts in order to encourage boaters to take an active role in safeguarding water quality. The Dana Point Harbor continues to demonstrate its leadership role in pursuing water quality with the Dana Point Shipyard becoming one of the first two California facilities to earn the new American Boat Builders & Repairers

[62] County of Orange, OC Watersheds.2003 Drainage Area Management Plan (DAMP). Available online 1/26/13: http://ocwatersheds.com/documents/damp/mapplan

[63] County of Orange, 2010: http://www.ocflood.com/NFC_WaterQualityProjects.aspx

Association (ABBRA) ABBRA Clean Maritime Facility Certification. This ABBRA certification is a comprehensive certification program to recognize boatyards that pursue and achieve high standards of operation and management, including meeting and exceeding environmental and regulatory best management practices. ABBRA worked with various California agencies that oversee water quality and environmental compliance to develop the certification requirements. An article on the new certification was posted in the ABBRA October 2012 Newsletter (www.abbra.org).

South Orange County's efforts have made a major impact on meeting the existing and proposed TMDL's, restrictions regarding ASBS's and protection of CCA's. South Orange County WMA continues to make progress in achieving water quality goals.

4.3.3 Increase Water Supply and Reliability Objectives and Strategies

South Orange County's water communities are facing increasing challenges in their role as stewards of the WMA's water resources. As population continues to increase, the WMA requires additional investments to continue providing adequate quantities of high quality water for its customers. Water planning and development is required to continue on a statewide, regional, and local level as competition for water from outside the WMA in areas such as Northern California and the Colorado River requires us to be more efficient in conserving our resources and developing local resources to help meet our needs. Furthermore, environmental awareness and consideration for the natural processes vital to the WMA have become influential features of comprehensive water planning.

The following objectives and supportive regional strategies reflect the WMA's water supply and reliability planning:

- ***WS-1: Improve planning and awareness of water supply reliability issues related to imported water into South Orange County:***

Strategy	Unit
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water	YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region	YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies	YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply	YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding	YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability	YES/NO

Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"	YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"	YES/NO

- ***WS-2: Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020:***

Strategy	**Unit**
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, surface runoff and recycled water	Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges	Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas	Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015	Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources	Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)	Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination	YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management	Acre-Feet Improvement

- ***WS-3: Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020:***

Strategy	**Unit**
Strategy: WS-3-S1-Increase recycled water production and distribution capacity	Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans	Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions	YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment	Acre-Feet

- ***WS-4: Increase capture and utilization of surface runoff for irrigation purposes:***

Strategy	Unit
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects	Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems	YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping	Acre-Feet Reduced

- ***WS-5: Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020:***

Strategy	Unit
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding	YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements	YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton	YES/NO

- ***WS-6: Improve System Reliability to protect against out of the region earthquakes and floods includes earthquakes in Orange County that would cause interruptions of supplies:***

Strategy	Unit
Strategy: WS-6-S1-Improve system reliability through various methods by 2030	YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects	YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability	YES/NO

- ***WS-7: Manage and improve the supplies available to South Orange County for the collective benefit of the area:***

Strategy	Unit
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency	Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities	YES/NO

A primary goal of the IRWM Plan is to present and discuss all water systems in a comprehensive and inclusive manner that indicates a regional understanding of the importance of an integrated planning approach. The continued development of projects and plans to pursue such a goal is vital to the economic and environmental health of the WMA. It is expected that this document will be updated as appropriate, and understood that as the WMA advances, efforts to improve water supply, quality and reliability will expand.

The IRWM Plan lists a variety of projects, including infrastructure improvements, desalting and recycling projects, and water use efficiency programs that are planned for the South Orange County WMA. These projects are effective tools to generate not only drought year water supply, but “regular year” water supply as well. By cleansing tainted groundwater supplies or recycling wastewater, previously unusable sources of supply are available to meet water demands. While these new water supplies may not contribute directly to long-term storage, they help reduce reliance on imported water. For these reasons, more types of processing and storage facilities are needed to improve both system and supply reliability. Other planned projects, such as stormwater capture and treatment facilities, contribute directly to both short-term and long-term storage. Diversion of floodwaters to recharge basins or to storage for reuse will mitigate the dangerous characteristics of flooding as well as augment the available water supply. Watershed planning, including invasive species removal and other habitat restoration projects will enhance water quality and ecosystem vigor.

4.3.4 Promote Water Use Efficiency Objectives and Strategies

Water use efficiency programs and demand curtailment are ways to extend the availability and reliability of existing supply. Curtailment or rationing is a viable option for short-term supply shortages, which may include limiting potable landscape meters during emergencies. As signatories to the Memorandum of Understanding containing 14 Best Management Practices (BMPs) for urban water conservation in California, MWDOC and South Orange County water agencies are voluntarily committed to the implementation of low cost effective BMPs. Examples of BMPs include Home Water Surveys, Low-Flow Showerhead and Toilet Retrofits, Clothes washer Retrofits, Landscape Irrigation Budgets, Education, Public Information, Industrial Process Water Improvements and Water Waste Prohibitions.

Promoting water use efficiency is an effective and reliable component to reducing regional reliance on imported water as the population of South Orange County continues to grow. The following objectives and supportive regional strategies reflect the WMA’s dedication to promoting water use efficiency:

- ***WC-1: Compliance with "20 x 2020" and with MWD's IRP Goals by 2020:***

Strategy	**Unit**
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes	YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water	YES/NO

efficiency to industrial manufacturers	
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions	YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers	YES/NO

- ***WC-2: Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020:***

Strategy	**Unit**
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers	Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume	Acre-Feet Conserved

- ***WC-3: Maximize Efficiency of Utility Based Operations:***

Strategy	**Unit**
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards	Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures	Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards	Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years	YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers	YES/NO

- ***WC-4: Promote use of low impact design for new and existing developments:***

Strategy	Unit
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020	Acres Impacted

Water agencies throughout Orange County have provided incentives for the installation of more than 350,000 Ultra-Low-Flush Toilets, which are saving more than 11,700 AF of water per year. In addition, more than 90 percent of the showerheads have been replaced with low-flow heads. As a result of these BMP implementation efforts, indoor residential water saving opportunities are maximized. Public Information, School Education, Conservation Pricing and metering with Commodity Rates are considered ongoing WUE efforts but area non-quantifiable in terms of water savings. Outdoor landscape irrigation water savings plumbing fixture retrofits in local businesses are the WMAs' next major areas of focus to achieve quantifiable water savings. These savings will be achieved through incentives to install weather-based irrigation timers, irrigation system distribution uniformity improvements, design changes including plant palette.

Orange County's Residential Runoff Reduction Study documented significant water savings, runoff reduction and pollution prevention benefits from the installation of self-adjusting Weather Based Irrigation Timers in single-family homes and commercial landscapes. This study was the basis for the first regional implementation program in the State offering rebate incentives to customers to install up to 5,000 Weather Based Irrigation Timers.

Additionally, MWDOC includes a Water Use Efficiency Department that provides programs to assist residential homeowners, commercial/industrial business owners, and professional landscapers in reducing the daily amount of water used. Several programs are administered by the Water Use Efficiency Department to assist in the effort of saving water, including the rebate programs for the following: High Efficiency Clothes Washer (HECW), High Efficiency Toilet (HET), Weather-Based Irrigation Controller (SmarTimer), Rotating Nozzles, Turf Removal, and Water Smart. MWDOC expanded the pilot rebate program in 2007 to target approximately 30% or 4,862 acre-feet per year of the maximum savings potential.

Implementation of two small scale pilot projects similar to the proposed project have been successfully completed including the SmarTimer and Edgescape Evaluation Project (SEEP, 2007) and the Reserve Study (2009-10). A third larger scale project designed to refine program implementation methodologies is currently being implemented in anticipation of the proposed region wide program.

MWDOC's Residential Runoff Reduction Study and the SmarTimer and Edgescape Evaluation Study have both demonstrated water conservation and water quality benefits. Water conservation benefits taken from the studies include an 18% reduction in residential and a 22% reduction in commercial landscape water use. Water quality

benefits include a significant reduction in both dry-weather runoff volume and non-point source pollutants entering local creeks ultimately leading to the Pacific Ocean. The Residential Runoff Reduction Study quantified a 50% reduction in dry-weather runoff and non-point source pollutants with a ten percent penetration of landscape improvements. Follow-up studies, 5-years post installation, are verifying that water savings have remained persistent.

Other water conservation programs continue to be implemented by the individual water districts as well. Educational classes and literature are made available to consumers in each school district. Examples of programs include water conservation workshops for homeowners, rebate programs for installation of water saving technologies, and professional landscape training and certification classes. Future potable water use efficiency in South Orange County will reduce water demand and the level achieved will be the result of several factors, including program investments, consumer acceptance, advancements in technology, etc.

MWDOC estimates indicate that by the year 2030, water supplies made available through conservation efforts will total 19,624 acre-feet per year as illustrated in Table 4-2 below, an increase of about 10,000 AF over and above existing Water Use Efficiency levels achieved in 2005. More aggressive efforts could possibly save additional water.[64]

Table 4-2: Total Projected WUE/Water Conservation Projects & Savings (AFY)

Type of WUE Project / Program	2005	2010	2015	2020	2025	2030	2035
Active WUE	3,000	4,000	4,500	5,500	6,500	7,500	8,500
Passive WUE	7,500	10,000	10,500	11,500	17,500	15,500	14,500
Total WUE	10,500	14,000	15,000	17,000	19,000	21,500	23,000

Source: MWDOC, provided 2/20/13.

In keeping with our commitment to environmental leadership, and our continuing effort to improve water quality, Orange County's Dana Point Harbor has made multiple improvements to the Harbor area. In early 2008, Orange County's Dana Point Harbor voluntarily participated in the Metropolitan Water District of Southern California's Public Sector Water Efficiency Program. The program involved a Harbor-wide audit of water usage, equipment, and procedures and resulted in numerous measures taken to conserve water and reduce runoff. Several improvements were made to landscaping such as lowering soil levels in many planter areas and replacing spray irrigation systems with bubblers. Irrigation systems are frequently inspected and repaired, low

[64] Municipal Water District of Orange County, 2004, *South Orange County Water Reliability Study Phase 2.*

maintenance yet visually appealing plants have been chosen for the common areas, and landscaping is now trimmed more frequently to minimize the amount of leaves falling into the water. All street and parking lot cleaning is performed on a regular basis using surface cleaners with built-in water recovery systems to eliminate runoff.

Orange County's Dana Point Harbor has also taken multiple steps to guarantee that waste-removal procedures promote environmental protection and conservation. Daily trash collection is mandated throughout the facility and OC DPH worked with OC Parks to provide trash receptacles that prevent birds from scattering the contents. Additional cigarette urns are being installed along the public walkways to encourage proper disposal of cigarette butts, keeping the amount of potential debris entering Harbor waters to a minimum. Harbor Maintenance personnel make regular sweeps in a small boat along the basins, collecting trash and debris as needed. Additional recycling receptacles such as monofilament line recycling collection stations have been established at several Harbor locations. OC Dana Point Harbor has also made provisions for the disposal of oil, oil filters, automatic transmission fluid, engine anti-freeze/coolant, batteries and bilge pads. Also available are hydrocarbon-absorbing bilge pads, to be placed in the bilges of boats to absorb oil, fuel, etc. as opposed to discharging these items overboard through bilge pumps.

4.3.5 Protect Natural Resources Objectives and Strategies

To assist with meeting Aquatic/Riparian Ecosystems and Watershed Management objectives, regional programs have been established that include partnerships between multiple projects to provide broad regional benefits, while maximizing resources.

As discussed in Section 3.3.1, the South Orange County WMA works with the Nature Reserve of Orange County (NROC), 501(c)(3) nonprofit corporation that manages the Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) for the Central and Coastal Subregion of Orange County California. It coordinates land management activities of public and private landowners within the 37,000 acre reserve system, conducts wildlife and habitat research and monitoring, and restores disturbed habitats. The South Orange County WMA includes a number of protected areas that form a network of interconnected and isolated biological communities within the Central and Coastal and Southern Subregion NCCP/HCP.

The following objectives and supportive regional strategies reflect the WMA's ongoing efforts for natural resources protection:

- ***NR-1: Enhance the functioning of regional aquatic ecosystems:***

Strategy	**Unit**
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's	Acres Impacted

Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems	Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns	Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health	Acre-Feet Treated

- ***NR-2: Reduce impacts from surface runoff:***

Strategy	**Unit**
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows	Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from entering municipal storm drain systems and aquatic ecosystems, during both wet and dry weather	Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible	Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030	YES/NO

- ***NR-3: Eradicate invasive species throughout the watershed:***

Strategy	**Unit**
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030	Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible	Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use	Acres Provided

- ***NR-4: Minimize impacts to air, energy, land, materials and habitat resources:***

Strategy	**Unit**
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible	Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies	YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030	YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair	YES/NO
Strategy: NR-4-S5-Reduce carbon footprint	Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation	YES/NO

The South Orange County WMA is located within the boundaries of the Central and Coastal NCCP/HCP. The following areas are included in the reserve system: Laguna Coast Wilderness Park, Mason Regional Park, Peters Canyon Regional Park, Upper Newport Bay Nature Preserve, Whiting Ranch Wilderness Park, Upper Newport Bay Ecological Reserve, and the University of California Irvine Reserve. Only the Laguna Coast Wilderness Park is within the South Orange County WMA. The remaining areas are within the Central Orange County WMA.

The South Orange County WMA includes a number of protected areas that form a network of interconnected and isolated biological communities. The Southern Subregion NCCP/HCP consists of 132,000 acres which includes 40,000 acres within the Cleveland National Forest and 92,000 acres within the Planning Area. The Southern Subregion NCCP/HCP was prepared by the County of Orange in cooperation with the CDFW and the U.S. Fish and Wildlife Service (USFWS). The Southern Subregion NCCP/HCP focuses on long-term protection and management of multiple natural communities that provide habitat essential to the survival of wildlife and plant species.

As described under Section 2.6.1, the South Orange County Team Arundo (Team Arundo) was formed during the IRWM planning process. An offshoot of the South Orange County IRWM Group, South Orange County Team Arundo works to remove invasive plants and restore native riparian habitat in the watersheds of the San Juan Hydrologic Unit (SJHU). South Orange County Team Arundo has developed a region-wide program for the restoration of riparian habitat in the SJHU through the control of invasive non-native plants (mainly Arundo donax and pampas grass) and the planting of native species. Arundo and pampas grass pose a serious threat to the native flora and fauna, and are a significant flood and fire risk to the community.

The invasive non-native plant control and riparian restoration program for the SJHU is based on a systematic watershed based control of target species that provides long term ecological and resource protection benefits. This process, along with details related to restoration and exotic plant control methods have been developed in coordination with the CA Department of Fish and Wildlife, USGS Biological Resources Division and the US Fish & Wildlife Service. South Orange County Team Arundo has mapped the non-native riparian plant species in the SJHU, identifying over 315 acres of target invasive plants. In addition, they have obtained all the necessary regulatory permits and environmental documents to remove non-native species in the SJHU.

4.4 Objective Weighting

Consistent with the Governance model, the South Orange County WMA includes an adopted Cooperative Agreement and decision-making framework for planning and implementing water management strategies. Through a series of meetings, the South Orange County IRWM Group collectively developed the objectives and prioritized them according to their water management responsibilities. The Management Committee solicited input from the South Orange County IRWM Group. The draft priority ranking was distributed via email to the Group members and discussed at a subsequent stakeholder workshop. Together, the group:

1. Identified and weighted Objectives
2. Reviewed and evaluated the effectiveness of the objectives
3. Ensured objectives are prioritized based on regional concerns, including: Flood Management, Water Quality, Water Supply and Reliability, Water Use Efficiency, and Natural Resources.
4. Identified and assess weighted values for goals and objectives and for project ranking.

The objectives were weighted by the WMA as part of the project review process. The WMA weighted objectives within goals, and then summed up the scores of each weighted goal to determine the total points for each project. This scoring process is described in detail in Section 6.1.2. There are five goals. Each goal has two to seven objectives. And each objective has any number of strategies listed beneath by which a project can meet the objective.

Weighted values were assigned to each objective as well as to each goal. To determine the score for an objective, each project proponent evaluated how well a project met a given objective, by assigning a score of 0-5 on any number of strategies. Regardless of the number of strategies employed to meet the objective, the highest ranking strategy's score was multiplied by the objective weight. These weighted objective scores were then summed together for the goal under which they fell. This total value was then multiplied by the overall goal weighting. This process determined the individual goal scores. The sum of the scores determined the overall project score.

An Ad-Hoc group of IRWM members is working to further refine the objectives to include measurable goals. This effort will be complete in 2013 and used in the next

update of the IRWMP as well as used in the prioritization of projects considered for Round 3 Implementation Funding. The revised objectives and measurable goals are currently available in draft form and are included in Appendix K. Overall targets will also be considered for inclusion in the Objectives & Strategies.

5 RESOURCE MANAGEMENT STRATEGIES

5.1 Process to Consider Resource Management Strategies

As part of the process to develop the goals, objectives and regional strategies for the South Orange County Region, as detailed in Section 4, the California Water Plan Update 2009 resource management strategies (RMS) were considered and evaluated for applicability to the region. A key objective of the California Water Plan Update 2009 is to present a diverse set of resource management strategies to meet the water-related resource management needs of each region statewide. The 27 RMS are summarized below, grouped by their intended outcome.

- *Reduce water demand*: Water conservation has become a viable long-term supply option because it saves considerable capital and operating cost for utilities and consumers, avoids environmental degradation, and creates multiple benefits.
    - Agricultural Water Use Efficiency RMS
    - Urban Water Use Efficiency RMS
- *Improve operational efficiency and transfers*: California's water system responds to our need to move water from where it occurs to where it will be used.
    - Conveyance—Delta RMS
    - Conveyance—Regional/Local RMS
    - System Reoperation RMS
    - Water Transfers RMS
- *Increase water supply*: California's communities are finding innovative ways to generate new supplies.
    - Conjunctive Management & Groundwater Storage RMS
    - Desalination – Brackish & Seawater RMS
    - Precipitation Enhancement RMS
    - Recycled Municipal Water RMS
    - Surface Storage—CALFED RMS
    - Surface Storage—Regional/Local RMS
- *Improve water quality*: Improved water quality can directly improve the health of Californians and our ecosystem.
    - Drinking Water Treatment and Distribution RMS
    - Groundwater/Aquifer Remediation RMS
    - Matching Quality to Use RMS
    - Pollution Prevention RMS
    - Salt and Salinity Management RMS
    - Runoff Management RMS

- *Practice resource stewardship*: Protect other resources as water supplies are made available for other beneficial uses.
    - Agricultural Lands Stewardship RMS
    - Economic Incentives (Loans, Grants, Water Pricing) RMS
    - Ecosystem Restoration RMS
    - Forest Management RMS
    - Land Use Planning and Management RMS
    - Recharge Area Protection RMS
    - Water-dependent Recreation RMS
    - Watershed Management RMS
- *Improve flood management*: Promote and practice integrated flood management to provide multiple benefits including better emergency preparedness and response, higher flood protection, more sustainable flood and water management systems, and enhanced floodplain ecosystems.
    - Flood Risk Management RMS

The RMS also considered the effects of Climate Change on the IRWM region. Due to the significance of climate change on all strategies, a complete climate change analysis was completed and is include in Appendix J.

The RMS considered relevant to the South Orange County IRWMP objectives were developed into regional strategies. The regional strategies that implement the objectives were reviewed by the IRWM Group for relevance to the WMA. Input from the Cities, water and wastewater districts, and the County was instrumental in updating the objectives to reflect current watershed, land use, and natural resources management plans for the WMA. Based on feedback, appropriate refinement to the objectives and strategies were made by Subgroup representatives and presented back to the IRWM Group for final approval. The following sections identify the RMS considered, RMS determined applicable to the Region and incorporated in the strategies and objectives, and RMS determined non-applicable to the Region.

5.2 Resource Management Strategies (RMS) Applicable to Region

In many cases, strategies and projects primarily targeted at one plan objective will also support other plan objectives. Strategies and projects that address multiple objectives are typically the most cost-effective and resource-efficient, and are for the most part given higher priority in this IRWMP.

In developing IRWM Plan goals, objectives and regional strategies, as detailed in Section 4.3, the IRWM Group considered the 2009 California Water Plan RMS. The RMS deemed applicable to the South Orange County IRWM Region were incorporated into the development of the IRWM Plan strategies to help achieve those objectives. Table 5-1 summarizes the California Water Plan Update 2009 Resource Management Strategies Considered and their applicability to the South Orange County IRWM Regional Goals and Objectives:

Table 5-1: Resource Management Strategies Applicability to Region

2009 California Water Plan Resource Management Strategies Considered	Goals and Objectives																			
	Integrate Flood Management		Improve Water Quality		Increase Water Supply and Reliability							Promote Water Use Efficiency				Protect Natural Resources				Not Applicable to Region
	FR-1	FR-2	WQ-1	WQ-2	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	WC-1	WC-2	WC-3	WC-4	NR-1	NR-2	NR-3	NR-4	
Agricultural Water Use Efficiency								X												X
Urban Water Use Efficiency			X		X		X	X				X	X	X	X		X			
Conveyance - Delta																				X
Conveyance – Regional / Local					X					X	X									
System Reoperation										X	X									
Water transfers					X					X	X									
Conjunctive Management & Groundwater						X	X	X	X		X									
Desalination – ocean and groundwater						X			X											
Precipitation Enhancement																				X
Recycled Municipal Water							X	X									X			
Surface Storage – CALFED																				X
Surface Storage – Regional/local		X			X			X												
Drinking Water Treatment and Distribution					X	X				X	X									
Groundwater Remediation / Aquifer Remediation				X		X														
Matching Quality to Use				X	X	X	X	X												

Table 5-1: Resource Management Strategies' Applicability to Region (Cont.)

2009 California Water Plan Resource Management Strategies Considered	Goals and Objectives																			
	Integrate Flood Management		Improve Water Quality		Increase Water Supply and Reliability							Promote Water Use Efficiency				Protect Natrual Resources				Not Applicable to Region
	FR-1	FR-2	WQ-1	WQ-2	WS-1	WS-2	WS-3	WS-4	WS-5	WS-6	WS-7	WC-1	WC-2	WC-3	WC-4	NR-1	NR-2	NR-3	NR-4	
Salt and Salinity Management						X	X	X	X											
Pollution Prevention			X	X		X														
Urban Runoff Management			X	X				X					X		X	X	X		X	
Flood Risk Management	X	X																	X	
Agricultural Lands Stewardship																				X
Economic Incentives (Loans, Grants, and Water Pricing)												X		X						
Ecosystem restoration	X	X	X	X				X					X			X	X	X	X	
Forest Management																				X
Recharge Area Protection						X														
Water-Dependent Recreation		X																X	X	
Watershed Management	X	X	X	X	X	X	X	X	X				X		X	X	X	X	X	
Crop Idling for Water Transfers																				X
Dewvaporation or Atmospheric Pressure Desalination																				X
Fog Collection																				X
Irrigated Land Retirement																				X
Rainfed Agriculture																				X
Waterbag Transport / Storage Technology																				X

5.3 Resource Management Strategies (RMS) Not Applicable to Region

Nearly all types of resource management strategies are applicable and considered within the South OC IRWM Plan and proposed projects. Although most of the resource management strategies were identified as applicable to the region, several were not. Agricultural Water Use Efficiency and Agricultural Lands Stewardship are not applicable to the very limited amount of agricultural land present in the Region.

Conveyance – Delta and Surface Storage – Calfed is not directly applicable to our region, as most of the Region's conveyance issues are related to local infrastructure and the Region does not own or operate conveyance in the Delta region or surface storage facilities in the Calfed region. Precipitation enhancement does not apply to our region as artificial cloud seeding is not a practice within the region.

Although the Region includes Cleveland National Forest and other open space, the forest management RMS is not applicable to the South Orange County Region because the Cleveland National Forest is directly managed by the US Department of Agriculture Forest Service. Crop idling for water transfers does not apply due to the limited agricultural land and farming that occurs in the region, where crop idling doesn't occur. Dewvaporation or Atmospheric Pressure Desalination is not a practice used within the region; however, reverse osmosis desalination is practiced and addressed accordingly. Fog collection is not applicable due to the limited rainfall and precipitation within the Region, Irrigated Land Retirement is not applicable since it is not a strategy used within our limited agricultural farming practices. Rainfed Agriculture is not applicable due to the low rainfall received. Waterbag Transport/Storage Technology has not been explored in our region, as our above ground reservoir storage facilities are used instead; this is not a practice applicable to our region at this time.

5.4 Regional Strategies

The state's RMS were considered in the development of regional objectives and strategies. The IRWM Plan includes multiple projects that will implement the regional strategies. Each project accomplishes several aspects of water management for the region. Strategies and projects that address multiple objectives are typically the most cost-effective and resource-efficient, and are for the most part given higher priority in the IRWM Plan. The regional goals, objectives and strategies developed by the South OC IRWM Group are discussed in Section 4.3.The following explains how the strategies were developed and items considered in developing the IRWM Plan goals, objectives, and regional strategies.

5.4.1 Integrate Flood Management Strategies

The WMA considered Flood Management Strategies in developing the IRWM Plan goals, objectives, and strategies. This management strategy will help stabilize streambeds impacted by development-exacerbated stormflows and convert hardened ditches and channels to widened soft-bottomed naturally-vegetated channels where feasible, to address erosion and flood control. Project performance would typically be measured by linear feet of streambed stabilized and/or converted channel; and acreage of soft-bottom channel created. This would also be accomplished by managing

development through the planning process (County and cities) to reduce post-project flow to pre-project flow.

A key component of Flood management is the use of geographic information systems, data bases and other data management tools to support data development and manage the Region's watersheds. It promotes the development, installation, application or updating of flood control and pollutant control data, methods of measurement and management to protect waterways. Short-term per-project performance may be measured by expansion of catalogued data, confirmation of previous data conclusions, identification of erosion and sedimentation sources, and identification of accurate and rapid source tracking methods. Long-term per-project performance would typically be measured by estimated reduction in nuisance runoff volume or rate discharged to beaches; and/or estimated reduction in concentration or quantity of pathogens or indicator pollutants discharged compared to pre-project conditions.

5.4.2 Improve Water Quality Strategies

The WMA considered water quality during the development of the IRWM Plan's goals, objectives, and strategies. This management strategy will promote the region-wide utilization of centralized and decentralized structural Best Management Practices, appropriate to non-point-source pollutants and land use types, to minimize the discharge of pollutants into or from municipal storm drain systems and into downstream aquatic ecosystems, during both wet and dry weather. Per-project performance would typically be measured by the number and area of sites affected; estimated reduction in nuisance and/or storm runoff volume or rate; and/or estimated reduction in quantity of key pollutants potentially exposed to discharge to the environment, compared to pre-project or conventional conditions.

Groundwater quality is also an important part of this strategy. This strategy will help prevent contamination of aquifers by sewage, industrial or other wastes. In some cases, groundwater remediation is necessary to improve the quality of degraded groundwater for beneficial use. Drinking water supply is the beneficial use that typically requires remediation when groundwater quality is degraded. In 1985 trichloroethylene, also known as TCE, was found in portions of the groundwater basin beneath the former El Toro Marine Corps Air Station and central Irvine within IRWD's service area. TCE is a volatile organic compound, or VOC, that was widely used as a solvent for aircraft cleaning. Prior to the development of stricter environmental regulations in the mid-1970's, it was common to dispose of cleaning solvents by simply rinsing off the aircraft and allowing the runoff to run into the ground. As a result of these past disposal practices, a one-by-three mile plume of contamination now extends off the base (see map to right). The contamination is about 150 feet deep beneath the base and 300-700 feet deep in the community area. However, drinking water in Irvine has been and continues to be absolutely safe. IRWD's drinking water meets or exceeds all state and federal water quality requirements. IRWD maintains a state-certified water quality laboratory that performs more than a quarter of a million tests annually on our water supply to ensure that high quality water is monitored and maintained. The plume is several miles from IRWD's drinking water well field and therefore does not affect IRWD's drinking water supply.

IRWD, the Orange County Water District and the United States Department of the Navy have completed a joint project, the El Toro Groundwater Remediation Project, which is designed to clean up the TCE plume. This project began full operation in January 2007 and pumps water from the plume of TCE contamination. Following treatment to remove the TCE, this water is used only for non-drinking purposes. Each year the El Toro Groundwater Remediation Project provides 1.3 billion gallons of clean water for non-drinking water purposes, which is enough to irrigate 1,300 acres of landscaping. The cleanup of the plume is expected to take approximately 40 years.

This strategy also protects recharge of groundwater aquifers in a cost-effective manner consistent with minimizing socioeconomic and environmental impacts. This will include potential production from the San Clemente wells as well as possible production from the San Mateo Groundwater Basin. Arrangements with Camp Pendleton and/or the Bureau of Reclamation may need to be developed for usage of San Mateo water.

5.4.3 Increase Water Supply and Reliability Strategies

This strategy implements water savings and benefits including improvements in technology and management of water. This strategy also promotes the utilization of structural and non-structural Best Management Practices to eliminate nuisance runoff, and prevent potential pollutants from entering municipal storm drain systems and aquatic ecosystems, during both wet and dry weather. Per-project performance would typically be measured by the number and area of sites affected; estimated reduction in water usage or nuisance runoff volume or rate; and/or estimated reduction in quantity of key pollutants potentially exposed to discharge to the environment, compared to pre-project or conventional conditions.

South Orange County is highly dependent on imported water resources for about 90% of its needs. Because of this level of dependence on imported water, the Region continues to work with MWDOC and Metropolitan on improving regional and local water conveyance facilities. Based on projects being implemented throughout South Orange County, the need for imported supply will decrease through to 2030, thus helping to improve the reliable conveyance of water to South Orange County and the Southern California Region.

A few MWDOC member agencies have also expressed interests in pursuing transfers of water from outside of the region to improve water supply reliability. MWDOC will continue to help its member agencies in developing these opportunities and ensuring their success. In fulfilling this role, MWDOC will look to help its member agencies navigate the operational and administrative issues of wheeling water through the Metropolitan water distribution system. Santa Margarita Water District (SMWD) has actively pursued additional water supply reliability through water transfers and successfully completed water transfers in the late 1990's through the Metropolitan system. At present the future of such transfers as a reliable and cost-effective means of providing the basic supply are uncertain, however, transfer with specific purposes, such as supplementing dry year supplies can be effective.

SMWD will continue to pursue water transfers as an alternative water supply and is currently working with MWDOC and other agencies to investigate possible transfers.

The Supplemental Dry Year Agreements are transfer agreements that are triggered under specific conditions when supplies from Metropolitan are limited. Cucamonga County Water District and Golden State Water Company (GSWC) will utilize groundwater in lieu of taking delivery of imported water from Metropolitan. SMWD has a transfer agreement with Cucamonga County Water District of 4,250 AFY, both short term and long term. SMWD also has a short term transfer agreement with GSWC of 2,000 AFY.[65]

Through conjunctive management, the WMA coordinates use of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region to meet various management objectives. Managing both resources together, rather than in isolation, allows water managers to use the advantages of both resources for maximum benefit. Implementation of conjunctive management will increase pumping and needed treatment of local groundwater for water supply, consistent with sustainability and conjunctive use with other supplies. The projection for groundwater production out of San Juan Basin is anticipated to move from 3,674 AFY in 2010- to 8,594 AFY in 2035. Additional dry-year yield may be developed through Groundwater Management Planning, discussed in Section 3.3.2.

Desalination is also part of this strategy and is included in the development of the IRWM Plan goals, objectives, and regional strategies. Application of desalination technology is increasingly being recognized as one important supply component to develop new sustainable water supplies and to bolster water system reliability. In Orange County, there are three proposed ocean desalination projects that could serve MWDOC and its member agencies with additional water supply. These are the Huntington Beach Seawater Desalination Project, the South Orange Coastal Ocean Desalination Project, and the Camp Pendleton Seawater Desalination Project (the Camp Pendleton Seawater Desalination project would likely serve San Diego County, but would contribute to offsetting regional water supplies). Desalination can help meet the goals and objectives of the region. Development of potable supplies through desalination of ocean sources has the opportunity to produce 15,000 AF of supplies or possibly more by 2030. At this time, research is still underway to identify the opportunities and constraints to utilizing this source for potable supplies at both the South Orange Coastal and Camp Pendleton sites.

MWD instituted its Groundwater Recovery Program in 1991 to provide financial incentives (up to $250 per acre-foot) to local agencies to develop brackish groundwater impaired from either natural causes or from agricultural drainage. The purpose of the program was to increase utilization of groundwater storage within the region for firm local production, conjunctive use storage, and drought supply. In MWDOC's service area, five groundwater recovery brackish water projects have contracts with Metropolitan.

[65] Municipal Water District of Orange County (MWDOC). 2010 Urban Water Management Plan Update. Available online 1/26/13:
http://www.mwdoc.com/Uploads/MWDOC_2010_RUWMP_final_draft_Submitted_04_28_11.pdf

Recycled water was also included during the development of the IRWM Plan goals, objectives, and regional strategies. The WMA plans to increase the production and distribution capacity for expanding the use of recycled water. Orange County is the leader in water recycling in the State of California, in both quantity and innovation. Water supply and wastewater treatment agencies in Orange County have received well-deserved recognition in the field of water reclamation and reuse. Based on MWDOC's projections, expansion of recycled supplies is expected to amount to 20,000 AF by 2030. This projection includes the use of some creek diversions for beneficial uses.

Drinking water treatment and distribution are also part of this strategy. These will aid in the development of local potable supplies including water treatment improvements to help reduce the risk of drought exposure to the South Orange County Region and will implement projects that will improve the reliability of the water supply system. The Region depends on a combination of imported and local supplies to meet its water demands and has taken numerous steps to ensure its member agencies have adequate supplies. Development of groundwater, groundwater recovery, recycled water systems, desalination opportunities, and collection of urban return flows augment the reliability of the imported water system.

Specific projects to improve the system reliability include:

- Orange County Cross Feeder
- Coastal Junction Pump Station
- IRWD Interconnections
- Groundwater Emergency Service Program
- Upper and Lower Chiquita reservoirs
- Ocean desalination facility

5.4.4 Promote Water Use Efficiency Strategies

The WMA considered Water Use Efficiency during the development of the IRWM Plan goals, objectives, and regional strategies. This strategy promotes the region-wide utilization of non-structural and structural Best Management Practices, appropriate to non-point-source pollutants and land use types, to conserve water and prevent potential pollutants from entering municipal storm drain systems and aquatic ecosystems, during both wet and dry weather. MWDOC is currently developing a WUE Master Plan that will provide a 5-year implementation plan and specific savings goals. Per-project performance would typically be measured by the number and area of sites affected; and estimated reduction in quantity of water discharged and key pollutants potentially exposed to discharge to the environment, compared to pre-project or conventional conditions.

One major area in which MWDOC works with other agencies to manage Orange County's water supply is water use efficiency. In terms of water management, MWDOC became a signatory to the Memorandum of Understanding (MOU) in 1991, monitored by the California Urban Water Conservation Council (CUWCC), which develops and maintains 14 Best Management Practices (BMP) for urban water use efficiency. The urban water use efficiency practices are intended to reduce long-term urban demands

from what they would have been without implementation of these practices, and are in addition to programs that may be instituted during occasional water supply shortages. For more than 30 years, MWDOC's Public Information and Water Education programs have reached thousands of consumers and nearly 90,000 Orange County students annually. The programs are performed on behalf of, and in coordination with, MWDOC's member agencies and are designed to facilitate a student's understanding of current water issues, as well as the challenges, opportunities, and costs involved in securing a reliable supply of high quality water. In 2004, MWDOC formed a partnership with the Discovery Science Center to bring the School Education Program to even more students and provide them with even greater educational experiences in the areas of water and science.[66]

To facilitate the implementation of BMPs, MWDOC focuses its effort on the following three areas:

- Regional Program Implementation: MWDOC develops, obtains funding for, and implements regional BMP programs on behalf of all retail water agencies in Orange County.
- Local Program Assistance: Upon request, MWDOC assists retail agencies in developing and implementing local programs within their individual service areas. MWDOC provides assistance with a variety of local programs including, but not limited to: Home Water Surveys, Landscape Workshops (residential and commercial), Public Information, School Education, Conservation Pricing, and Water Waste Prohibitions.
- Research and Evaluation: An integral component of any water use efficiency program is the research and evaluation of potential and existing programs. In the past five years, MWDOC has conducted research that allows agencies to measure the water-savings benefits of a specific program and then compare those benefits to the costs of implementing the program. This cost/benefit analysis enables individual agencies to evaluate the economic feasibility of a program prior to its implementation.

Regional/local surface storage management also promotes water use efficiency and includes investigation of emerging technology and regulatory actions for on-site capture, storage and re-use of rainwater for irrigation purposes, consistent with water quality and vector control needs. Surface water provides an additional local source to some MWDOC member agencies, including IRWD and Trabuco Canyon Water District. Surface water supplies in Orange County are captured mostly from Santiago Creek into Santiago Reservoir (a.k.a. Irvine Lake) and some reclaimed from local streams and surface runoff in South Orange County (in the Santa Margarita Water District service area). There are a few other dams located on the smaller streams throughout the County; however, these are generally only for flood control or local agricultural use. Effort has been made in exploring the opportunity for increasing utilization of water in

[66] Municipal Water District of Orange County. 2010 Regional Urban Water Management Plan. 4/28/11.

San Juan Basin in South Orange County through the development of desalters and percolation basins.

5.4.5 Protect Natural Resources Strategies

The WMA considered protection of natural resources during the development of the IRWM Plan goals, objectives, and strategies. This strategy has multiple benefits of eliminating or reducing non-native surface runoff from affecting riparian eco-systems, water reuse, and creating additional beneficial uses. At this time, it is difficult to project the quantity of supplies that could be developed from this source. The goal would be to increase capacity to capture, treat and utilize dry-weather surface runoff and stormwater, primarily for non-potable uses.

Protecting receiving waters and marine Areas of Special Biological Significance to the extent feasible is part of this strategy. Implemented projects may have a number or acreage of sites retrofitted with control measures; and measure estimated reduction in daily or storm discharges to the receiving waters or ASBS. This strategy will help re-establish native aquatic, riparian and transitional biotic communities along streamcourses to the extent feasible. Project performance would typically be measured by linear feet of restored streamcourse; acreage of vegetation re-established; species diversity; and percent cover.

In addition, this strategy provides opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use. Per-project performance would typically be measured in linear feet or acreage of area made accessible; and estimated recreational use or capacity for use.

Integration of these regional strategies to meet the IRWM Plan objectives enhances the benefits of project implementation throughout the South Orange County region.

5.5 Regional and Inter-regional Benefits

Implementation of the IRWM Plan and its projects will lead the Region into a future with a reliable water supply, protected and improved water quality, and achievement of the statewide priorities and program preferences for integrated regional planning. The IRWM Plan has served as an impetus to bring stakeholders together to discuss common goals, address concerns, and brainstorm solutions.

As the Plan is implemented and benefits of water supply and water quality are realized, so will adjacent areas and regions benefit from the South Orange County regional efforts. Benefits to implementing projects with interregional benefits/advantages include increased opportunity for project implementation, collective planning to monitor regional changes and facilitate refinements for implementation, increased participation and cooperation by the public, shared costs, and cooperative land-based planning as opposed to confinement within political boundaries.

Development of South Orange County local supplies and enhancement of reliability of its existing supplies also provides enhanced reliability of imported water suppliers for other regions. When dependence on imported water for the Region is reduced, water supply to other regions will increase, enhancing their reliability.

Long-term attainment and maintenance of water quality standards within the watersheds throughout the Region will result in enhanced local supplies, habitat restoration, pollution control, and outdoor recreational opportunities. Pollution reduction in impaired water bodies and sensitive habitat will benefit South Orange County wildlife habitat. Overall watershed health realized in the Region provides greater opportunities for communities to enjoy the area in which they live, including beach activities, hiking, biking, bird watching, horseback riding, and other activities that thrive in this Region.

The IRWM Plan will establish an integrated regional water management model that could be used as a model for other regions and areas of the State. Individual projects that are implemented and produce beneficial results may also be used as pilot projects that are transferable to other regions. Regional planning presents the opportunity for collective and collaborative planning in a logical and beneficial process. The prioritization of projects within the Region provides the greatest benefit for the greater good.

Moreover, it is important to recognize that the objectives of the Region regarding water supply reliability, groundwater management, water conservation, and water quality / pollution reduction, along with achievement of specific statewide priorities, clearly require regional solutions. In certain cases, “Regional Action Projects” have been defined where appropriate to implement a single strategy across the entire region that would involve all participants on a phased, as-needed funding basis. Regional solutions are being implemented in the objectives.

Collaboration of regional projects and priorities will achieve substantially enhanced regional benefits, increased opportunity for project implementation, collective planning to monitor regional changes and facilitate refinements for implementation, increased participation and cooperation by the public and interregional benefits to adjacent areas. Certain watershed and habitat areas and the improvements made to them know no boundaries. Neighboring regions will experience benefits from the implementation of the South Orange County IRWM Plan.

5.6 Disadvantaged Communities / Environmental Justice Benefits

Disadvantaged communities are a major concern for the IRWM Group. In order to address disadvantaged communities, the IRWM Group has made it a top priority to incorporate disadvantaged communities within their projects. The disadvantaged communities of South Orange County, as discussed in Section 3.6 Disadvantaged Communities, predominantly utilize the waters within the Region as recreational hubs. Waters within the Region include area beaches, local creeks and streams, and wetland environments. Since these waters are 100 percent accessible to the disadvantaged communities of South Orange County, projects focusing to provide safe drinking water and enhance water quality will primarily benefit these communities. Figure 3-15 depicts the disadvantaged communities throughout the entire South Orange County IRWM Region.

Water quality of the watersheds greatly impacts the recreational opportunities for the disadvantaged community members, especially since portions of the watersheds that drain into the beach areas are impaired waters. The San Diego Regional Water Quality

Control Board has designated beneficial uses for many of the watershed waters for agricultural supply, contact and non-contact water recreation, warm freshwater habitat and wildlife habitat. Groundwater municipal supply is a beneficial use in the San Juan basin and easterly portion of Aliso Creek. Projects proposed in this plan will contribute to each of these beneficial uses, enhancing the opportunity to disadvantaged communities.

Coastal Benefits

The surrounding areas of Doheny State Beach Park, the Dana Point Harbor, area beaches, and parks located along regional stream courses serve as community gathering places for these communities and are used heavily year round on the weekends. Many of the recreational areas are accessible via public transit and often do not charge an entrance fee for walk-in visitors. Many recreational areas are also handicapped accessible. Today, Doheny state Beach continues to have millions of visitors each year.

Projects focused on improving the water quality of Aliso Creek Beach, like Aliso Viejo's Dairy Fork Wetland project, will greatly benefit disadvantaged communities, especially low-income apartment complexes along the upper Aliso Creek. Aliso Creek beach is accessible through the Orange County Transportation Authority bus system since it is a facility of the County of Orange. This beach along with beaches and parks in the Region serve the disadvantaged communities equally since there is no entrance fee.

The City of San Clemente Recycled Water Treatment and Distribution project was funded under Proposition 50 IRWM Implementation Grant Program. Upon completion in 2014, the project will reduce wastewater effluent into the ocean accommodating disadvantaged communities that utilize neighborhood parks and beaches as a weekend retreat. Disadvantaged communities will continue to enjoy the beach and ocean resources as a result of fewer beach closure days due to higher water quality. Water quality is a key consideration for the Region to ensure protection of the health and safety of the entire population in the area, especially for the disadvantaged community residents that do not have the means to travel to other areas of the state or country.

Inland Benefits

Multiple creek restoration, wetland, and Arundo removal projects are underway in the Region, and include the Audubon's Starr Ranch Sanctuary, which will restore 125 acres of the Bell Creek riparian zone providing wildlife and habitat research education programs for kids and adults. This and other creek habitat and restoration projects will significantly benefit the continued enjoyment of the Region's natural systems for low income populations.

In addition, El Toro Water District's Recycled Water Distribution System Expansion was funded by Proposition 84 Round 1 Implementation Grant and consists of constructing a new recycled water distribution system to serve the El Toro Water District Service Area that includes disadvantaged communities in the City of Laguna Woods. The project would result in the conversion of approximately 75 existing potable water dedicated irrigation meters to recycled water. The conversions would reduce the amount of

potable water imported by the District by as much as 300 acre feet per year. This Project would directly benefit disadvantaged community members.

These projects would meet multiple objectives and provide multiple benefits, including recreational and aesthetic benefits. Expanded opportunities for recreational benefits include contact and non-contact water recreation, walking paths, bird watching, nature study, painting and photography, and other passive activities.

Recreational opportunities will result from the implementation of the Oso Creek Multi-Use Trails Project in Laguna Niguel. This project will provide and expand creek-side trail-ways for recreation and easier access to regional trails, the metrolink station, and bus route links, and will expand the opportunity for use by disadvantaged communities.

Educational and public outreach activities like those found in the Audubon Starr Ranch project will increase residents' understanding and appreciation of wetlands and other areas of significance, including how human interaction impacts habitat areas and other natural resources. The Audubon Starr Ranch project will inspire broad implementation of water quality and water conservation improvements across the community.

Additional projects within the Region continue to incorporate measures to improve infrastructure needs in disadvantaged communities, such as offering catch basin insert installation to multi-family housing complexes where economically disadvantaged concentrations are significant.

Benefits of Disadvantaged Community Participation

Through addressing water quality issues in areas of recreational use, the IRWM Plan incorporates environmental justice in a way that provides every resident equal opportunity and fair treatment in the regional water planning process. As part of the disadvantaged communities, the IRWM Group has and will continue to actively involve regional minority communities, including the Juaneno Band of Mission Indians and Hispanic community groups to ensure their active involvement in the IRWM Plan. Additionally, the IRWM Plan projects have recognized the benefits to support disadvantaged communities within their areas of influence. The following describes the outreach completed as a part of this IRWM Plan.

The Juaneno Band of Mission Indians tribe provided a letter of support for the 2005 IRWMP. In June 2012, David Belardes (Chief and Chairman of Juaneno Band of Mission Indians) was contacted and notified about the July 9, 2012 Stakeholder Workshop.

The Laguna Woods Village Professional Community Management (Homeowner's Association) was contacted and the July 9, 2012 Stakeholder Workshop announcement and OC link was provided to Professional Community Management. The invite notice and link were posted on the HOA website on in July 2012.[67].

[67] Wendy Bucknum, Professional Community Management. Laguna Woods Village HOA. 7/6/12.

The National Hispanic Environmental Council (NHEC) provided a letter of support for the 2005 IRWM Plan as a result of outreach efforts. In June 2012, NHEC was contacted and provided a copy of the 2005 letter of support. NHEC was invited to the July 9, 2012 Stakeholder Workshop.

Latino Health Access provided a project for inclusion in the 2005 IRWM Plan. Latino Health Access was contacted in June 2012 and invited to the July 9, 2012 Stakeholder Workshop.

OC Watersheds staff attended a California Latino Water Coalition (CLWC) event in 2010 at the Orange County Water District. In June 2012, CLWC was contacted via phone and email and invited to attend the July 9, 2012 Stakeholder Workshop.

The IRWM Plan and implementation of its projects will significantly benefit the Region's disadvantaged communities and support regional environmental justice.

5.7 Environmental Impacts / Benefits to Other Resources

The regional watersheds contain a wide variety of environmental resources, extending from headwaters to ocean, and from urban landscape to forested mountaintop. These resources include water, wildlife, cultural and physical landscapes.

Currently, local watersheds are suffering from a variety of water resource and related land resource problems. Most of these are related to widespread changes in the watersheds, including changes in the hydrologic regime, channel instability, habitat loss, ecosystem degradation, declines in water quality, threats to recreational resources, and others. While change is a part of the evolution of any landscape, dramatic change from a balanced historic state often results in undesirable consequences.

All proposed projects within the IRWM Plan are individually evaluated under CEQA guidelines to identify potential impacts (both negative and beneficial) to the following:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation and Traffic
- Utilities and Service Systems

Where significant potential negative impacts are identified, the CEQA/NEPA process will implement appropriate mitigation measures into the project. Responsibility for mitigation measures lies with the individual project sponsor(s). Where there are potential impacts to jurisdictional waters, habitats or species, mitigation requirements are determined within permitting processes with the RWQCB, US Army Corps of Engineers, and California Department of Fish and Wildlife. Federal anti-degradation policies for surface water quality and "no net loss" policies for wetlands are typically reflected in the permit requirements. The data management methods identified in Section 7 will work in conjunction with environmental impact analysis and ongoing project monitoring to identify potential impacts.

6 PROJECTS

The projects support the objectives and regional strategies described in Section 4 of this IRWM Plan. Implementation of the projects will enable the Region to reach its objectives, described in Section 5 of this IRWM Plan. Within this section, specific capital improvement projects and programs have been prioritized with consideration of implementing regional strategies within a 20-year planning horizon.

The specific projects listed are being developed by one or more of the public agency partners under the IRWM Plan. In certain cases, “Regional Action Projects” (RAP) have been defined where appropriate to implement a single strategy across the entire region that would involve all participants on a phased, as-needed funding basis. The project list is included in Appendix F of this report. Appendix F includes two lists: 1) a Priority Project List for projects to have an opportunity for funding, and 2) a Funded Project List for projects that have received funding and are in progress.

6.1 Project Review Process

The South Orange County IRWM Group has established a Project Review Process that is driven by the Governance Structure and IRWM Plan Updates process, as described in Section 2.6.2.

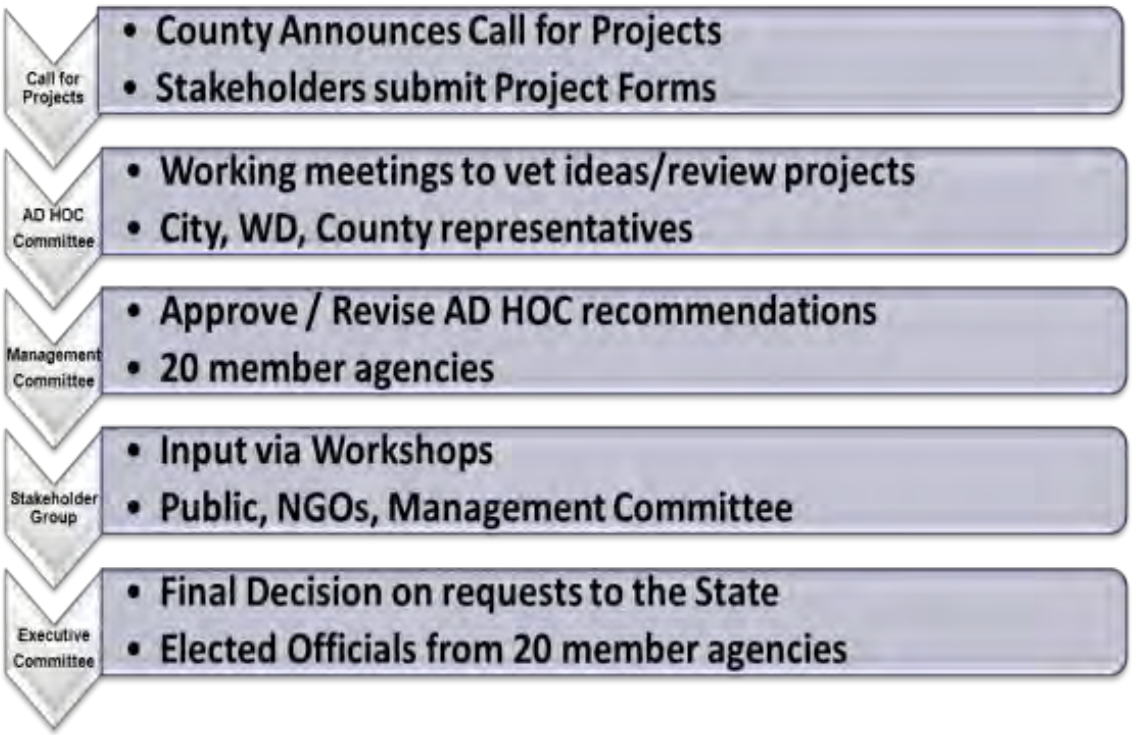

Figure 6-1: Project Review Process

6.1.1 Project Solicitation

The South Orange County IRWM Group solicited projects in 2012 for inclusion in the IRWM Plan Update. A Project Form was created and made available to interested

parties (see Appendix C). Projects that had completed forms were evaluated for inclusion on the Comprehensive Project List (see Appendix F). The Project Forms required project proponents to provide detail on their project, including the following:

- Implementation of IRWM Plan goals, objectives, and strategies
- Multi-benefit project
- Technical feasibility of the project.
- Project Costs and financing
- Economic feasibility (cost/benefit consideration)
- Project Status; Ready to proceed.
- Environmental clearance status.
- Equitable geographic distribution of projects (regional impact).
- Reduction of imported water supply dependence
- Benefits to Region, including DAC and Native American tribes
- Environmental Justice Considerations
- Impacts on Climate Change and GHG emissions

6.1.2 Evaluation and Prioritization

As a result of the 2012 Call for Projects, 57 project forms were received. These projects were added to previous projects for a total of 139 projects now included in the IRWM Plan.

To evaluate projects for potential funding, a system to compare and evaluate projects was developed. A point accumulation system was built for projects to be ranked, with the highest ranked projects receiving further evaluation for consideration. The ranking system consisted of each project proponent being given a copy of the IRWM Project Priority Evaluation Tool to rank each of their own projects. This was provided in a simple spreadsheet framework. Of the total 139 projects, 60 projects were evaluated based on the project proponents willingness to assess benefits. These projects were prioritized as shown in the Project Evaluation Summary in Appendix F.

The Project Priority Evaluation Tool uses a weighted additive formula for each project, summing the scores of weighted objectives within goals, and then summing the scores of each weighted goal to determine the total points a project receives. There are five goals. Each goal has two to seven objectives. And each objective has a number of strategies listed beneath by which a project can meet the objective.

Weighted values were assigned to each objective as well as to each goal. The following Table 6-1 identifies the weighting of each goal and each objective.

Table 6-1: Goal and Objective Weighting

Goals	Objectives	Weighting
Integrate Flood Management		3.4
	FR-1- Enhance flood protection for public safety and property	3.6
	FR-2- Implement economically and technically feasible multiple uses for flood control facilities	3.2
Improve Water Quality		4.5
	WQ-1- Comply with Clean Water Act and Porter-Cologne	4.4
	WQ-2 - Protect beneficial uses of receiving waters	4.1
Increase Water Supply and Reliability		4.3
	WS-1-Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	2.7
	WS-2-Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	3.5
	WS-3-Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	3.5
	WS-4-Increase capture and utilization of surface runoff for irrigation purposes	3.5
	WS-5-Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	3
	WS-6-Improve system reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	3.5
	WS-7-Manage and improve the supplies available to South Orange County for the collective benefit of the area	3.7
Promote Water Conservation		3.7
	WC-1-Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	3
	WC-2-Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	3.8
	WC-3-Maximize Efficiency of Utility Based Operations	3.1
	WC-4-Promote use of low impact design for new and existing developments	3.4
Protect Natural Resources		3.3
	NR-1-Enhance the functioning of regional aquatic ecosystems	3.1
	NR-2-Reduce impacts from surface runoff	4
	NR-3-Eradicate invasive species throughout the watershed	3
	NR-4 Minimize impacts to air, energy, land, materials and habitat resources	3.1

To determine the score for an objective, each project proponent evaluated how well a project met a given objective, by assigning a score of 0-5 on any number of strategies. Regardless of the number of strategies employed to meet the objective, the highest ranking strategy's score was multiplied by the objective weight. These weighted objective scores were then summed together for the goal under which they fell. This total value was then multiplied by the overall goal weighting. This process determined

the individual goal scores. Finally, the sum of all five goal scores determined a project's total points.

Using the Comprehensive Landscape Water Use Efficiency Program project as an example, Table 6-2 below lists all the strategies for the WC-2, WC-3, and WC-4 objectives under the goal of "Promote Water Use Efficiency". The strategies have been ranked from 0-5. The highest strategy value for a given objective is multiplied by the weight of that objective. The points for each set of objectives are summed and then multiplied by the weight of the goal to determine the total points for the goal. This process is performed through all the goals and their underlying objectives and strategies. Using the rankings in the table below, the math works out as: [(WC-2 = 3.8 * 5) + (WC-3 = 3.1 * 3) + (WC-4 = 3.4 * 4)] * 3.7 which totals 155.03 for the Goal "Promote Water Use Efficiency". When the points for all the goals are summed, the project total is achieved.

Table 6-2: Example Weighting

Goals	Objectives	*Strategies*		Weight
Promote Water Use Efficiency			Goal Points **155.03**	**3.7**
	WC-2-Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020		Objective Points **19**	**3.8**
		WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	*5*	-
		WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	*4*	-
		WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	*4*	-
		WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	*3*	-
		WC-2-S5-Provide landscape water efficiency education to landscape owners and managers	*3*	-
	WC-3-Maximize Efficiency of Utility Based Operations		Objective Points **9.3**	**3.1**
		WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards	*0*	-
		WC-3-S2-Implement conservation based rate structures	*0*	-
		WC-3-S3-Implement meter repair and replacement programs following AWWA Standards	*0*	-
		WC-3-S4-Update water waste prevention regulations every 5 years	*0*	-
		WC-3-S5-Implement school education and public information programs to consumers	*3*	-
	WC-4-Promote use of low impact design for new and existing developments		Objective Points **13.6**	**3.4**
		WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	*4*	-
		WC-4-S2-Achieve permit compliance by 2020	*0*	-

Once the project proponent scores were provided, they were reviewed by the Ad-Hoc committee for general adherence to the scoring guidelines. The projects that ranked the highest were selected for further review/vetting by the Stakeholder group. At a public workshop, the top projects were presented by the Project Proponents. The attendees chose a focus group to participate (one oriented towards each goal) and reviewed the scoring for all top ranked projects in that focus group's goal and updated the scores as needed to reflect the relative benefit derived from each project relative to the other top ranked projects. This stakeholder process was used to determine the final relative ranking of the top projects. High priority projects were ranked based on the following factors:

- Importance of the project to progress toward Regional Goals and objectives.
- Appropriate multipurpose balance achieved between the five key water strategy categories: Water Supply, Water Use Efficiency, Water Quality, Natural Resources and Flood Management.
- Equitable geographic distribution and participation by all IRWM Plan agencies is achieved.
- Ready to begin implementation.
- Commitment by individual agency sponsors to incorporate local funding within their fiscal year budget planning processes.
- Environmental clearance is already achieved, in progress, or readily achievable for the project.

The top projects were then further evaluated for the following:

- Contribution of the project in adapting to the effects of climate change in the region.
- Contribution of the project in reducing greenhouse gas emissions (GHG).

A comprehensive list of all projects and the Project Evaluation Summary Sheets, including the self-scored and re-evaluated project list with the Top7 high priority projects, can be found in Appendix F. The IRWM Group will continue to evaluate regional goals and modify the prioritized Projects list appropriately. As part of this 2013 Update the high priority projects include:

High Priority Projects

1. Comprehensive Landscape Water Use Efficiency Program – Municipal Water District of Orange County
2. Riparian Invasive Control Restoration, Monitoring, and Education, at Audubon Starr Ranch Sanctuary – Audubon Starr Ranch
3. Dairy Fork Constructed Wetland – Cities of Aliso Viejo, Lake Forest, Laguna Hills, and Laguna Woods
4. Baker Water Treatment Plant – Irvine Ranch Water District.
5. San Juan Creek Storm Drain L01S02 BMPs – City of Dana Point

6. Water Conservation, Implementation of Targeted Programs – South Coast Water District
7. Oso Creek Multi-use Trails – City of Laguna Niguel

Ongoing work is being performed by the IRWM members to establish overall targets for each project. This effort will be complete in 2013 and used in the next update of the IRWMP as well as used in the prioritization of projects considered for Round 3 Implementation Funding. The revised objectives and measurable goals are currently available in draft form and are included in Appendix K.

6.1.3 Contribution to Statewide Priorities

The SWRCB and DWR established Statewide Priorities that include the following:

- Drought preparedness
- Use and Reuse Water More Efficiently
- Climate Change Response Actions
- Expand Environmental Stewardship
- Practice Integrated Flood Management
- Protect Surface and Water and Groundwater Quality
- Improve Tribal Water and Natural Resources
- Ensure Equitable Distribution of Benefits

Efforts to meet Statewide Priorities and improve water quality conditions have been underway in the Region for many years, and have continually advanced as new technologies and resources have become available. All of the statewide priorities above are incorporated into the IRWM Objectives and Resource Management Strategies, as defined in this IRWM Plan. Refer to Section 4.1.1 for detailed discussion on the Statewide and regional goals.

6.1.4 Project Integration of Regional Strategies

As part of the project review process, projects that integrate multiple regional strategies, which are discussed in Section 5.4, were identified and ranked. The regional strategies were developed based on the state's Resource Management Strategies. Strategy integration includes implementing various projects that, when combined, achieve a synergistic approach to watershed management. The method for achieving full integration of strategies is through the careful implementation of the various projects. Though the projects must address at least one of the strategies targeting a regional objective, the majority incorporate several complementary strategies, often to achieve multiple objectives. For example, projects that assist with increasing water supply by offsetting imported water supply needs may also achieve watershed management through implementation of conservation measures throughout the watershed to enhance water use efficiency; reducing water demand by utilizing recycled water supplies; and improve operational efficiency and transfers in proposed development.

The method for achieving full synergy is through identifying projects that incorporate several complementary strategies to achieve multiple objectives.

Each project accomplishes several aspects of water management for the region.

The project review process itself allowed an open exchange/dialogue of existing and future plans. As discussed in Section 6.1.1 projects were prioritized based on readiness to proceed and accomplishment of IRWM plan strategies and objectives. Projects were either pulled from existing plans in its entirety or created through combining projects from different plans. As a result, the most immediate needs and balanced implementation was identified.

Benefits to implementing interregional benefits/advantages include increased opportunity for project implementation, collective planning to monitor regional changes and facilitate refinements for implementation, increased participation and cooperation by the public, shared costs, and cooperative land-based planning as opposed to confinement within political boundaries. Strategies and projects that address multiple objectives are typically the most cost-effective and resource-efficient, and are for the most part given higher priority in the IRWM Plan.

6.2 Impacts and Benefits

The intent of this Section is to document potential impacts and benefits of implementation of the IRWM Plan and to clearly communicate those impacts and benefits to stakeholders. In the development of an IRWM Plan, it is important that participants understand the potential benefits to be gained by implementing a regional plan and some of the impacts that may occur.

The list of implementation projects will change as the IRWM planning effort matures. This impact and benefit (Table 6-3) analysis serves as a benchmark as the Plan is implemented and Plan performance is evaluated. The IRWM Plan implementation will result in positive impacts and benefits to the watersheds within the WMA, between regions, disadvantaged communities, and environmental justice concerns, and Native American Tribal communities. As discussed in Section 4 of this IRWM Plan, the WMA has established Goals, Objectives, and quantitative and qualitative strategies for evaluating each project. The strategies contain units of measure that will be used to assess the impacts and benefits of implemented projects. Appendix F includes a list of the Top 7 projects and the projected impacts and benefits, as linked to qualitative and quantitative strategies.

Ongoing work is being performed by the IRWM members to further refine the overall targets associated with each project. This effort will be complete in 2013 and used in the next update of the IRWMP as well as used in the prioritization of projects considered for Round 3 Implementation Funding.

Table 6-3: Impacts and Benefits

IRWM Goal	Project	Within IRWM Region	
		Potential Impacts	Potential Benefits
Integrate Flood Management	Dairy Fork Wetland - Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	Enhance Flood protection for public safety and property.	Has the capacity to contain up to 72,000 cubic feet of stormwater.
		Reduction of pollutants entering storm drain and Aliso Creek	90% reduction
Protect Natural Resources	Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary - Audubon Starr Ranch Sanctuary	Land Management Activities	125 acres of invasive control, restoration, monitoring, and education
		Restoration of Oak (Riparian) Woodlands	125 acres of invasive control and song-bird monitoring
		Restoration of Significant Ecosystem and Natural Landscapes	125 acres of monitoring, protection, and restoration of riparian forests
		Restoration of Riparian Habitat Ecosystems	Management and monitoring of pristine Bell Creek within the 125 acre area
		Eradication of Invasive Species	Nonchemical control of riparian invasive species within the 125 acre area
		Fish Habitat	Habitat enhancement for potential steel head within the 125 acre area.
Water Quality Goal	San Juan Creek Storm Drain L01S02 BMPs- City of Dana Point	Improve Water Body Impairments	358 acre subwatershed improvement in beneficial use impairments
		Water Quality Improvement	358 acre subwatershed improvement in water quality
		Desalinization Water Quality Improvement	1600 acre-feet/year treated for water re-use
		Restoration of Riparian Habitat Ecosystems	2 acres of arundo removal and ecosystem restoration
Increase	Baker Water	Conveyance - Water	86 acre-feet per day of water

Water Supply and Reliability	Treatment Plant - Irvine Ranch Water District	Supply Enhancement	supply enhancement
		Conveyance - Water Quality Improvement	86 acre-feet per day of water quality improvement to drinking water standards
		Water Quality Treatment Technology	Advanced treatment using modern micro-filtration membrane and ultraviolet disinfection treatment technologies.
		New Water Supply Facilities	Design and Construction of a new membrane surface water treatment plant
		Improve Water Supply Facilities	86 acre-feet per day of water supply facilities
		Feasibility Studies – Flood Control/Water Supply	Study highlighted the need for a new water treatment plant.
Water Quality Goal	Oso Creek Multi-use Trails - City of Laguna Niguel	Trail construction/improvement	3,650 linear feet of new bike trail
		Urban greening	2.8 acre conversion from impervious to pervious landscaping
		Stormwater Quality Improvement	2.63 acres draining to bioretention BMPs
		Water Storage – Groundwater Water Supply Enhancement	70,000 cubic feet infiltrated from average annual rainfall of 13”
		Wildlife Habitat Linkage	14,500 square feet planted with native species
		Flood protection	5,000 cubic feet reduction in per-storm stormwater discharge volume
Water Conservation Goal	Comprehensive Landscape Water Use Efficiency Program - Municipal Water District of Orange County	Water Use Efficiency, Conservation – Water Demand/Conservation	8,883 acre-feet water saved over a 10 year project life
		Watershed Protection – Water Quality Improvement	50% reduction in runoff pollutant load

		Sediment Removal – Water Quality Improvement	50% reduction in dry-weather runoff volume
		Management Plans – Conservation	Water savings will assist the region in meeting its SBx 7-7 water savings goal of 20% by 2020
Water Conservation Goal	Water Conservation, Implementation of Targeted Programs - South Coast Water District	Reduced Potable water use inside businesses & homes and reduced water demands irrigation.	Targeted goal of 3 acre feet in water reductions over life of program and beneficial inclusion of 20 acres of land in program.
		Builds public awareness and encourages action	Target up to 12,000 of District Water Customers
		Compliance with 20 X 2020	Will achieve 12% of regions goals by 2020 if implemented widely.
		Compliance with CWA and Porter-Cologne	Monitor program participants for actual water use and runoff reductions.

The projects included in the table above are the high priority projects and are intended to serve as a sampling of the impacts and benefits of the total 139 projects on the comprehensive project list in Appendix F. The comprehensive project list shows each project identified by the most directly related water management strategy. Although numerous water management strategies may be implemented by each project, the discussion below provides an overview of how the high priority projects meet the IRWM Goals and reflect the comprehensive project list:

- Integrate Flood Management Goal – example project: Dairy Fork Wetland as sponsored by Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods. The comprehensive project list includes 6 projects with Flood Management impacts and benefits.
- Protect Natural Resources Goal– example project: Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary as sponsored by Audubon Starr Ranch Sanctuary and Oso Creek Multi-use Trails sponsored by City of Laguna Niguel. The comprehensive project list includes 14 projects with Natural Resource impacts and benefits.
- Increase Water Supply and Reliability Goal - example project: Baker Water Treatment Plant - Irvine Ranch Water District: The comprehensive project list includes 41 projects with Water Supply impacts and benefits.
- Water Conservation Goal - example projects: Comprehensive Landscape Water Use Efficiency Program - Municipal Water District of Orange County and

Implementation of Targeted Water Conservation Programs - South Coast Water District - The comprehensive project list includes 51 projects with Water Conservation impacts and benefits.

- Water Quality Goal – example projects: San Juan Creek Storm Drain L01S02 BMPs- City of Dana Point and Oso Creek Multi-use Trails - City of Laguna Niguel. The comprehensive project list includes 27 projects with Water Quality impacts and benefits.

The impacts and benefits of each Project implemented will be monitored by the measurable objectives. In this way, achievement of IRWMP Goals will be tracked. The Projects will have impacts and benefits throughout all the watersheds in the WMA, as described below.

6.2.1 Impacts on WMA Watersheds

The following discussion includes the high priority projects used as a sampling of the impacts and benefits for the South Orange County WMA watersheds.

6.2.1.1 Aliso Creek Watershed

As outlined in the Aliso Creek Watershed Management Plan, the watershed suffers from a number of problems related to water resources.[68] The identified problems are grouped in four general categories: creek instability, water quality, loss of fish and wildlife habitat, and flooding damages.

Human impacts have propagated water quality impairments in the Aliso Creek main-stem and tributaries, not supportive of designated beneficial uses and basin plan objectives. The Aliso Creek Watershed Work Plan[69] identifies eight watershed impairing pollutants, which include: indicator bacteria, selenium, total nitrogen, total phosphorous, toxicity, benzo[b]fluoranthene, dieldrin, and sediment toxicity, posing a significant concern to the health of the watershed.

Implementation of the IRWM Plan will result in watershed management to decrease negative impacts of human activities and to increase the positive impacts. This IRWM Plan's economic resources are necessary to enable the community to address and solve resource problems such as nonpoint source pollution. The IRWM Plan's goal-oriented objectives and management program can prevent problems before they occur and will result in less expensive and more efficient use of community energy. Efforts to accomplish needed improvements will include programs to reach several listed objectives of the plan.

[68] County of Orange. Aliso Creek Watershed Plan. 12/20/04. Available online 2/13/13: http://www.ocwatersheds.com/AlisoCreek_ReportsStudies.aspx

[69] County of Orange, OC Watersheds, "Aliso Creek Watershed Work Plan", January 1, 2012. Available online 12/6/12: http://www.ocwatersheds.com/Documents/2012_AlisoCreekWatershedWorkplan.pdf

The objectives are measurable milestones that will enable the community to track progress toward maintaining a natural balance in watershed resources. Most of the objectives promote and encourage practices and behaviors that support development of a healthy environment for the watershed. Education is therefore a major component of this management program, as well as enhanced public outreach to promote a more complete understanding of the environmental problems and the ecological value of the Aliso Creek Watershed.

This IRWM Plan's regional projects, such as the Comprehensive Landscape Water Use Efficiency Program, will assist in meeting the water conservation and water quality goals of all the watersheds throughout the region. Project goals and objectives assist in meeting several objectives of the Aliso Creek Watershed Management Plan and the Aliso Creek Watershed Work Plan. Implementation of the Comprehensive Landscape Water Use Efficiency Program would promote the transformation of turf intensive landscapes to California Friendly landscapes that emphasize plantings that have water needs similar to our natural rainfall or 12 inches of precipitation per year.

Verification of IRWM Plan implementation benefits will be measured on a project bases through evaluations that reflect water use before and after the landscape improvements. Working with local water districts, water use information for participating sites will be obtained for inclusion in project specific evaluations. The positive impacts will be carefully documented for credit in contributing to meeting basin plan objectives.

6.2.1.2 Dana Point Coastal Streams Watershed

The Dana Point Coastal Streams Watershed includes beneficial uses for several waterways. Priority concerns for the watershed are poor water quality affecting Salt Creek Beach and Baby Beach, and nuisance flows and environmental issues at the Dana Point Harbor. The Dana Point Coastal Streams Watershed Work Plan[70] identifies Indicator bacteria exceedances (as determined by fecal indicator bacteria) at the beaches, and the resulting potential for human health impacts, as currently the most significant concern.

The South Orange County IRWM Plan Implementation will positively benefit and impact the watershed. The goals and objectives of regional projects will assist in meeting several objectives of the Dana Point Coastal Streams Watershed. The Comprehensive Landscape Water Use Efficiency Program will reduce watershed irrigated landscape and improve irrigation efficiency, resulting in less pollution making its way downstream towards the beach into watersheds such as the Dana Point Coastal Streams. The poor water quality affecting Salt Creek Beach and Baby Beach are concerns related to inland runoff. Projects proposed in this Plain will assist in reducing overall runoff and nuisance flows.

[70] County of Orange, OC Watersheds, "Dana Point Coastal Streams Watershed Work Plan", January 1, 2012. Available online 12/3/12: http://www.ocwatersheds.com/Documents/2012_DanaPointCoastalStreamsWatershedWorkplan.pdf

The IRWM Plan's Water Conservation and Implementation of Targeted Programs project will also be implemented in the Dana Point Coastal Streams Watershed. This program will be complimentary to the Comprehensive Landscape Water Use Efficiency program by adding a watershed-wide education and outreach component, and by lending support to the analysis, planning, implementation, and measurement of program results for watershed conservation activities. This program would reduce dry weather nuisance flows, improve in-stream water quality, and provide support for impaired beneficial uses.

6.2.1.3 Laguna Coastal Streams Watershed

The Laguna Coastal Streams Watershed discharges into the Pacific Ocean in Laguna Beach and contains undeveloped areas largely within the Laguna Coast Wilderness Park and the Aliso and Wood Canyons Regional Park. The water quality in the Pacific Ocean along the Laguna Coastal Streams consistently ranks

among the cleanest in Southern California with regard to Ocean Plan objectives.[71] The primary reasons this watershed ranks so highly are the large amounts of open space within and the presence of seventeen dry weather diversion units on the largest subwatersheds.

Receiving waters offer several beneficial uses, including agricultural supply, non-contact and contact water recreation, warm freshwater habitats, and wildlife habitats. The Heisler Park Ecological Reserve is an Area of Special Biological Significance (ASBS) located in this watershed, and protection of the reserve is underway through stringent coastal planning efforts between the City of Laguna Beach, City of Newport Beach, Irvine Company, the County of Orange, California State Parks, and Caltrans. The Heisler Park Marine Habitat Protection Project was implemented as part of this IRWM Plan to assist in protecting the ASBS.

Implementation of the IRWM Plan will provide positive impacts and benefits to this watershed. To further protect the resources and beneficial uses in this watershed, regional projects will aid in the reduction of watershed irrigated landscapes, improve irrigation efficiency, and decrease associated nuisance flows, which can carry pollutants to creeks and the ocean. The projects will also help meet receiving water objectives established in the Region 9 San Diego Basin plan as well as indicator bacteria objectives established in the Region 9 Beaches and Creeks Bacteria TMDL.

6.2.1.4 San Juan Creek Watershed

The San Juan Creek Watershed is the largest watershed in the South Orange County WMA. A small western portion of the San Juan Creek Watershed extends into Riverside County, which is in an adjacent IRWM region. The Creek ultimately discharges into the Pacific Ocean at Doheny Beach. The watershed includes the

[71] County of Orange, OC Watersheds, "Laguna Coastal Streams Watershed Work Plan", January 1, 2012. Available online 12/3/12: http://www.ocwatersheds.com/Documents/2012_LagunaCoastalStreamsWatershedWorkplan.pdf

following beneficial uses: agricultural supply; cold freshwater habitat; industrial; contact water recreation; non-contact water recreation; spawning habitat; warm freshwater habitat; and wildlife habitat. The following designations apply to the mouth of San Juan Creek: rare, threatened, or endangered species; non-contact water recreation; marine habitat; migratory habitat; shellfish habitat; and wildlife habitat.

The San Juan Creek Watershed Management Plan identifies the following as the most severe problems in the watershed: Flooding and erosion, general ecosystem degradation including channel and floodplain instability, poor water quality (both in surface waters and ocean nearshore zone, and loss of habitat with associated wildlife loss.[72]

Human impacts have propagated water quality impairments in the San Juan Creek main-stem and tributaries, not supportive of designated beneficial uses. The San Juan Creek Watershed Work Plan[73] identifies eight watershed impairing pollutants, which include: indicator bacteria, chloride, sulfates, total dissolved solids, DDE, diazinon, and selenium, posing a significant concern to the health of the watershed.

This IRWM Plan contains regional water quality projects, such as MWDOC's Comprehensive Landscape Water Use Efficiency Program, that will help protect the beneficial uses of downstream waters in the San Juan Creek Watershed by reducing the amount of surface runoff and pollution entering the waterways through reducing landscape irrigation and improving irrigation efficiency.

The City of Dana Point's proposed San Juan Creek Storm Drain L01S02 BMPs will remove trash from runoff and infiltrate and/or divert nuisance dry weather flows for treatment from the L01S02 storm drain before entering the San Juan Creek, which directly discharges to the Pacific Ocean at Doheny State Beach. This project would further help support impaired beneficial uses by reducing watershed priority pollutant loadings. It also includes an arundo removal component to further improve the watershed and habitat.

The Audubon Starr Ranch Sanctuary will restore 125 acres of riparian and wetland habitat in the Starr Ranch Sanctuary on Bell Creek, a major tributary to San Juan Creek in the upper watershed. Restoration of the site will ensure increased protection of water quality and sustained beneficial uses for recreation and wildlife uses on San Juan Creek.

This IRWM Plan also contains flood risk management projects, including OCFCD's Channel Improvements to San Juan Creek and Trabuco Creek Channels to fortify levees to protect homes and businesses from the threat of storms. OCFCD's feasibility study, currently being prepared by the US Army Corps of Engineers, focuses on flood

[72] County of Orange, OC Watersheds, "San Juan Creek Watershed Management Plan," September 2002. Available online 12/3/12: http://www.ocwatersheds.com/Documents/San_Juan_Creek_WMP_Sep2002.pdf

[73] County of Orange, OC Watersheds, "San Juan Creek Watershed Work Plan", January 1, 2012.

risk management and potential ecosystem restoration opportunities on the lower reaches of San Juan Creek Watershed.

In addition, the Oso Creek Multi-use Trails Project will result in significantly improving the quality of water flowing through the watershed while increasing pollutant removal. The project will replace existing impermeable roadway surfaces with permeable bikeways and walkways and native landscape areas, and provide stormwater hydromodification facilities for groundwater recharge along new and proposed creek-side trails. Activities are expected to decrease stormwater runoff and pollutant loadings in the watershed. The IRWM Plan implementation will provide treatment of surface runoff and protect downstream waters, contributing to meeting the Basin Plan objectives.

6.2.1.5 San Clemente Coastal Streams Watershed

The San Clemente Coastal Streams Watershed includes Prima Deshecha Canada, one of two main streams that flow through the City of San Clemente which ultimately discharges into the Pacific Ocean at Poche Beach. The following existing beneficial uses are designated in the Basin Plan for the receiving waters listed above: agricultural supply; contact water recreation; non-contact water recreation; warm freshwater habitat; and wildlife habitat. The San Clemente Coastal Streams Watershed Work Plan[74] identifies indicator bacteria exceedances (as determined by fecal indicator bacteria) at our beaches, and the resulting potential for human health impacts, as the most significant issues.

The beach has been routinely posted for exceedances of fecal indicator bacteria standard when tested in the surf zone. A dry weather filtration/UV disinfection plant at the Poche Creek outlet was completed in 2009 and is currently undergoing performance testing.

The IRWM Plan implementation will help protect this watershed and enhance the water quality. Specifically, projects like the Comprehensive Landscape Water Use Efficiency Program will regionally assist in enhancing the water quality of beaches. Landscape irrigation is the largest demand in the South Orange County WMA. Therefore, by reducing the amount of surface runoff carrying pollutants to the beaches, regional water conservation projects will help meet the beneficial uses of the San Clemente Coastal Streams Watershed.

6.2.1.6 San Mateo Creek Watershed

Most of San Mateo Creek and its outlet to the Pacific Ocean, at San Onofre State Beach, are actually located in San Diego County, in an adjacent IRWM region. There are both existing and potential beneficial uses as described in the Basin Plan for the

[74]County of Orange, OC Watersheds, “San Clemente Coastal Streams Watershed Work Plan,” January 1, 2012. Available online 12/3/12: http://www.ocwatersheds.com/Documents/2012_SanClementeCoastalStreamsWatershedWorkplan.pdf

San Diego Basin. The following existing potential beneficial uses are designated in the Basin Plan for the receiving waters listed above: cold water habitat; rare species habitat; contact water recreation; non-contact water recreation; spawning habitat; warm water habitat; and wildlife habitat. There are currently no 303(d) impaired waterbodies in the portion of the San Mateo Creek Watershed within Orange County, nor have any pollutants of concern been identified.[75]

There are several projects within this IRWM Plan that, once implemented, will result in water quality, water conservation, and other benefits. For example, the Comprehensive Landscape Water Use Efficiency Program, the Oso Creek Trails Multi-use Project, the Dairy Fork Wetland Project, and the L01S02 diversion project will collaboratively work to reduce the overall pollutant load transport within the South County WMA and Coastal Zone. This cohesive approach to regional projects is consistent with enhancing water quality in the San Mateo Creek Watershed by reducing dry weather nuisance pollutant run-off.

As demonstrated, the proposed Projects within this proposal are consistent with the San Diego Basin Plan objectives for protecting beneficial uses of the waterways (and watersheds) throughout the South Orange County WMA. Collectively, the Projects will protect the South Orange County WMA's precious water resources for the greater San Diego Region.

6.2.2 Inter-regional Impacts

Coordination among the Tri-County FACC ensures that inter-regional benefits and impacts of proposed IRWM projects are considered. Collaboration among the San Diego, Upper Santa Margarita, and Orange County Regions through the Tri-County FACC will result in implementation of projects and programs that are mutually beneficial for water managers throughout the Funding Area. Potential negative impacts associated with this collaboration are limited to construction-related impacts associated with individual projects. However, project-specific and/or programmatic environmental compliance processes will mitigate those impacts.

6.2.3 Disadvantaged Communities, Environmental Justice, Tribal Communities

Disadvantaged Community (DAC) involvement is an important part of the South Orange County IRWMP process. The disadvantaged communities of South Orange County are in the City of Laguna Woods. The Projects will protect the water resources of the region, which are used by all members of the region, including members of disadvantaged communities (DAC's). The surrounding areas of Doheny State Beach Park, the Dana Point Harbor, area beaches, and parks located along regional stream courses serve as community gathering places for communities and are used heavily

[75] County of Orange, OC Watersheds, "San Mateo Creek Watershed Work Plan," January 1, 2012. Available online 12/3/12: http://www.ocwatersheds.com/Documents/2012_SanMateoCreekWatershedWorkplan.pdf

year round on the weekends. Many of the recreational areas are accessible via public transit and do not charge an entrance fee for walk-in visitors.

Poor water quality can negatively impact the recreational opportunities for disadvantaged community members. Several projects within the IRWMP focus on identifying the cause of water pollution for Doheny Beach and other beaches within the Region. Water quality is a key consideration for the Region to ensure protection of the health and safety of the entire population in the area, especially for the disadvantaged community residents that do not have the means to travel to other areas of the state or country. By addressing water quality issues in areas of recreational use, the IRWMP incorporates environmental justice in a way that provides every resident equal opportunity and fair treatment in the regional water planning process.

Disadvantaged community members use natural areas that are open and available to the public at no cost. Proposed Projects meet multiple objectives and provide recreational and aesthetic benefits, including contact and non-contact water recreation, and other passive activities available at no cost to all community members.

The Projects included in this IRWM Plan address the water quality needs of DACs. For example, MWDOC's Comprehensive Landscape Water Use efficiency program will directly address beaches recreated by DAC members by reducing dry weather runoff pollutants and protecting costal resources like marine reserves, tidepools, and beach zones. The Region's Water Conservation and Targeted Programs will provide water conservation education and outreach to DAC members and help protect future opportunities for recreation and support established beneficial uses of the Creek and Beaches within the Dana Point and Laguna Coastal Streams watersheds.

Projects focused on improving the water quality of Aliso Creek Beach, like Aliso Viejo's Dairy Fork Wetland project, will greatly benefit disadvantaged communities, especially low-income apartment complexes along the upper Aliso Creek. Aliso Creek beach is accessible through the Orange County Transportation Authority bus system since it is a facility of the County of Orange. This beach along with beaches and parks in the Region serve the disadvantaged communities equally since there is no entrance fee.

Projects in this Plan focus on increasing recycled water supply for the region. The City of San Clemente's Recycled Water Treatment and Distribution project was funded under Proposition 50 IRWM Implementation Grant Program. Upon completion in 2014, the project will reduce wastewater effluent into the ocean accommodating disadvantaged communities that utilize neighborhood parks and beaches as a weekend retreat.

In addition, El Toro Water District's Recycled Water Distribution System Expansion was funded by Proposition 84 Round 1 Implementation Grant and consists of constructing a new recycled water distribution system to serve the El Toro Water District Service Area that includes disadvantaged communities in the City of Laguna Woods. The project would result in the conversion of approximately 75 existing potable water dedicated irrigation meters to recycled water. The conversions would reduce the amount of potable water imported by the District by as much as 300 acre feet per year. This Project would directly benefit disadvantaged community members.

Disadvantaged communities will continue to enjoy the beach and ocean resources as a result of fewer beach closure days due to higher water quality. Water quality is a key consideration for the Region to ensure protection of the health and safety of the entire population in the area, especially for the disadvantaged community residents that do not have the means to travel to other areas of the state or country.

6.3 Completed/Funded Projects

Since the launch of the South Orange County IRWM Program in 2005, the WMA has successfully implemented several projects. Prop 50 Integrated Regional Water Management Implementation Grant provided $25,000,000 for the following projects:

1. Water Use Efficiency Program Expansion: MWDOC on behalf of 13 cities and 12 special districts in South Orange County – Status: Completed 2012.

2. Canada Gobernadora Multipurpose Basin: Santa Margarita Water District - Status: Design Phase, completion estimated for 2014.

3. Heisler Park Marine Habitat Protection: City of Laguna Beach - Status: Completed 2013.

4. J.B. Latham Treatment Plant – Advanced Water Treatment: South Orange County Wastewater Authority, in cooperation City of San Juan Capistrano, Moulton Niguel Water District, and South Coast Water District - Status: Cancelled.

5. Groundwater Recovery Plant, Recycled Water, and Non-potable Water Transmission System Improvements: City of San Juan Capistrano – Status: Completion scheduled for 2013.

6. Recycled Water Treatment and Distribution: City of San Clemente - Status: Completion scheduled for 2013.

7. Aliso Creek Environmental Restoration Project: County of Orange, South Orange County Wastewater Authority (SOCWA), and Moulton Niguel Water District (MNWD) - Status: Completion scheduled for 2013.

8. Coastal Treatment Plant Export Sludge Equalization Basin: South Orange County Wastewater Authority - Status: Completion scheduled for 2014.

9. Recycled Water Distribution System Expansion: El Toro Water District – Status: Completed 2013.

10. Aliso Creek Urban Runoff Recovery, Reuse, and Conservation: South Coast Water District - Status: Completion scheduled for 2013.

In 2008, the Orange County Flood Control District (OCFCD) was awarded $5,000,000 under the Prop 84 LLUR Local Levee Urgent Repair Grant for the following project:

1. San Juan Creek Channel (Facility No. L01) from 2100-ft upstream to 6100-ft upstream Stonehill Drive (left side) Phase 1 - Status: Completed in November 2009.

In 2011, the South Orange County WMA was awarded a Prop 84 IRWM Round 1 Implementation Grant for $2,316,780 for the following three projects:

1. South Orange County Water Smart Landscape (WSL) Project – MWDOC - Status: Completion scheduled for April 2016.

2. Rockledge Ocean Protection Project – City of Laguna Beach - Status: Complete May 2013.

3. Shadow Rock Detention Basin Project – Trabuco Canyon Water District – Status: Completion scheduled for February 2014.

In 2013, the South Orange County WMA submitted a Prop 84 IRWM Round 2 Implementation Grant for $1,708,646.85 to fund the following projects:

1. Municipal Water District of Orange County's (MWDOC) Comprehensive Landscape Water Use Efficiency Program.

2. Audubon Starr Ranch Sanctuary's Riparian Invasion Control, Restoration, Monitoring, and Education Project.

3. Irvine Ranch Water District's (IRWD) Baker Water Treatment Plant.

4. South Coast Water District's (SCWD) Targeted Water Conservation Program.

5. County of Orange Grant Administration

6.4 Plan Performance and Monitoring

As discussed under Section 2 Governance, the South Orange County WMA includes an IRWM Group (includes all stakeholders), Executive Committee, and Management Committee. Together, the groups oversee the IRWM Plan Implementation through the project review process discussed in Section 6.1. The project review process includes evaluating and ranking each project based on the extent to which it meets the IRWM Plan objectives. IRWM Implementation will be tracked with a Data Management System, maintained by the County of Orange or other designated entity to continuously track project success and overall IRWMP implementation. As shown in Figure 7-1, primary data management functions will continue to reside with the primary data collectors (data owners).

State Funded Projects

Per state funding requirements, the lead agency of each state-funded project implemented will be responsible for developing project-specific monitoring plans and activities at the start of project operation/implementation. As applicable, projects will

include a Project Monitoring and Performance Plan and a Quality Assurance Project Plan where water quality monitoring will be performed and lessons learned will be documented. At a minimum, each implemented Project funded by state funds will complete a Project Monitoring and Performance Plan which will evaluate and monitor the WMA's ability to meet the objectives and implement projects in the IRWM Plan. The Plan will include:

a) Project Performance Measures table with the following:
   - Project Goals (Benefits/Objectives)
   - Desired Outcomes
   - Performance Indicators
   - Measurement Tools and Methods
   - Targets (Prior to Project Completion)

b) Measurement Tools and Methods: Description of performance measures that will be used to quantify and verify project performance.

c) Measurement Tools and Methods: Description of monitoring system to be used to verify project performance with respect to the project benefits or objectives identified; Description of where data will be collected and types of analysis used. Identify schedule and frequency for monitoring.

d) Project Goals: Description of how monitoring data will be used to measure the performance in meeting the overall goals and objectives of the IRWM Plan.

e) Monitoring protocols/methodologies to be performed by project's lead agency.

These performance plans will address how the project will result in measurable improvements in water supply, water quality, watershed condition, capacity for effective watershed management, and other measurable benefits. In this way, the projects will meet the objectives of the IRWM Plan.

An example of a Project recently completed as part of this IRWM Plan implementation is MWDOC's Water Use Efficiency Program. The program installs SmarTimer irrigation systems throughout residential homes and commercial properties. The project has resulted in the following water savings:

- Residential Homes: 1,215 installations completed, 671 acre-feet water savings.
- Commercial Properties: 1,324 Installations completed, 10,776 acre-feet water savings.

The program is monitored by MWDOC to continue tracking the number of SmarTimers installed and the total water savings. This has a direct impact on the South Orange County WMA regional demand and offsets the need for imported water supply. Programs or projects like MWDOC's provide important data for ongoing plan performance and monitoring. These efforts are helping the WMA meet its objectives to: Improve Water Quality, Increase Water Supply and Reliability, Promote Water Use Efficiency, and Protect Natural Resources.

Section 7 Data Management describes how the state-compatible data will be available to stakeholders.

Non-state Funded Projects

Individual projects not funded by state bond programs may establish other indicators of success as applicable. The following list shows the methods of project monitoring and performance measuring that are either already being implemented within the Region or will be implemented with the IRWM Plan to meet objectives:

- Increased community awareness and participation
- Increased watershed partnerships
- Improved water quality measurements
- Acres of wetland restored
- Feet of stream channel stabilization
- Photo documentation

Much of the data that currently exists for the various projects is included in existing local and regional plans, documents, and programs identified in Section 10. As the IRWM Plan is implemented, objectives may need to be updated based on alterations to baseline data or understanding of water management issues. In this circumstance, any amendments to the objectives will go through IRWM Group, Management Committee, Executive Committee and stakeholder review to adequately identify water demand, water supply, water quality projections, environmental stewardship, and actions that may support DACs.

7 DATA MANAGEMENT

7.1 Data Management Collection

Water management data has been, and is currently being, collected throughout the region by various governmental and non-governmental organizations. Data is technical information such as designs, feasibility studies, reports, and information gathered for a specific project in any phase of development including planning, design, construction, operation, and monitoring of a project. This includes data from the monitoring of surface water quality, surface flow, groundwater quality and quantity, stormwater runoff (NPDES Program), water use, and habitat assessments. The objective of data collection is to: 1) define existing conditions, 2) help develop water management objectives, 3) evaluate project and overall Plan effectiveness, 4) provide a tool for IRWM planning and decision making, and 5) provide a means of sharing information with state agencies, stakeholders, and the general public. The proper collection, organization, storage, and analysis of this data is essential to the continued success of integrated regional water management and to the ongoing participation and support of stakeholders.

Providing an adequate water supply remains a critical requirement for the South Orange County WMA. Imported water supply accounts for approximately 90 percent of the South Orange County WMA's potable water supply, and local water maintains and protects the area's ecological functions that are dependent on the availability of high quality surface water and groundwater. The continued collection and analysis of the Region's water use data, industrial, agricultural, and domestic, will assist the IRWM Group with water needs planning and how and where to focus conservation efforts.

The urbanization of the South Orange County WMA has placed considerable stress on the quality of its local water resources. Dry and wet weather surface flows have increased due to a reduction of absorbent landscape and an increase in impermeable coverage. Increased stream flows often lead to erosion of riparian habitats.

Streambed and overland flows carry pollutants endemic to urbanized areas, increasing pollutant loading in the water bodies of the South Orange County WMA's seven watersheds and the connected coastline. Polluted runoff is considered to be the major contributor of pollution to water bodies throughout the Region and the leading cause of water quality impairments. Despite the various existing programs designed to monitor polluted runoff (Municipal Stormwater Permit, TMDLs, Non-point Source Program), efforts are often hampered by a lack of specific knowledge about individual sources within the Region that collectively contribute polluted runoff. Effective management will require that: data collection be focused on better characterizing the specific sources of polluted runoff; Best Management Practices are developed to address the pollutants generated, and; monitoring and tracking improvements are developed for the runoff produced from these sources.

It is the purpose of IRWM planning to provide a regional focus, prevent duplicating data efforts, and provide access to water and land use plans, GIS data, IRWM planning information, and various technical data.

The South Orange County IRWM Group shall continue to promote the collection and dissemination of data that will provide information valuable to the management, conservation, and quality of the region's limited water supply, and for the continued preservation of the region's delicate ecological resources.

7.2 Existing Monitoring Efforts

Various monitoring is being implemented throughout the Region to meet water quality data needs. The following list represents monitoring efforts. All projects proposed in this plan will implement one or more of the following data monitoring efforts:

- Water Quality Monitoring: For those projects designed to improve the chemical quality of water, water sampling is expected to be performed in a manner compatible with State prescribed methods. A Quality Assurance Project Plan (QAPP) may also be required for such projects.
- Ambient Water Quality Monitoring: Monitoring data for these projects will follow the SWAMP data reporting requirements.
- Load Reduction Monitoring: Projects that are designed to prevent pollutants from impacting water bodies will generate an annual estimate of load reductions achieved.
- Stream and Wetland Monitoring: Projects that include protection or restoration of streams, shorelines, or wetlands will include an annual accounting of the acreage of wetlands restored, feet of streambank and shoreline protected, and feet of stream channel stabilized, as appropriate.
- Photo-Monitoring: Projects that include restoration or enhancement activities will include photographic documentation in accordance with the guidelines produced by the SWRCB.

As projects within the Plan come to fruition, monitoring and information management will be implemented. To ensure data consistency and quality assurance, two activities will be employed, as consistent with the SWRCB and DWR: quality control and quality assessment. Quality control assures that adequate sampling and technical activities are employed. Quality assessment refers to the process of quantifying the effectiveness of the quality control procedures.

7.3 Data Management System and Dissemination

A wide variety of water and natural resource data are collected throughout the region by various entities such as permitted dischargers, non-governmental organizations (NGOs), research institutes, and government agencies. In addition, the SOC IRWM Group has an extensive list of Studies and Data Sets, as included in Table 9-1 in Section 9 of this Plan. Technical information and data sets are obtained from the extensive planning and technical studies that have been conducted for the WMA Watersheds. Projects are supported by specific studies.

The responsibility of maintaining and managing this data is typically the responsibility of the entity collecting it. It is the intent of the SOC IRWM Group to support data collection throughout the region and assist with consistency, management, and dissemination of

the data to support regional decision making, stakeholder interests, and public education and involvement.

As shown in Figure 7-1, primary data management functions will continue to reside with the primary data collectors (data owners). The data owners are responsible for the collection, storage, quality assurance/quality control (QA/QC), analysis, reporting in compatible formats, and dissemination of the data to any data bases already receiving their data. Data owners are responsible for ensuring that the data disseminated to the existing state databases, including IWRIS, CERES, CEDEN, SWAMP, GAMA, and other RWQCB programs, is in a format compatible with those databases.

The County shall work with stakeholders to implement a consistent QA/QC program for data collection and analysis, avoid data redundancy, work to fill data gaps, and ensure data comparability. Figure 7-1 shows the process of data collection, storage, and dissemination to IRWM participants, stakeholders, the public, and state.

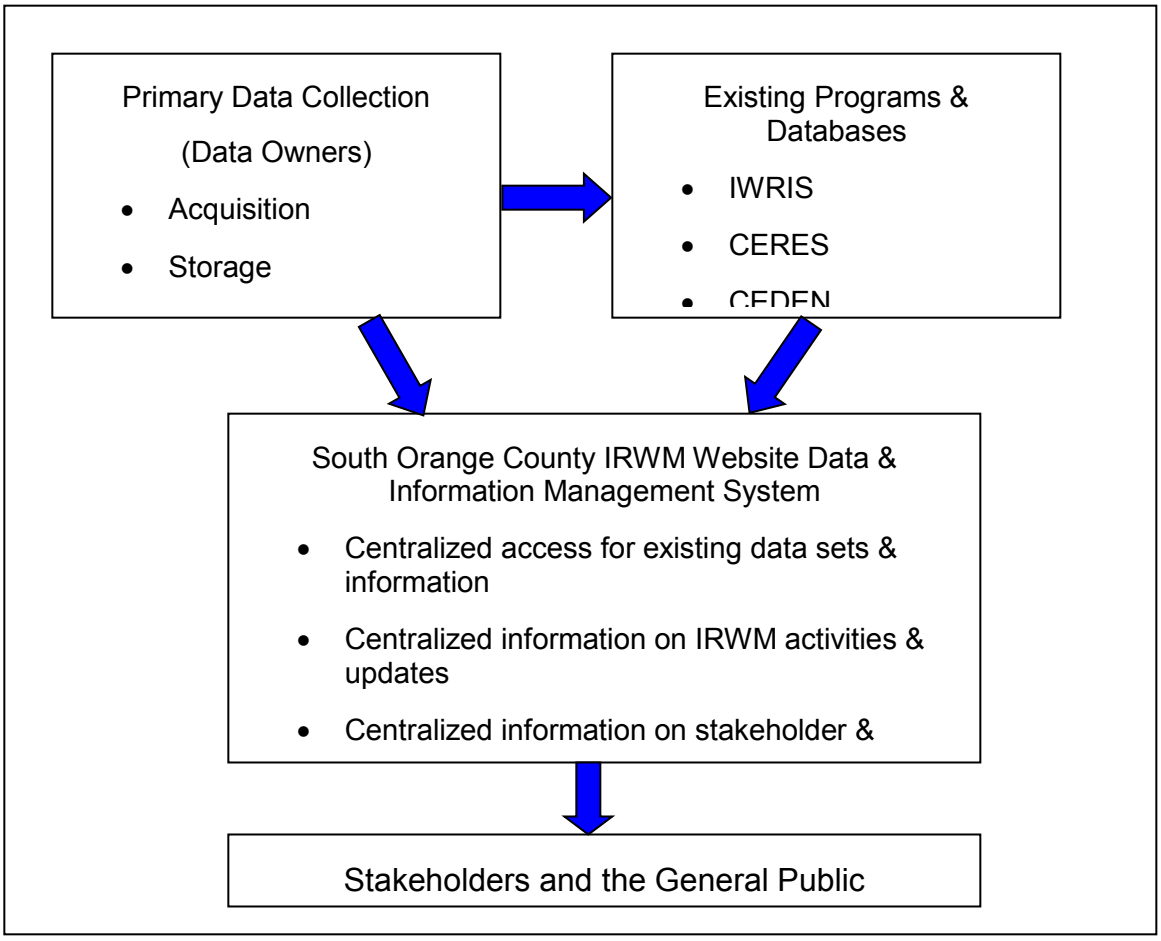

Figure 7-1: Data Management

Examples of data to be made available on the County's website include: information sets, Plan project information, IRWM planning process information such as meeting schedules, meeting minutes, agendas, annual reports, Plan updates, etc. All

information will be posted in user-friendly electronic formats accessible to the general public. Other relevant information will be made available on the website such as related web links and stakeholder and agency contact information. Other monitoring websites will be identified and utilized as appropriate during implementation of the Plan.

The South Orange County IRWM Data & Information Management System supports the IRWM Group's efforts to share collected data with other interested parties including local, state, and federal agencies by providing transparency of information and consistency of data. The data formats will be compatible with state data management programs to provide widespread access to regional information.

IRWM stakeholders and the general public shall be informed of updates in IRWM planning procedures and online data availability through email notifications or physical mailings to interested parties. Consistent outreach with the public will encourage ongoing participation.

State Data Management Programs

To promote data reliability, the Region will implement techniques compatible with State programs such as the Integrated Water Resources Information System (IWRIS), the California Environmental Resources Evaluation System (CERES), the California Environmental Data Exchange Network (CEDEN), the Surface Water Ambient Monitoring Program (SWAMP), and the Groundwater Ambient Monitoring and Assessment (GAMA) Program.

The following provides an overview of the State information and data exchange programs, including IWRIS, CERES, CEDEN, SWAMP, and GAMA:

IWRIS: http://www.water.ca.gov/iwris/images/what_iwris.gif. IWRIS is a data management tool for water resources data. It is a web based GIS application that allows you to access, integrate, query, and visualize multiple sets of data. The IWRIS databases include the DWR Water Data Library (WDL). The WDL database stores data from various monitoring stations, including groundwater level wells, water quality stations, surface water stage and flow sites, rainfall/climate observers, and water well logs. IWRIS databases also include the California Data Exchange Center (CDEC), USGS streamflow, Local Groundwater Assistance Grants (AB303), and data from local agencies. Information on IWRIS is available at: www.water.ca.gov/iwris.

CERES: The California Environmental Resources Evaluation System (CERES) is an information system developed by the California Resources Agency to facilitate access to a variety of electronic data describing California's rich and diverse environments. The goal of CERES is to improve environmental analysis and planning by integrating natural and cultural resource information from multiple contributors and by making it available and useful to a wide variety of users.

CERES collects and integrates data and information and distributes it via the World Wide Web, tapping into important information sources and contributing to advances in the science of data management and metadata cataloging by encouraging cooperation among governmental, educational, and private groups.

CERES focuses on three related components: technology, data, and community. The first, technology, includes the development of new software and network structures to accommodate the search and retrieval, organization, and accessibility demands associated with huge volumes of data in a wide range of forms. The second, data, encompasses the conversion of vast quantities of information into digital form as well as the evaluation of existing digital data sets and the development of metadata catalogs required searching and data-quality and appropriate use assessment. The third, community, contains CERES' efforts to promote the use of the network for planning and policy and to foster the growth of new users and contributors in a far-reaching web of affiliations.

CERES also coordinates focused applications to support well-defined natural resource management activities and to supply the public with critical and timely information.

CERES' Web links that have been developed include:

- Environmental Education
- Environmental Law
- Land Use Planning Information Network
- Watershed Information Technical System
- California Wetlands Information System
- The California Environmental Information Catalog
- California Environmental Keyword Thesaurus

Data standards are central to the exchange of information between CERES partners. Some data are exchanged by manually transferring them into a shared system. Other data are exchanged using machine to machine transfers. CERES has identified multiple websites and standards to be useful for coordinated data sharing, including the California Environmental Information Catalog (CEIC). CEIC is CERES' own online directory for reporting and discovery of information resources for California. Potential partnerships for information exchange utilizing this system include cities, counties, utilities, state and federal agencies, private businesses, and academic institutions that have spatial and other types of data resources. CEIC is based on the Federal Geographic Data Committee (FGDC) metadata standard. Contributors may enter data into the catalog via a convenient web interface, or with a batch process by exporting the data to an XML file made available to CEIC over the Internet.

CEDEN: The California Environmental Data Exchange Network (CEDEN) is another of CERES' identified websites for coordinated data sharing. CEDEN is a growing statewide cooperative data exchange program of various groups involved in the water and environmental resources of the State of California. Most of CEDEN's data exchange services are custom developed using a robust tool set which has been used to connect scores of programs into the network. Multiple projects are underway to extend CEDEN data exchange to additional standards and those services should be available in the coming year. The Surface Waters Ambient Monitoring Program

(SWAMP) describes the standards used for these services, as well as the Environmental Data Standards Council (EDSC), which uses standards to establish data exchanges with the CalEPA sector of the US EPA National Environmental Information Exchange Network.

SWAMP: The Surface Water Ambient Monitoring Program (SWAMP) was proposed to integrate existing water quality monitoring activities of the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB), and to coordinate with other monitoring programs.

SWAMP is a statewide ambient monitoring effort designed to assess the conditions of surface waters throughout the state of California. Responsibility for implementation of monitoring activities resides with the nine RWQCBs that have jurisdiction over their specific geographical areas of the state. Ambient monitoring refers to any activity in which information about the status of the physical, chemical, and biological characteristics of the environment is collected to answer specific questions about the status, and trends in those characteristics. For the purposes of SWAMP, ambient monitoring refers to these activities as they relate to the characteristics of water quality.

SWAMP also hopes to capture monitoring information collected under other State and Regional Board Programs such as the State's TMDL (Total Maximum Daily Load), Nonpoint Source, and Watershed Project Support programs. SWAMP does not conduct effluent or discharge monitoring which is covered under National Pollutant Discharge Elimination System permits and Waste Discharge Requirements. In addition, local project implementation and reported water quality results will also provide additional monitoring information for the SWAMP.

Monitoring and assessment of ambient water quality and beneficial uses is necessary in order to:

(a) Identify and characterize water quality and beneficial use problems and threats;

(b) Identify trends in water quality and beneficial uses;

(c) Determine whether water quality standards are met;

(d) Evaluate the uniqueness or pervasiveness of problems;

(e) Evaluate the severity of problems;

(f) Make decisions about which problems and which locations should be prioritized for action; and

(g) Make decisions about what actions should be taken.

In accordance with Clean Water Act section 305(b), the SWRCB and RWQCBs periodically compile an inventory of the state's major waters and the water quality condition of those waters, using monitoring data and other pertinent information. This

inventory is known as the Water Quality Assessment. The Water Quality Assessment is the foundation upon which the TMDL Program is built, although continues to be inadequately funded.

To enhance the need for more extensive and more thorough monitoring and assessment of the waters of the San Diego region, monitoring and assessment, for both status and trends, needs to be planned, ongoing, and continuous. The San Diego RWQCB uses SWAMP resources to ensure that monitoring is conducted in each hydrologic unit once in every five-year period. The San Diego RWQCB locates monitoring sites on main stem rivers and streams, just above tidal influence; main stem rivers and streams just above the confluence with major tributaries, and major tributaries just above the confluence with the main stem rivers and streams.

In the WMA, nine monitoring stations are included in the following watersheds:

- Aliso Creek (1)
- San Juan Creek (2)
- Arroyo Trabuco (1)
- Oso Creek (1)
- Bell Canyon Creek (1)
- Laguna Canyon Creek (1)
- Moro Canyon Creek (1)
- English Creek (1)

Ambient monitoring is not intended to be conducted only by SWRCB / RWQCB staff. Academic and other research groups, dischargers, and other stakeholders all have a role in monitoring and assessment. The South Orange County IRWM Group will assist in meeting the goals of the Water Quality Assessment Program and the SWAMP by providing water quality data to the State's programs. This additional level of monitoring information will be conducted and coordinated with the State to enable sharing of information and avoid duplicative monitoring. The State's monitoring coordination program, initiated in July 2004, will assist in identifying regulatory and non-regulatory monitoring efforts in the San Diego Region and to coordinate the SWAMP monitoring efforts with these programs. For more information, please visit the State Water Resources Control Board's SWAMP website at: http://www.waterboards.ca.gov/water_issues/programs/swamp/.

GAMA: The primary objective of the Groundwater Ambient Monitoring and Assessment (GAMA) Program is to comprehensively assess statewide groundwater quality and gain an understanding about contamination risk to specific groundwater resources. The primary goals of the GAMA Program are to:

1. Improve comprehensive groundwater monitoring and,
2. Increase the availability of groundwater quality information to the public.

To facilitate a statewide, comprehensive groundwater quality monitoring and assessment program most efficiently, uniform and consistent study-design and data-collection protocols are being applied to the entire state. The GAMA Program monitors

groundwater for a broad suite of chemicals at very low detection limits, including exotic chemicals such as wastewater chemicals and pharmaceuticals. Monitoring and assessments for priority groundwater basins are to be completed every ten years, with trend monitoring every three years. The SWRCB is collaborating with the U.S. Geological Survey (USGS) and Lawrence Livermore National Laboratory (LLNL) to implement the GAMA Program.

Stewardship of the state's groundwater resources is the shared responsibility of all levels of the government and community. A key aspect of GAMA is interagency collaboration, data sharing, and communication with local water agencies. While the GAMA Program remains voluntary, the Program provides the following benefits to federal, state, local, and community participants:

- Improves comprehensive statewide groundwater monitoring;
- Increases the availability of groundwater quality information to the public;
- Provides a mechanism to unite local, regional, and statewide groundwater programs in a common effort to understand and manage groundwater resources effectively;
- Facilitates interagency communication and data-sharing between federal, state, and neighboring local agencies;
- Improves understanding of local, regional, and statewide hydrogeology, as well as groundwater quality issues and concerns;
- Provides groundwater data to establish baseline conditions and early warning of potential water quality concerns;
- Provides agencies with knowledge of groundwater trends and long term forecasting in groundwater quality; which is important for groundwater management plan growth and preparation;
- Provides agencies with better information to respond to concerns of consumers and consumer advocate groups;
- Helps inter-basin agencies that have basin wide or regional groundwater management objectives; and
- Creates a database with access to groundwater quality data and provides tools to aid in completing groundwater assessments.

The GAMA Program has two sampling components: the California Aquifer Susceptibility (CAS) Assessment which addresses public supply drinking water wells and the Voluntary Domestic Well Assessment Project which addresses private drinking water wells. The CAS assessment utilizes low level VOCs and age dating analyses to assist in the evaluation of the hydrogeologic conditions within the groundwater basin/subbasin.

The GAMA Program is also focused on an effort to identify and centralize the many sources of groundwater data and information available in the state. As part of this effort, the SWRCB has joined with other groundwater agencies to form a Groundwater Resources Information Sharing Team. The various groundwater data sets will be made accessible to the public and interested agencies within a Groundwater Resources Information Database.

Various groundwater monitoring and assessment programs collect a significant amount of groundwater related data in various coverage and formats. Data in different electronic formats may not be as accessible as a single database of information. The lack of data comparability and sufficient data sharing significantly hampers oversight of groundwater resources.

Identification of measures that would increase coordination among state and federal agencies that collect groundwater contamination information would be beneficial. Coordination is essential for the success of a Comprehensive Groundwater Quality Monitoring Program. Increased coordination will also benefit all agencies through data sharing, training costs, and project responsibilities. The emphasis should be on increasing collaboration to effectively expand existing programs to cover a wider range of sampling, analyses, and evaluation efforts. The following measures will result in increased basic interagency coordination and communication on groundwater programs:

- Share data (e.g., GIS Coverages);
- Share data collection responsibilities;
- Develop minimum sampling and analytical protocols;
- Share specialized training;
- Collaborate on data interpretation;
- Share laboratory facilities and share information on laboratory methods;
- Continue the ITF to ensure interagency coordination / communication;
- Meet on a periodic basis to achieve these listed elements; and
- Develop a standardized data format for electronic submittal of groundwater monitoring data.

The GAMA program recognized the value of public supply wells used in a monitoring network to assess groundwater that is used for drinking water purposes. By enhancing the analytical information already collected by the local purveyors, GAMA further analyzes for low-level VOCs and age-dating in order to assist in assessing the hydrogeology in areas that are vulnerable to surface contamination as well as be an early warning indicator of impacts. The GAMA program has already begun to assess these high priority areas.

Just as state agency data are being incorporated into a comprehensive database, local groundwater quality data may also assist in basin/subbasin and larger scale assessments. It is anticipated that the amount of local data is significant in some basins/subbasins.

Partnerships and effective coordination with the local agencies will be an important part of the GAMA Program. Thus, projects implemented as part of the South Orange County IRWM Plan that result in information beneficial to the GAMA Program will coordinate with the state to provide useful data. For more information please visit the

State Water Resources Control Board's GeoTracker GAMA website at: http://geotracker.waterboards.ca.gov/gama/ .

8 FINANCE

The South Orange County IRWM Group is committed to funding this IRWM Plan implementation. The County of Orange contributed funding for the Proposition 50 grant application preparation, public outreach, facilitator, and other consulting services to assist in increasing public and stakeholder IRWM outreach efforts, supporting and facilitating IRWM Group meetings, coordinating with IRWM efforts of adjoining regions, assessing institutional structure options, facilitating agency and stakeholder development input and consensus on the long-term Plan institutional structure, and implementing the long-term IRWM institutional structure. The funding strategy to support ongoing IRWM Plan implementation and related efforts is described below. In 2011, the County was successful at securing a Proposition 84 Planning Grant to fund the update of this plan. Subsequently, the IRWM Group passed a cost-shared budget which assists with IRWM administrative and technical support.

8.1 Tri-County FACC Ongoing Funding

As described in Section 2.9, the Upper Santa Margarita Regional Watershed Management Group (RWMG), San Diego RWMG, and SOC IRWM Group collaborate in an inter-regional body established via a Memorandum of Understanding (MOU) and known as the Tri-County Funding Area Coordinating Committee (Tri- County FACC):

- *SOC IRWM Group*: County of Orange, Municipal Water District of Orange County (MWDOC), and South Orange County Wastewater Authority (SOCWA).

- *Riverside County Upper Santa Margarita RWMG*: Riverside County Flood Control and Water Conservation District (RCFCWCD), County of Riverside, and Rancho California Water District (RCWD).

- *San Diego RWMG*: City of San Diego, County of San Diego, and San Diego County Water Authority (SDCWA).

The Tri-County FACC enables the three RWMGs to balance the necessary autonomy of each planning region to plan at the appropriate scale with the need to improve inter-regional cooperation and efficiency. It ensures close coordination of the three planning regions to improve the quality and reliability of water throughout the span of all three IRWM Regions (San Diego, Upper Santa Margarita, and South Orange County), also known as the San Diego Funding Area.

The Tri-County FACC coordinates and works together with their advisory groups to address issues and conflicts across planning regions, identify common objectives and projects that address those needs, and provide general planning cooperation for shared watersheds. The Tri-County FACC meets on an as-needed basis.

The Tri-County FACC builds a foundation that ensures sustainable water resources planning within the Funding Area. The three RWMGs commit to coordinated planning within the Watershed Overlay Areas– one comprising the San Mateo Creek watershed area and the other the Santa Margarita River watershed area, which cross planning

region boundaries. This approach will capture the integration of water supply, wastewater, and watershed planning across regions in the three coordinated IRWMPs.

Each of the Tri-County FACC members has prepared and adopted an IRWMP and desires close coordination to enhance the quality of planning, identify opportunities for supporting common goals and projects, and improves the quality and reliability of water in the San Diego Funding Area. The Tri-County FACC will coordinate and work together with their advisory groups to address issues and conflicts across planning regions, identify common objectives and projects that address those needs, and provide general planning cooperation for shared watersheds. Overall, the goal of the Tri-County FACC is to provide smart funding for critical watershed projects throughout the San Diego Funding Area.

By consensus, the Tri-County FACC has developed an agreement (MOU) to improve IRWM planning in the Funding Area to coordinate across planning region lines and facilitate the appropriation of funding for IRWM projects.

The MOU serves as a funding mechanism for the Tri-County FACC. It provides for a long-term stable group to coordinate current and future issues related to IRWM planning in the larger Funding Area. The coordinating role of the committee provides for MOU renewal to support the IRWM program beyond the current grant cycle.

The MOU accomplishes the following for the Funding Area:

- Defines terms, which enables all parties to use a common language;
- Clearly identifies boundaries of the three planning regions covering the entire Funding Area;
- Identifies Watershed Overlay Areas to facilitate planning and coordination in cross-boundary watersheds;
- Creates an ongoing process for coordination and planning in the Funding Area and in the Overlay Areas;
- Provides for advisory committee cross membership to promote understanding, communication, and cooperation;
- Provides for IRWMP consistency, common references, and coordination of grant submittals to facilitate DWR's review process;
- Determines the funding allocation among the planning regions; and
- Identifies a process for identification and funding of common programs found by the Tri-County FACC to be of high value across the Funding Area.

In the unlikely event that any RWMG agency or group withdraws from the Tri-County FACC, members of the Tri-County FACC will continue to coordinate with the withdrawn agency and consider them as a stakeholder to the maximum extent possible. Additionally, the remaining members will negotiate with the withdrawn member to determine fair allocation of funding within the principles provided in the MOU agreement and will notify DWR as to the outcome of these negotiation and coordination efforts.

The Tri-County FACC is working to identify areas of cooperation and to align planning efforts both to increase efficiency and to better inform each planning region about the efforts and plans of the others. The Tri-County FACC will build a foundation that ensures sustainable water resources planning within the Funding Area by serving as an umbrella organization, allowing the three IRWM regions to coordinate water resources planning activities and pool resources. Because man-made water infrastructure systems are the key water management units in the Funding Area, the planning regions reflect this reality and cross-boundary watershed issues are addressed via a collaborative subcommittee process.

The three RWMGs will undertake coordinated planning within the Watershed Overlay Areas, one for the Santa Margarita River watershed area and one for the San Mateo Creek watershed area. Water resources projects and programs that may benefit from Funding Area-wide coordination, administration, funding, or support will be identified by the Tri-County FACC. Projects within the Watershed Overlay Areas identified as valuable and benefiting from cross-boundary coordination will be identified in the three IRWM project selection processes. A project may be proposed by a single RWMG or by several, where relevant to the Overlay Areas. However, the Tri-County FACC will coordinate to ensure that project costs are only identified once among the proposals.

8.2 South OC WMA Cooperative Agreement Ongoing Funding

As part of Orange County municipalities and special districts' effort to develop a countywide Water Quality Strategic Plan, the South Orange County Watershed Management Area (WMA) members developed a Cooperative Agreement based on the desire to collaborate in protecting and managing water resources in the South Orange County WMA through coordinated implementation of an integrated approach.

The purpose of the Cooperative Agreement is to establish the South Orange County WMA as a cooperative framework for planning and implementing water management strategies in the South Orange County WMA. As described in Section 2.2 of this IRWM Plan, the cooperative efforts include but are not limited to: addressing water quality impairments; establishing priorities for water resource needs; integrating water resource solutions across traditional disciplinary bounds; and jointly advocating for policies and funding that assist these goals. The Cooperative Agreement serves as a funding tool to implement the projects identified in the South Orange County IRWM Plan. Refer to Appendix A for a copy of the Cooperative Agreement.

Through the Executive Committee's established duties and powers, ongoing political and financial support for the IRWM Plan shall be ensured. As part of the agreement, the Executive Committee shall approve an annual cost-shared budget for the administration and activities of the South Orange County WMA, its committees, projects, or actions, including any administrative support for the South Orange County WMA. The Annual Cost-Shared Budget requires approval by 80 percent of the members of the Executive Committee. The responsibility for payment of the Annual Cost Share Budget shall be distributed equally among the South Orange County IRWM Group. Each member shall include their respective share of the Annual Cost-Shared Budget in their City's annual budget.

The County of Orange will provide staff support for the South Orange County WMA and its committees and will perform services including planning activities, facilitating regional planning and coordination activities related to water resources, and general administration for the implementation of the South Orange County WMA's plans and work programs, as directed by the Executive Committee. Additionally, implementation of any cost-shared programs shall be accomplished through Project Implementation Agreements. This Cooperative Agreement will ensure an ongoing funding mechanism for the South Orange County IRWM Plan Implementation.

8.3 South Orange County Watershed Management Area Costs

From 2004 to 2009, expenses for the South Orange County IRWM Plan were approximately $400,000 and included the following:

- IRWMP Preparation, including consultant contracts.
- IRWMP Grant Preparation, including consultant contract.
- Grant advocacy and Prop 50 grant contract negotiation (2004 – 2009), including consultant contracts.
- Grants from the State.
- Grant administration.
- Project costs (Team Arrundo)
- Tri-FACC participation, Regional Acceptance Process (RAP) Activities and submittal

The bullet items costs above serve as an example of the costs considered for each fiscal year work plan. On behalf of the South Orange County WMA, the County of Orange prepares proposed work plans and budgets that are presented to the Executive Committee for approval.

On September 13, 2005, the Watershed Permittees entered into an Implementation Agreement for the purpose of funding and performing water quality monitoring, reporting, research, planning, and compliance activities including development and implementation of the CLRP. The Implementation Agreement establishes a funding mechanism for the shared costs of the

Watershed Permittees based on each municipality's area and resident population. This planning and funding approach has demonstrated to be effective in other watersheds, and provides the foundation for the watershed permittees to plan and fund projects together. The County of Orange serves as the Lead Watershed Permittee. As Lead Watershed Permittee, the County is responsible for coordinating the production of the Workplan and coordinating annual watershed review meetings and public participation/public noticing.

The Watershed Permittees hold quarterly meetings to: 1) review and approve the annual budget, 2) review and discuss the status of the Workplan and BMP implementation, monitoring, data management and reporting, and 3) review priorities and necessary refinements. The current year budgets and work plans are posted on the County's website at: http://ocwatersheds.com/programs/ourws/wmaareas/wmasouthoc

8.4 Sources of Funding

Securing project funding is key to IRWM Plan implementation. Accordingly, implementation efforts of the South Orange County IRWM Group will, in part, focus on:

- Refining project cost estimates,
- Further evaluating potential impacts and benefits of the projects, and ensuring the
- Participation of and benefits to disadvantaged communities,
- Addressing the cost-effectiveness and regional affordability of proposed projects,
- Prioritizing projects, and
- Ensuring adequate funding for IRWM Plan and project implementation.

Table 8-1 below identifies the top ranked projects and the sources and certainty of funding. The projects represent typical approaches to funding throughout the South OC WMA and include a non-profit, cities and water districts. In many cases, multiple sources of funding are secured.

Table 8-1: Project Funding Summary

Project Name	Implementing Agency	Approximate Total Cost	Funding Sources & % of Total Cost	Funding: Certainty/Longeveity	O&M Finance Source	O&M Finance Certainty
Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary	Audubon Starr Ranch Sanctuary	$275,500	So CA. Wetlands -10%, The Gimble Fund-7%, Prop 84-83%	Funding secured from So. CA Wetlands and The Gimble Fund	Non-profit grant funding efforts	Continuously funded since 2009
Baker Treatment Plant	Irvine Ranch Water District	$78,500,000	Prop 84- 1% Local Matching Funds- 99%	Pending	IRWD Budget	Secured
Comprehensive Landscape Water Use Effeciency Program	Municipal Water District of Orange County (MWDOC)	$1,774,329	Prop 84- 40%, Local Matching Funds- 60%	MWDOC General Fund	Program Participants	Responsibility of the Participants
Dairy Fork Wetland	Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	$916,500	Prop 84 General Funding OCTA Grant	Funding secured through the City's budget	City Budget	Secured
Oso Creek Multi-use Trails	City of Laguna Niguel	$3,000,000	Prop 84-40%, Local Matching Funds-30%, Other Matching Funds-30%,	Funding Secured for Local and Other Matching Funds	City General Fund Operating Budget	Secured
San Juan Creek Storm Drain LO1SO2 BMPs	City of Dana Point	$770,000	Prop 84- 75%, Local Matching Funds- 25%	Funding Secured for Local Matching Funds	City Budget	Secured
Water Conservation, Implementation of Trargeted Programs	South Coast Water District	$750,000	Prop 84- 50%, Matching Funds-50%	SCWD Annual Operating Budget	SCWD Operating Revenue	Secured

8.4.1 Capital Improvements Program Funding

Many of the large infrastructure projects addressed within this Plan are addressed in Capital Improvement Program (CIP) budgets prepared and adopted by implementing agencies. The CIPs address project costs, project implementation schedules, and funding sources for implementing budgeted projects. Large-scale water and wastewater agency CIP projects are typically funded through debt (revenue bonds or general obligation bonds) serviced by water and sewer rates, capacity charges, standby charges, or agency shares of property taxes or assessments. Flood control CIP projects are typically funded through County property taxes. Smaller scale water and wastewater

CIP projects may be funded by the agencies with cash on hand, short-term lines of credit, or directly from water or sewer rates. CIP projects may also be funded by outside grants or financial assistance.

8.4.2 State and Local Funding

Several financial assistance programs are available to support local contributions by implementing governmental agencies within the Region. As described in Section 2.6.1, the South Orange County WMA has successfully obtained state grant funding to implement the IRWM Plan. State and local programs offer funding assistance for all project phases, from initial planning and design to construction and operation.

Grants
Agricultural and Urban Water Use Efficiency (Proposition 50)
Drainage Funding (Proposition 204)
Flood Corridor Program (Propositions 84 and 1E)
FloodSAFE California (Proposition 84 and 1E)
Integrated Regional Water Management (Proposition 50, 84 and 1E)
Local Groundwater Assistance (Proposition 84)
Safe Drinking Water/Contaminant Removal (Proposition 50)
Stormwater Flood Management (Proposition 1E)
Urban Streams Restoration Program
Water Desalination (Proposition 50)
Watershed Restoration (Proposition 50)

Loans
Agricultural Water Conservation Program (Proposition 13)

Past Grant and Loan Programs
Groundwater Recharge Construction (Proposition 13), Loans
Groundwater Storage (Proposition 13), Grants
Infrastructure Rehabilitation Construction (Proposition 13), Grants
Infrastructure Rehabilitation Feasibility Study (Proposition 13), Grants
Local Water Supply Project Feasibility Study (Proposition 82), Loans
New Local Water Supply Construction Loans (Prop 82)
Salton Sea Financial Assistance Program

Local Programs

Orange County Transportation Authority (OCTA) – Measure M Funding: OCTA administers a variety of funding programs for cities to widen streets, improve intersections, coordinate signals, build Smart Streets and rehabilitate pavement. OCTA also administers regional streets and roads improvement projects.

- The Local Fair Share Program - Provides flexible funding to help cities and the County of Orange pay for the escalating cost of restoring the aging street system.

In addition, cities can use these funds for other local transportation needs such as residential street projects, traffic and pedestrian safety near schools, signal priority for emergency vehicles, etc.

- The M2 Environmental Cleanup Program accepted applications in 2012 and had two tiers for calls for projects. The program is designed to fund regional, potentially multi-jurisdictional, capital-intensive projects. Examples include constructed wetlands, detention/infiltration basins, and bioswales, which mitigate pollutants such as litter and debris, heavy metals, organic chemicals, and sediment.

Local Programs Assistance - When requested, MWDOC assists retail agencies to develop and implement local programs within their individual service areas. This assistance includes collaboration with each retail agency to design a program to fit that agency's local needs, which may include providing staffing, targeting customer classes, acquiring grant funding from a variety of sources, and implementing, marketing, reporting, and evaluating the program. MWDOC provides assistance with a variety of local programs including, but not limited to, Home Water Surveys, Large Landscape, Public Information, School Education, Conservation Pricing, and Water Waste Prohibitions. These local programs have also been structured through Integrated Regional Water Management Planning processes in north, central and south Orange County.

8.4.3 Operation and Maintenance Funding

A significant majority of the operation and maintenance project costs are for water supply reliability infrastructure, including:

- Treated and raw water conveyance facilities,
- Water treatment facilities, including upgrade and expansion,
- Water storage facilities, including upgrade and expansion,
- Groundwater supply projects, including brackish groundwater demineralization, and
- Recycled water treatment, storage, and distribution projects.

Operation and maintenance of implemented water management facilities/projects will be the responsibility of implementing agencies. O&M costs may not apply to all projects, as some projects may only involve preparing studies or plans. Additionally, several project proponents report no anticipated project operating costs, as existing staffing levels within the organizations are adequate to manage the proposed projects without additional costs.

For water supply, recycled water, groundwater, wastewater, and stormwater projects proposed by government agencies, maintenance budgets will primarily be funded through annual agency operating funds. Such maintenance/operating expenses may be funded by the following: water or sewer rates, flow or capacity charges, standby charges, user fees, or agency shares of tax assessments.

In addition to being used to finance capital debt for implementation, financial incentive programs may be used to offset maintenance and operation costs. Additional means of financing operation and maintenance include: special property assessments (flood control projects), groundwater assessments (groundwater management districts established per the State of California Groundwater Management Act), partnerships with in-kind services used to offset partner agency costs, private funding or endowments (conservation, habitat, or environmental projects), or membership fees (non-government agency projects).

The 2013 IRWM Planning efforts were funded by local partners via the MOU and state IRWM Planning grant funds. The certainty/longevity of funding is contingent on continued successes in grant programs.

9 TECHNICAL ANALYSIS

The stakeholders within the South Orange County WMA have a long history of working collaboratively on studies, programs, and projects to address water quality, ecosystem restoration, and water supply. As a result, there is an extensive library of data and technical analysis information about the watersheds that has been created through numerous studies and project planning efforts. The WMA continues to develop science-based studies to analyze coastal water quality impacts and identify effective solutions. Not only do the unique ecological resources in this WMA provide the impetus for integrated water resource planning, but the history of collaboration and availability of the technical information make effective planning, analysis, and project implementation possible. The planning approach and framework of the South Orange County IRWM Plan ensures that solution-oriented projects are coordinated within the WMA and that funding and project benefits are leveraged to the greatest extent possible.

9.1 Technical Information

Technical information and data sets are obtained from the extensive planning and technical studies that have been conducted for the WMA Watersheds. Those studies are identified in Section 10. In addition, priority projects included in the project list (Appendix F) are supported by specific studies as shown in Table 9 -1 below.

Table 9-1: WMA Technical Studies/Data Sets

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Orange County Transportation Authority Mitigation Funding, 2009	Cost and Environmental Analysis	Mitigation and funding activities conducted by the OCTA	Used to consider funding opportunities	Audubon Society, OCTA
Southern California Wetlands Recovery Project, SCCWRP 2009	Environmental Analysis	Regional Coastal wetland restoration grant funding and report	Used to consider wetland restoration funding	Audubon Society, SCCWRP
Santa Margarita Water District SEP, (For Regional Water Quality Control Board), 2012	Environmental Analysis	Implementation of a supplemental environmental project (SEP)	Used to consider supplemental environmental project (SEP) funding	Audubon Society, SMWD and RWQCB
USFWS, Partners for Fish and Wildlife, 2007	Environmental Analysis	Regional Coastal wetland restoration strategies	Used to consider wetland restoration funding	Audubon Society, USFWS
Preliminary Well Design and Site Selection Report, Domestic Non-Domestic and Brackish Water Wells Geotechnical Consultants, Inc. 2001 prepared for Capistrano Valley Water District.	Geotechnical Analysis	Domestic, Non-Domestic, and Brackish Water Data	Used to assess groundwater quality.	Capistrano Valley Water District, Geotechnical Consultants
Wood Canyon Emergent Wetland, City of Aliso Viejo 2010	Environmental and Engineering Analysis	Pollutant reduction efficiency and treatment capacity	Used to consider project effectiveness	City of Aliso Viejo

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Preliminary Identification and Prioritization of Nuisance Water Diversion Sites in Dana Point, January, 2005	Environmental and Engineering Analysis	Identification and prioritization of feasible Dana Point nuisance water diversion sites.	Used to consider potential diversion sites	City of Dana Point
Dana Point LO1SO2 Diversion Feasibility Investigation, 2012	Feasibility and Environmental Analysis	L01S02 Diversion Feasibility Study	Used to assess the feasibility of diversions sites	City of Dana Point
South Orange County Team Arundo: Implementation and Program Management Plan, on-going	Environmental Analysis	Management Plan for the control and eradication of Arundo	Used to consider invasive species eradication efforts	City of Dana San Juan Capistrano, Team Arundo
City of Laguna Beach Capital Improvement Study, 2001-2002.	Economic and Environmental Analysis	System Improvements & Costs	Used to consider IRWM Project Impacts on Laguna Beach coastline.	City of Laguna Beach
Multi-Agency Rocky Inter-tidal Network (MARINe) monitoring plan. 1996 to present.	Environmental Analysis	Current state of Orange County Marine Protected Areas.	Used to consider IRWM Project Impacts on Laguna Beach coastline.	City of Laguna Beach, Cal State Fullerton, Laguna Beach Marine Conservation Area, and Orange County Marine Protected Areas Committee.
Gateway Specific Plan and EIR, 2011	Environmental Impact Analysis	Impact of the project's implementation	Used to assess Environmental impact	City of Laguna Niguel
On-site Geotechnical Study, 2012	Geotechnical Analysis	Site infiltration analysis	Used to consider site infiltration capacity	City of Laguna Niguel

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
San Juan Creek Watershed Management Study, Orange County, California. U.S. Army Corps of Engineers, Los Angeles District, August 2002.	Watershed Analysis	Watershed Management Data	Used to assess condition of watershed.	City of San Juan Capistrano, ACOE
Recycled Water Master Plan, AKM Consulting Engineers, 2000 (revised in 2006 with the RWMP Update) prepared for the City of San Juan Capistrano.	Master Plan Analysis	Recycled Water Needs and Expansion	Used to consider IRWM Project implementation costs	City of San Juan Capistrano, AKM Consulting Engineers.
Revenue Requirements, Cost of Service Allocations, and Rate Design for the Water and Wastewater Utilities Report. Black & Veatch, October 2009.	Economic Analysis	Revenue & Costs	Used to consider IRWM Project implementation costs	City of San Juan Capistrano, Black & Veatch
Non-Domestic / Recycled Water Master Plan Update – Final Program Environmental Impact Review (Schedule No. 2006-11-11-59), Environmental Science Associates, October 2007.	Environmental Analysis	Environmental Impact	Used to consider IRWM Project Impacts	City of San Juan Capistrano, Environmental Science Associates.

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
San Juan Basin Groundwater Management and Facility Plan. NBS Lowry, 1994.	Groundwater Analysis	Groundwater Management	Used to consider Groundwater Management Facilities	City of San Juan Capistrano, NBS Lowry.
Final Environmental Impact Report No. 589, General Plan Amendment/Zone Change, The Ranch Plan, approved by County of Orange November 8, 2004	Environmental Impact Analysis	Ranch/Open space and habitat protection and restoration	Used to assess quality and quantity of open space preserved.	County of Orange, Rancho Mission Viejo
Planned Utilization of Water Resources in the San Juan Creek Basin Area. State of California, Resources Agency: Department of Water Resources, June 1972.	Groundwater Analysis	Planned Groundwater Resources	Used to consider baseline San Juan Creek Basin area conditions	Department of Water Resources
Baker Pipeline Regional Treatment Facility Feasibility Study Report, January 2007	Feasibility Analysis	Baker Treatment Plant Feasibility Study	Used to consider the feasibility of the project	Irvine Ranch Water District
Baker Water Treatment Plant Pilot Testing Program Final Documentation	Engineering Analysis	Baker Treatment Plant Pilot Testing to determine efficiency of	Used to consider Treatment Plant's proposed System	Irvine Ranch Water District

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Report, August 2008		proposed system		
Membrane Filtration System Procurement for the Baker Water Treatment Plant, February 2010	Engineering Cost Analysis	Membrane Filtration System selection and procurement	Used to assess membrane filtration cost	Irvine Ranch Water District
Baker Water Treatment Plant Preliminary Design Report, April 2010	Engineering Design Analysis	Used to describe proposed design features	Used to consider Treatment Plant project	Irvine Ranch Water District
Construction Plans and Project Manual for the Baker Water Treatment Plant, January 2013	Engineering Analysis	Construction features of the proposed Treatment Plant	Used to consider Treatment Plant project	Irvine Ranch Water District
Phase 5 Preliminary Market Assessment - Recycled Water Distribution Expansion, Moulton Niguel Water District	Environmental & Engineering Analysis	Recycled Water Needs and Expansion	Used to consider project for WMA.	Moulton Niguel Water District
Recycled Water Master Plan Update, Moulton Niguel Water District	Environmental & Engineering Analysis	Recycled Water Needs and Expansion	Used to consider project for WMA.	Moulton Niguel Water District

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Residential Runoff and Reduction Study, Municipal Water District of Orange County, 2004.	Environmental Analysis	Water Conservation Study	Used to assess reduction in dry-weather runoff volume and non-point source pollutants.	Municipal Water District of Orange County
SmarTimer and Edgescape Evaluation Study (SEEP), Municipal Water District of Orange County, 2008	Environmental Analysis	Water Conservation Study	Used to assess water conservation improvements	Municipal Water District of Orange County
Residential Runoff Reduction Study, July 2004	Environmental Analysis	Effectiveness data for flow/pollutant reduction	Used to assess effectiveness water conservation	Municipal Water District of Orange County
SmarTimer and Edgescape Evaluation Program, November 2008	Environmental Analysis	Effectiveness data for flow/pollutant reduction	Used to assess effectiveness water conservation	Municipal Water District of Orange County
San Juan Creek Watershed Feasibility Study prepared by USACOE for OCFCD	Environmental Analysis	Watershed Feasibility	Used to assess watershed condition	Orange County Flood Control District, United States Army Corps of Engineers
San Juan Creek Watershed Stream Monitoring Program, prepared by PACE, dated March 2008.	Stream Analysis	Stream Monitoring Data	Used to assess water quality of San Juan Creek.	PACE
Final Environmental Impact Report No. 589, General	Environmental Impact Analysis	Habitat Conservation Data in support	Used to support open space Ranch Planning	Rancho Mission Viejo, County of Orange

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Plan Amendment/Zone Change, The Ranch Plan, approved by County of Orange November 8, 2004		of NCCP		
Updated Rancho Mission Viejo Runoff Management Plan – Planning Level Regional Detention Basin Strategy – 100year Urbanized Peak Flow-rate Attenuation Analysis, by PACE, under contract for RMV, dated June 2009	Attenuation Analysis	100-Year Park Flow Rate for Regional Detention Basin	Used to consider Gobernadora Multi-Purpose Basin Project for WMA	Rancho Mission Viejo, PACE
Watershed Hydrology Analysis, Impacts Analysis, and Planning Level Mitigation Study, by PACE, under contract for RMV, dated April 2009	Watershed Hydrology Analysis	Watershed Hydrology	Used to consider Multi-purpose basin in Rancho Mission Viejo	Rancho Mission Viejo, PACE
Annual Integrated Environmental Monitoring Report, Psomas, April 2004 (with annual updates in 2005, 2006, 2007, 2008, 2009), prepared for the San Juan	Environmental Monitoring Analysis	San Juan Basin Groundwater Supply and Quality Data	Used to assess condition of groundwater basin.	San Juan Basin Authority, Psomas

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Basin Authority.				
Gobernadora Multipurpose Basin, by PACE, under contract for SMWD and RMV, July 2006	Geotechnical Analysis	Current capacity of basin	Used to consider hydrologic conditions for erosion control stabilization	Santa Margarita Water District and Rancho Mission Viejo, PACE
CEQA Certification for Gobernadora Multipurpose Basin, by Dudek & Associates, under contract for SMWD, pending	Environmental Analysis	Environmental Impact	Used to support Gobernadora Basin Project	Santa Margarita Water District, Dudek & Associates
Phase II Report on Proposed Non-Domestic Seasonal Water Storage Reservoirs prepared for SMWD by Henry Miedema & Associates dated October 19, 2004	Environmental Analysis	Seasonal Storage Data	Used to support non-domestic seasonal water storage data	Santa Margarita Water District, Henry Miedema & Associates
Concept Plan for Gobernadora Basin, by Rivertech, under contract for SMWD, September 1999	Geotechnical Analysis	Current capacity of basin	Used to consider hydrologic conditions for erosion control stabilization	Santa Margarita Water District, Rivertech
Impact of Regional Treatment Plant Fats, Oils & Grease (FOG)	Energy Analysis	Regional Treatment Plant Fats, Oils & Grease Waste to Energy Data	Used to consider impact on FOG to treatment plant	SOCWA

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
Addition On Existing Digesters. June, 2009.				
Greenhouse Gas Emissions Inventory Report – CY 2008. May, 2009.	Energy Analysis	Greenhouse Gas Emissions Data	Used to consider GHG emissions for WMA	SOCWA
Regional Treatment Plant AQMD Rule 1110.2 Compliance. August, 2008.	Air Quality Analysis	Wastewater Treatment Plan Air Quality	Used to consider treatment plant FOG project	SOCWA
Alternative AWMA Access Road Alignment. 2009.	Coastal Treatment Export Sludge System Rehabilitation Analysis	Feasibility of Coastal Treatment Export Sludge Rehab	Used to consider treatment export sludge rehabilitation project	SOCWA
Export Sludge Equalization Basin Preliminary Design. 2005.	Coastal Treatment Export Sludge System Rehabilitation Analysis	Feasibility of Coastal Treatment Export Sludge Rehab	Used to consider treatment export sludge rehabilitation project	SOCWA
Miscellaneous Biological Surveys in Aliso and Wood Canyon Wilderness Park. 2000 – 2008.	Biological Analysis	Biological data	Used to consider biological condition of wilderness parks	SOCWA
Plant 3A Aeration System Evaluation Assessment. May, 2008.	Wastewater Treatment System Analysis	Aeration System data	Used to consider project for WMA.	SOCWA

WMA Technical Studies/Data Sets				
Supporting Technical Documents for Projects	**Analysis Method**	**Results/ Derived Information**	**Use in IRWM Plan**	**Reference or Source**
J. B. Latham Strategic Plan (Underway)	Facility Analysis	Underway	Used to consider treatment plant planning	SOCWA
J. B. Latham Treatment Plant AWT Facility Value Engineering. September, 2009.	Value Engineering	Cost data for Treatment Plant Upgrade	Used to assess Treatment Plant Aeration System/Cogeneration Upgrade Project	SOCWA
Aeration and Co-Generation System Upgrade for the J. B. Latham Treatment Plant. July, 2009.	Treatment Facility Analysis	Feasibility of Aeration and Co-Generation Upgrade for Treatment Plant	Used to assess Treatment Plant Aeration System/Cogeneration Upgrade Project	SOCWA
Nolte & Associates, South Orange County Reclamation Authority, Salt Balance Model, 1991	Salinity Analysis	Water Reclamation Feasibility	Used to consider Salt & Nutrient Management	SOCWA, South Orange County Reclamation Authority, Nolte & Associates
Shadow Rock Detention Basin Dry Season Runoff Capture and Collection System Technical Report, 2006.	Engineering Analysis	Design and water quality analysis	Used to consider project for WMA.	Trabuco Canyon Water District, CH2MHill
Population Growth	Statistical Analysis	Future Population	Used to calculate future water demand	United States Census Bureau 2010

The planning studies identify opportunities and constraints for watershed projects, including habitat protection and restoration, restoration of ecosystem processes, creek restoration for flood control and water quality, stormwater programs to protect water quality, use of water quality treatment wetlands, runoff reduction through landscape

conservation programs, and an array of other studies related to habitat, water quality, and water supply.

The studies conducted by the ACOE include a reconnaissance report that documents baseline conditions. The technical studies are scientifically based and measure dry and wet weather flows, constituents of concern, effectiveness of BMPs for water quality, bioaccumulation, sources and contribution to water quality degradation, effects of hydromodification in creek channels, toxicity, and others. In addition, annual monitoring reports are prepared for each TMDL, containing water quality measurements as specified in the TMDL. A monitoring report is also prepared annually for the County's NPDES permit, and the Orange County Health Care Agency performs weekly water quality monitoring within the watersheds. Each of these studies and regular reports has been used in the development of the Plan as they identify where specific actions are needed and offer scientifically-based recommendations for strategies.

As identified in Section 10, the Plan also incorporates the agencies' adopted master plans for water, wastewater, and recycled water systems, each of which includes a detailed engineering analysis of current system conditions, future service demands, and system improvements.

This extensive knowledge base incorporating planning studies, science-based technical studies, and engineering studies has enabled the Plan to be developed through an informed stakeholder process. Because of this valuable resource, watershed management issues and conflicts have been clearly identified, the objectives directly respond to those issues, and implementation of the strategies and projects has been selected based on the findings and recommendations of those studies.

9.2 Technical Analyses and Methods

The South Orange County WMA performs monitoring to obtain sound technical information, analyses, and methods. Monitoring is intermittent surveillance carried out in order to ascertain compliance with a standard or deviation from an expected norm to:

- Determine compliance with standards,
- Construct, adjust and verify predictive models,
- Provide information to evaluate abatement measures and identify progress against control objectives, and
- Provide early warning of future problems.

Many of the WMA's monitoring programs and activities provide data that are useful to IRWM planning and management in the WMA. This section provides an overview and description of efforts thought to be of particular importance to integrated, regional planning, but is not intended as a comprehensive survey of all programs and activities. Refer to Section 7 for a more comprehensive discussion of Data Management throughout the WMA.

Water Supply Monitoring. Operators of public water systems conduct routine monitoring to ensure that the water they produce complies with Safe Drinking Water Act

standards. Results are reported to the State of California Department of Health Services (DHS). Monitoring broadly encompasses several categories of constituents, which are discussed under Section 3.

Sampling is conducted at treatment plants, within distribution systems, and at the tap, and monitoring results are evaluated to ensure that applicable drinking water quality standards are met. For regulated constituents, results are compared to Primary and Secondary MCLs, and unregulated contaminants are evaluated against DHS Detection Limits for Purposes of Reporting (e.g., color, corrosivity, and odor).

Small water systems (i.e., community water systems that serve 199 connections or less from groundwater supply wells) are also required to conduct routine monitoring and report to the County Department of Environmental Health (DEH).

Monitoring for constituents for all water suppliers is conducted every three years, and more frequent monitoring is conducted for bacteria and nitrates.

Surface Water Quality Monitoring. Numerous federal, state, and local agencies and organizations have conducted surface water quality monitoring in the WMA over the past several decades. WMA and site-specific surface water quality monitoring efforts are currently underway, including the following:

- **Core Monitoring** – Routine, ongoing water quality monitoring within the regulatory framework of the National Pollutant Discharge Elimination System (NPDES) and Total Maximum Daily Loads (TMDL) monitoring programs. This type of monitoring addresses clearly defined questions related to point, non-point and targeted pollutant levels with a commitment to improving our understanding of County specific environmental issues.
    - **Unified Program Effective Assessment (PEA) report** - The Unified PEA is an annual report provided by the County of Orange as the Principle Permittee in collaboration with the cities / co-permittees within the county. The water quality data and their analyses are presented in Section C-11 of the Unified PEA.
- **Regional Monitoring** – Periodic, collaborative, and larger-scale multi-agency surveys.
    - **Southern California Bight Studies** – The Bight studies, coordinated by the Southern California Coastal Water Research Project (SCCWRP), utilize standardized sampling and analytical methods to produce a wide range of data from both impacted and reference areas.
    - **Stormwater Monitoring Coalition (SMC)** – The SMC often use exploratory data analysis methods to investigate new measurement methods, improve basic understanding, characterize problems, or provide one-time measurements of important parameters or processes.
    - **Coastal Receiving Water Regional Program** – A model monitoring program that consolidates coastal receiving waters pathogenic indicator bacterial monitoring efforts for OC Public Works, OC Sanitation District,

South Orange County Wastewater Authority, and OC Health Care Agency.

- **Special Studies/ Research** – OC Watersheds along with cities, governmental agencies, NGOs and/ or universities has a strong commitment to advancements in water quality science through focused special studies to answer specific issues of concern related to Orange County. For further information on current studies or studies of interest, please go to OC Watersheds Research.
- **Watershed Sanitary Surveys** - Per the California Surface Water Treatment Rule (Title 22 of the California Code of Regulations), every public water system using surface water is required to conduct a comprehensive sanitary survey of its watersheds every five years. The purpose of such a survey is to identify actual or potential sources of contamination or any other watershed-related factor which might adversely affect the quality of water used for domestic drinking water. Source water is analyzed for organic and inorganic constituents, microorganisms, and general physical characteristics, and results compared to the MCL and/or SMCL standards for drinking water. Potential sources of contaminants in the watersheds draining into reservoirs are examined through a review of various data sets including existing aerial photographs, GIS data, reports, water quality data and other record documents, and supplemented by field surveys.
- **Southern California Coastal Water Research Project (SCCWRP)**. SCCWRP is a joint powers agency focusing on marine environmental research for the Southern California Bight. SCCWRP gathers scientific information so that member agencies can effectively and cost-efficiently protect the Southern California marine environment. Although SCCWRP has traditionally focused its efforts on wastewater discharges from Publicly Owned Treatment Works (POTWs), SCCWRP in recent years has developed and refined urban runoff and surface water quality monitoring programs. South Orange County WMA uses scientific data and information from SCCWRP to analyze the WMA.

Groundwater Monitoring - Groundwater monitoring data are available through a variety of sources in the WMA.

- **USGS National Water Information System (NWIS) -** The USGS National Water Information System (NWIS) supports the acquisition, processing, and long-term storage of water data. This system provides real-time data on depth to groundwater.
- **Waste Discharge Compliance Monitoring -** NPDES permits contain monitoring requirements to verify compliance with applicable conditions. NPDES permit requirements often include groundwater monitoring. For example, the Regional Board has established monitoring programs for recycled water and wastewater operations that discharge to groundwater. Dischargers must periodically collect and analyze groundwater quality samples from wells representative of the receiving groundwater. The Regional Board has established groundwater monitoring requirements for within many of the WMA's watersheds.

- **Underground Storage Tank Monitoring -** The Regional Board and DEH require groundwater monitoring as part of regulating compliance with underground tank regulations. Monitoring associated with underground storage tanks is normally limited to the immediate vicinity of the underground tank (to check for tank leaks). At documented remediation sites where leaks have been detected, however, extensive groundwater monitoring is required to document site remediation and recovery.
- **Special Studies and Projects -** Groundwater quality data are also periodically collected or compiled as part of special studies, including CEQA evaluations, groundwater supply investigations, scientific studies conducted by government or research organizations.
- **Habitat and Natural Resources Monitoring -**A significant variety of habitat data has been collected within the WMA. Data have been collected as part of site-specific or project specific investigations (e.g. CEQA analyses), educational or scientific investigations, volunteer organizations, and WMA habitat conservation programs. The most significant ongoing habitat monitoring programs are conducted as part of the NCCP efforts. Refer to Section 3.3.1.2 for more detail on the NCCP.
- **The Natural Community Conservation Planning (NCCP)** – This program of the California Department of Fish and Wildlife (CDFW) is a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An NCCP identifies and provides for the regional or area wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. South Orange County WMA has completed the following ongoing efforts as part of the NCCP - 1) Creation of a permanent Habitat Reserve consisting of 11,950 acres owned by the County of Orange and contained within three existing County regional and wilderness parks (O'Neill Regional Park, Riley Wilderness Park and Casper's Wilderness Park) and 20,868 acres owned by Rancho Mission Viejo. 2) Formulation and implementation of a Habitat Reserve Management Program (HRMP) 3) Receipt of State and Federal regulatory coverage and provisions for the impacts of proposed Covered Activities on proposed Covered Species and CDFW Jurisdictional Areas; and 4) Execution of an Implementation Agreement and identification of funding necessary to implement the HRMP. South Orange County WMA continues to gather data throughout this extensive Habitat and Natural Resources Monitoring process.

9.3 Data Gaps

Many governmental and non-governmental organizations currently collect surface water quality, surface flow, groundwater, habitat, and water use data within the WMA. Regional stormwater runoff data collection efforts have been coordinated and managed by the Municipal Separate Storm Sewer System (MS4) Co-permittees, but no central or organized data management structure exists for the majority of the WMA's water

management data. Significant data gaps exist in the collection and assessment of regional surface water quality, groundwater quality, groundwater availability, and habitat data. Filling the data gaps and coordinating data collection and management within the WMA will be required to assess regional water management needs and to assess the effectiveness of implemented water management projects.

Water Quality Monitoring

Despite the extensive ongoing water resources monitoring within the WMA, opportunities exist for additional data gathering to close existing gaps. Monitoring is generally conducted to support specific organizational, regulatory, or research objectives rather than within a regional or integrated framework. As a result, many of the gaps discussed here are related to a general lack of regional, integrated planning and concomitant data support strategies. Since a primary purpose of IRWM planning is to provide that regional focus, it is expected that this assessment of gaps will be updated and refined substantially over the next several years.

There are an extensive number of studies that have been completed for the Aliso Creek, Laguna Coastal Streams, San Juan Creek, San Clemente Coastal Streams, and San Mateo Watersheds, and there are a number of studies planned or underway. These studies are being conducted to address identified data gaps, such as those identified in the Watershed Workplans for the San Diego Region of Orange County.[76]

SWAMP as discussed in Section 7, has monitored watersheds from 2002-2008. Data collected is analyzed and prepared into reports by the Regional Board to assess the magnitude and extent of existing data and to identify existing data gaps. Monitoring has been conducted for conventional water chemistry, water and sediment toxicity, fish tissue contamination, and bioassessment. Detailed information in regards to monitoring sites within the watersheds can be found at the CEDEN website as discussed in Section 7: http://www.ceden.us/AdvancedQueryTool.

Pollutants and Sources

Some data gaps exist within the WMA's programs to monitor pollutants and sources, as described below:

Characterization of Nonpoint Sources

Nonpoint source (NPS) pollution is considered to be the major contributor of pollutants to impacted streams, lakes, wetlands, estuaries, marine waters, and groundwater basins, and the leading cause of water quality impairments, in California. Yet, despite the existence of a myriad of programs focused on various aspects of NPS management (e.g. MS4 Permits and TMDLs), ongoing efforts are hampered by a lack of specific knowledge about the individual sources within the WMA's watersheds that collectively constitute NPS pollution. For instance, the MS4 Permit for South Orange County local jurisdictions to implement programs to prevent and minimize pollutants in stormwater

[76] OC Watersheds Work Plans. Available online: 4/8/13.
http://ocwatersheds.com/programs/waterways/stormwater/documentspr

runoff from commercial and industrial activities. These potential pollutant sources are present by the tens of thousands throughout the WMA. In the long-term, effective management will require that data collection be focused on better characterizing the specific sources of priority pollutants in the WMA's watersheds. Not only must specific activities and processes occurring on-site be better understood, but our knowledge of how threats to water quality vary within broad categories of regulated sources (e.g., residences, restaurants, etc.) must also be increased.

Agricultural Runoff and Sources

Water quality monitoring of agricultural runoff has been identified as an additional area where more data could prove helpful. Chemicals applied during agricultural operations (e.g., pesticides and fertilizers) may be carried into the ground, and to surface or groundwater. The impact on water quality from agricultural practices is currently not well defined, and more could be learned from future data collection efforts.

Pathogen Impacts and Loading

Recreational uses are among the most important beneficial uses of many of the WMA's receiving waters. However, in recent years, section 303(d) listings for bacterial indicators have become increasingly common. The greater than 40 existing listings for bacterial indicators are problematic because the indicators themselves are not thought to present a threat to humans, i.e., there presence is merely an indicator of the potential presence of disease organisms. Future monitoring would benefit from the development of measures that provide a better indication of actual risk, as well as a basis for the identification and assessment of specific management measures. Likewise, site specific epidemiological studies and source investigations (e.g., DNA source tracking) may also be indicative.

Evaluation of Source Load Reductions

While considerable data collection has focused on identifying water quality problems and impairments throughout the WMA, comparatively little is known about the effectiveness of specific management measures targeted to remedy these problems. The 2009 MS4 Permit for South Orange County requires that load reductions be achieved for a variety of sources regulated under the permit. However, the current state-of-the-art for conducting load reduction estimates, especially at a broad programmatic level, requires extensive data. Considerable effort is currently being invested in the development of improved methods, but data are generally not available to support estimation either of nonstructural BMP effectiveness or implementation frequency. Improved data in this area would help assess the effectiveness of source control efforts.

Representative Watershed Sampling

Water quality monitoring that does not include the upper portions of many of the WMA's watersheds presents a spatial data gap. Stormwater programs have conducted mass loading monitoring at the base of the WMA's watersheds since 1993-94. However, while useful for focusing and prioritizing efforts regionally, this approach is limited in its ability to provide a representative characterization of the quality of receiving waters within

these watersheds. The addition of Temporary Watershed Assessment Stations in the 2009 MS4 Permit for South Orange County has begun to address this data gap, but additional focus on augmenting upstream data sets will be required in the future. Expanding the numbers and locations of monitoring stations would also provide a more representative assessment of water quality for completing updates of the 303(d) list of water quality impairments in the WMA, and would better support source identification and management efforts. Additional water quality monitoring efforts in the watersheds have been proposed to address monitoring requirements under adopted TMDLs and CLRP monitoring and assessment programs.

Streamflow Monitoring

Ongoing streamflow monitoring provides a basic statistical understanding of surface water flows within major streams and rivers in the WMA. A larger number and greater geographical distribution of streamflow gauging stations, however, is required to assess streamflow recharge of groundwater, to provide a better understanding of streamflow within smaller watersheds and lesser tributaries, and to provide streamflow data needed to develop TMDLs.

Groundwater Monitoring

While groundwater data are collected in many watersheds within the WMA, data are insufficient to adequately characterize groundwater quality, groundwater availability, and aquifer characteristics throughout much of the WMA. This is particularly evident in areas exclusively dependent on groundwater supplies. Groundwater data are sufficient to characterize groundwater quality and availability only within some of the WMA's major aquifers. More water quality data is needed to effectively characterize and manage water quality problems. Spatial and temporal understanding of groundwater quality in these areas is therefore lacking. A centralized, coordinated groundwater data collection effort would be required to allow for more complete characterization of groundwater availability and quality within the WMA. Data needs include the development of chloride mass balance method to compare to current Thronthwaite methodology of assessing groundwater recharge, more stream gauging of creeks in the groundwater reliant areas to better quantify runoff factor in recharge equations and more monitoring wells in fractured rock aquifers to provide a better understanding of existing quantities.

Monitored Constituents

Because monitoring strategies are often driven by regulatory mandates, the selection of monitored constituents tends to be broad, inclusive (e.g., all EPA Priority Pollutants), and static. In the past several years, watershed and water quality management in the WMA has evolved to become increasingly focused on specific issues and problems. Likewise, watershed sources of pollution are in continual flux. For instance, it is estimated that there are currently more than 85,000 chemicals in commerce the U.S., with more than 2,000 new chemicals being added to this mix annually (a rate of seven per day).

Although the nature of water and environmental pollution generally remains the same over time, the details clearly do not. Monitoring and data collection must therefore become increasingly focused on newly identified priorities, as well as "emerging

chemicals of concern" (e.g., pyrethroid pesticides, brominated flame retardants, nanoparticles, and pharmaceutical wastes).

Habitat and Natural Resource Monitoring

Habitat mapping efforts within the WMA are reasonably complete, but significant additional data collection is needed to better address habitat health and viability and to update habitat maps. Additional habitat health, species composition, and invasive species data are required in all watersheds to provide for a greater understanding of geographic-, temporal-, and water quality-related trends. Although several federal, state and local agencies collect data with respect to the quantity and quality of habitat, currently no single entity can provide a comprehensive assessment of such data.

Monitoring and Assessment Approaches

In some instances, data gaps could be addressed through modifications to existing monitoring and assessment approaches. For instance, monitoring approaches that better focus on water quality or environmental "risk," rather than static regulatory benchmarks such as chemical concentrations, could better and more cost efficiently focus management efforts toward solutions. Likewise, considerable benefit, including cost-savings, could be achieved through data gathering approaches that are designed to assess cumulative impacts rather than those of a single source or project. Another key issue with respect to monitoring approaches is that of linkages between media. Although the cycling of many constituents between water supply systems, surface waters, groundwater, and potentially biota, is well understood from a theoretical perspective, little real world data exist to support the development of effect management approaches. For instance, high levels of TDS have been documented in supplied water, surface waters, and groundwater throughout the WMA. Future data collection will need to be increasingly focused on characterizing and managing this problem.

Finally, an increased understanding of the dynamics of the systems within which existing monitoring is conducted would be beneficial. The WMA has a strong commitment to advancements in water quality science through focused special studies to answer specific issues of concerns including participation in regional monitoring programs that involve southern California as a whole. Some of the special studies that have been completed or are underway that will help us to better understand our watersheds include:

- Pathogenic and Fecal Indicator Bacteria Contributions
    - Coastal urbanized streams
    - Beaches and closed embayments
- Natural Source Contributions
    - Geologic Contributions to Urban Stormwater Runoff
- Stream Ecology Alteration Source Characterizations
    - Hydromodification Effects on Water Quality

    - Trash and Litter Monitoring Programs
- Invasive Aquatic Species
    - New Zealand Mudsnails
    - Giant Reed (Arundo donax)
- Environmental Toxicity Identification Evaluations
    - Water quality impairment pollutant source characterization
    - Sediment quality habitat degradation in coastal estuaries
- Effects of Urbanization on Stream Physical Habitat
    - Hydromodification
- Biological Objectives
    - Coastal stream benthic macroinvertebrate assemblages

10 COORDINATION WITH EXISTING LOCAL/REGIONAL PLANS

Each of the IRWM agencies plan and execute both short-term capital improvement programs and long-term plans and management programs. It is their plans, reports, studies, and programs along with certain regional plans, documents, and programs that provide the foundation for the IRWM Plan and present a coordinated, integrated approach. In addition to the numerous planning documents listed in this section, key planning documents are also included as Appendices to this Plan, such as Appendix G: Salt and Nutrient Management Plan, Appendix H: Floodplain Management Plan, Appendix I: Groundwater Management and Facility Plan, and Appendix J: Climate Change Analysis.

10.1 Local Water Planning

It is the intent of this IRWM Plan to be congruent with local plans and to include current, relevant elements of local water planning and water management issues common to multiple local entities in the Region. The IRWM planning does not replace or supersede local planning, but incorporates local planning elements.

The IRWM Group shall coordinate water management activities and information with local water planners and stakeholders through IRWM Group meetings, workshops, outreach activities, and email and website updates. Additionally, IRWM Plan strategies and priority projects are planned and implemented through extensive coordination and cooperation between Group members. Planning activities addressed in this teaming process include:

- Groundwater Management
- Urban Water Management
- Water Supply Management
- Wastewater Management
- Watershed Management
- City and County General Planning
- Low Impact Development
- Flood Protection
- Stormwater Management
- Ecological Resource Management
- Salt and Salinity Management
- Emergency Response/Disaster Plans

Many existing plans, including Water Supply Master Plans, Groundwater Management Plans, Watershed Management Plans, Water Reliability Assessments, Recycled Water Studies, Desalinization Feasibility Studies, and Long-Range Plans contain proposed

projects that are instrumental in meeting the goals and objectives of the Region. Projects within local and regional plans and studies have been incorporated into this IRWM Plan, and will continue to be implemented in coordination with those plans.

Although this IRWM Plan addresses Region-wide water management issues, local plans may present efforts or goals specific to a local water or natural resource. In the case that a stated goal or activity of a local plan conflicts with, or is inconsistent with, this IRWM Plan the IRWM Group shall organize meetings with the local governments or agencies to identify inconsistencies between the plans and resolve any issues. As IRWM planning develops and progresses, the dynamic relationships between local plans and the IRWM Plan will continue to consider and incorporate:

- Consistency and coordination regarding local plan content and the IRWM Plan content,
- Relevant, accurate, and current local plan information and references of which the IRWM Plan is based,
- Water management issues and climate change adaptation and mitigation strategies from local plans into the IRWM Plan, and
- Limits, levels, management tools or criteria relevant to water management in local plans that are applicable to the IRWM Plan.

Both local plans and this IRWM Plan will periodically be updated to reflect effective, integrated, and consistent water planning and management as the Region faces increasing challenges in managing its water supply due to climate change, increasing water demand as population increases, and uncertainty regarding the availability of water from the Sacramento-San Joaquin Delta and other sources. When the IRWM Plan is updated, the relevancy of the plans included here will be reviewed and the most updated or recent plans will be included.

Table 10-1, Existing Local and Regional Plans, Documents, and Programs, demonstrates the multitude of plans and projects that the South Orange County IRWM Plan integrates into regional planning.

Table 10-1: Existing Local and Regional Plans, Documents and Programs

GROUNDWATER MANAGEMENT		
Document Title	**Agency**	**Contribution to IRWM Plan**
Groundwater Management and Facilities Plan, 2013	San Juan Basin Authority	Local groundwater management information & data
Basin Water Levels and Well Yield, Geotechnical Consultants, 11/01	San Juan Capistrano, City of	Technical data
Groundwater Supply and Management Study, Boyle Engineering Corporation, 09/87	San Clemente, City of	Technical data
San Juan Basin Groundwater Management and Facilities Plan, NBS Lowry, 05/94	San Juan Basin Authority / MWD	Local groundwater management information & data
Selection of Recommended Projects for San Juan Basin Groundwater Management, SJBA, 05/95	SJBA	Local projects information
Seven-Year Drought Groundwater Flow Model Results, Geotechnical Consultants, 06/02	San Juan Capistrano, City of	Technical data

URBAN WATER MANAGEMENT PLANNING		
Document Title	**Agency**	**Contribution to IRWM Plan**
2010 Regional Urban Water Management Plan Update, Arcadis, 6/11	MWDOC	Regional water management information & data
2010 Urban Runoff Diversion Study Report, Arcadis, 6/11	Laguna Beach, City of	Technical information
2010 Urban Runoff Management Plan, Arcadis, 6/11	Laguna Hills, City of	Local water management information & data
2010 Urban Runoff Management Plan, Arcadis, 6/11	San Clemente, City of	Local water management information & data
2010 Urban Water Management Plan, Arcadis, 6/11	El Toro WD	Local water management information & data
2010 Urban Water Management Plan, Irvine Ranch WD, 12/00	Irvine Ranch WD	Local water management information & data

2010 Urban Water Management Plan, Arcadis, 6/11	Laguna Beach County WD	Local water management information & data
2010 Urban Water Management Plan, Arcadis, 6/11	Moulton Niguel WD	Local water management information & data
2010 Urban Water Management Plan, Arcadis, 6/11	San Clemente, City of	Local water management information & data
Urban Water Management Plan 2010, Arcadis, 6/11	Santa Margarita WD	Local water management information & data
2010 Urban Water Management Plan, Arcadis, 6/11	San Juan Capistrano, City of	Local water management information & data
2010 Urban Water Management Plan, Arcadis, 6/11	South Coast WD	Local water management information & data
2010 Urban Water Management Plan, Arcadis, 6/11	Trabuco Canyon WD	Local water management information & data

WATER SUPPLY MANAGEMENT		
Document Title	**Agency**	**Contribution to IRWM Plan**
CVWD and MNWD SERRA AWT and Pipeline Project, Cathcart Garcia Von Langen Engineers, 7/94	Moulton Niguel WD	Technical data
Determining the Value of Water Supply Reliability, Orange County Business Council, 8/03	MWDOC	Technical data
Drinking Water Source Assessment, Geotechnical Consultants, 3/01	San Juan Capistrano, City of	Technical data
ETWD, IRWD, and MNWD Recycled Water Project Study Draft, Tetra Tech, 12/03	Moulton Niguel WD	Local project information & data
Evaluation of Recycled Water Supply for MNWD & ETWD, Cathcart Garcia Von Langen Engineers, 4/01	Moulton Niguel WD	Technical data
Joint Regional Water Supply System Master Plan, AKM Consulting Engineers, 02/97	South Coast WD	Water supply information
MNWD Master Plan for District-wide Facilities, Moulton Niguel WD, 1996	Moulton Niguel WD	Local water facility information

Non-Domestic Water Master Plan Financial Study, City of San Juan Capistrano, 04/00	San Juan Capistrano, City of	Technical data
Ocean Desalination Plant Feasibility Study, Boyle Engineering Corporation, 1/03	MWDOC	Project feasibility
Planned Utilization of Water Resources in the San Juan Creek Basin Area, DWR, 06/72	DWR	Water resource information & data
Preliminary Design of MNWD Recycled Water System Expansion with ETWD, Cathcart Garcia Von Langen Engineers, 08/02	Moulton Niguel WD	Local recycled water project
Preliminary Engineering MNWD AWMA-Side Water Reclamation Distribution System, Nolte and Assoc, 06/88	Moulton Niguel WD	Local reclaimed water distribution information
Preliminary Engineering MNWD SERRA-Side Water Reclamation Distribution System, Nolte and Assoc, 06/89	Moulton Niguel WD	Local reclaimed water distribution information
Preliminary Well Design and Site Selection Report, Geotechnical Consultants, 6/01	San Juan Capistrano, City of	Groundwater well information & data
Reclaimed Water Master Plan, AKM Consulting Engineers, 04/94	San Clemente, City of	Local reclaimed water information
South Orange County Water Reliability Study (Phase 1&2), , Boyle Engineering Corporation / MWDOC, 2001&2004	MWDOC	Regional water reliability information
Southern California Comprehensive Water Reclamation and Reuse Study, CH2MHILL; U.S. Bureau of Reclamation, 1999	U.S. Bureau of Reclamation and 8 partnering agencies	Regional data
Strategic Plan 2003-2008, South Coast WD, 11/03	South Coast WD	Regional planning information
Water and Sewer Master Plan, RBF Consulting, 12/04	El Toro WD	Local planning information
Water Master Plan, 04/94	San Clemente, City of	Local planning information
Water Master Plan Update, AKM Consulting Engineers, 3/04	San Juan Capistrano, City of	Local planning information

WASTEWATER MANAGEMENT		
Document Title	**Agency**	**Contribution to IRWM Plan**
Biosolids Management Strategic Plan, Tetra Tech, Inc, 9/02	SOCWA	Technical data
Enclosed Composting Facility, SOCWA, 10/02	SOCWA	Technical data
Jay Latham Wastewater Treatment Plant Preliminary Design Report, Cathcart Garcia Von Langen Engineers, 09/00	SOCWA	Technical data
Sanitary Sewer Master Plan, Tetra Tech, 2003	San Juan Capistrano, City of	Local sewer information & data
Sewer Collection Strategic Plan and Capital Improvements Program, City of Laguna Beach, 07/02	Laguna Beach, City of	Local sewer information & data
Ten Year Capital Improvement Program 2002-2012, SOCWA, 10/02	SOCWA	Technical data & planning information

GENERAL PLANNING		
Document Title	**Agency**	**Contribution to IRWM Plan**
General Plan and Draft Environmental Impact Report for Doheny State Beach, Department of State Parks, 12/03	California State Parks	Local planning information
General Plan/Local Coastal Program "Open Space and Conservation" Element, City of Laguna Beach, 2004	Laguna Beach, City of	Local planning information
Long Range Plan Update, Moulton Niguel WD, 2/02	Moulton Niguel WD	Local planning information

WATERSHED MANAGEMENT		
Document Title	**Agency**	**Contribution to IRWM Plan**
Aliso Creek Watershed Management Plan, U.S. Army Corps of Engineers, 9/01	County of Orange	Local watershed management information & data

Laguna Coastal Streams Watershed Management Plan, Co-permittees, 2004	Laguna Beach, City of	Local watershed management information & data
San Juan Creek Watershed Management Study, U.S. Army Corps of Engineers, 09/02	County of Orange	Local watershed management information & data
Santa Ana Integrated Watershed Plan, SAWPA, 06/02	SAWPA	Local watershed management information & data

STORMWATER/FLOOD MANAGEMENT		
Document Title	**Agency**	**Contribution to IRWM Plan**
Drainage Area Management Plan, Co-Permittees, 2003	County of Orange	Technical data
Identification of Regional BMP Retrofitting Opportunities Draft (Stormwater Program), RBF Consulting, 04/04	County of Orange	BMP data
Local Implementation Plan (Jurisdictional Urban Runoff Management Plan), Co-Permittees, 2003	All cities	Technical data
Baby Beach Dana Point Harbor Bacterial Indicator Total maximum Daily Load Annual Progress Report	County of Orange & City of Dana Point	Water Quality Data
Model Water Quality Management Plan , 2011	County of Orange	Post-construction stormwater runoff requirements
Aliso Creek Comprehensive Load Reduction Plan – Draft 2012	County of Orange	Stormwater Management Program
Aliso Creek Watershed Workplan, 2012	County of Orange	Stormwater Management Program
Dana Point Coastal Streams Watershed Work Plan, 2012	County of Orange	Stormwater Management Program
Laguna Coastal Streams Watershed Work Plan, 2012	County of Orange	Stormwater Management Program
San Juan Creek Watershed Work Plan, 2012	County of Orange	Stormwater Management Program
San Juan Creek Comprehensive Load Reduction Plan- Draft 2012	County of Orange & City of San Juan Capistrano	Stormwater Management Program

San Clemente Coastal Streams Comprehensive Load Reduction Plan – Draft 2012	County of Orange & City of San Clemente	Stormwater Management Program
San Clemente Coastal Streams Creek Watershed Work Plan, 2012	County of Orange	Stormwater Management Program
San Mateo Creek Watershed Work Plan, 2012	County of Orange	Stormwater Management Program

ECOLOGICAL RESOURCE MANAGEMENT		
Document Title	**Agency**	**Contribution to IRWM Plan**
Heisler Park Preservation and Renovation Conceptual Plan, SFC Consultants, 07/04	Laguna Beach, City of	Open space planning
Heisler Park Preservation and Renovation EIR, SFC Consultants, 12/04	Laguna Beach, City of	Open space planning
Laguna Creek Initial Study and Conceptual Restoration Plan, PCR Services Corporation, 10/03	Laguna Beach, City of	Local restoration planning
Natural Community Conservation Plan, County of Orange, 1996	County of Orange	Conservation planning
Bikeways, Trails & Open Space Master Plan, Dangermond Group, 11/01	Laguna Hills, City of	Open space planning
Southern California Steelhead Recovery Plan January 2009	NOAA - Southwest Regional Office, National Marine Fisheries Service Long Beach, CA	Steelhead Recovery
Southern California Wetlands Recovery Project 2009	SCCWRP	Cooperative wetland recovery planning and implementation
OCTA Mitigation Funding, 2009	OCTA	Environmental Mitigation Planning
Santa Margarita Water District Supplemental Environmental Project (for Regional Water Quality Control Board) 2012	SMWD	Environmental Mitigation Planning

Each watershed in the Region includes unique surface water and groundwater sources and is managed by a Drainage Area Management Plan (DAMP). Therefore, by approaching the Region on a watershed basis, the availability of local water resources

can be clearly outlined. To meet the requirements of Sections J and L of the municipal National Pollution Discharge Elimination System (NPDES) Stormwater Permits issued jointly to the cities within the County, the Orange County Flood Control District and the County of Orange, watershed chapters developed for the County's DAMP are updated annually. The chapters and their respective updates are developed by the Permittees of each watershed. The Permittees are comprised of each city within the geographic boundaries of the watershed in addition to the County of Orange and the Orange County Flood Control District.

A representation of coordination with an existing plan is the Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS). This 6-year study evaluated the feasibility of maximizing the beneficial uses of recycled water through regional collaborative programs. The Study covered a 6 county area in southern California, included over 7,300 demand points and all wastewater supplies in its data bases. The SCCWRRS was a partnership between the U.S. Bureau of Reclamation and eight cost sharing partners. Three phases of the study have been completed: compilation of data to analyze the optimum use of reclaimed water; development of preliminary designs and costs for specific projects; and identification of short and long-term projects. Many of the findings, recommendations, and proposed projects were considered within this IRWM Plan. The IRWM Plan will continue to be coordinated with this Study and other planning documents that already have studied and considered many of the key factors within the IRWM Plan.

The Projects in this IRWM Plan reflect effective, integrated, and consistent water planning and management as the Region faces increasing challenges in managing its water supply due to climate change, increasing water demand as population increases, and uncertainty regarding the availability of water from the Sacramento-San Joaquin Delta and other sources. The Projects integrate watershed management plans. The Projects also support implementation of DAMP and SCCWRRS, as well as local plans. The Smart Water Landscape Project implements MWDOC's Urban Water Management Plan, Runoff Reduction Studies, and other long range plans. The Shadow Rock Detention Basin Project assists in the municipal National Pollution Discharge Elimination System (NPDES) Stormwater Permits issued jointly to the cities within the County, the Orange County Flood Control District and the County of Orange. In addition, the Trabuco Canyon Water District signed an MOU with the Trabuco Highlands Community Association (THCA) for the Project operation to coordinate land and water management. The Rockledge Ocean Protection Project implements the City of Laguna Beach's Sewer Capital Improvement Plan, as well as multiple plans associated with the Laguna Beach State Marine Conservation Area (SMCA).

10.2 Local Land Use Planning

Land use decisions and water management decisions are often under the purview of different agencies, yet the resources each agency manages are inextricably linked. Often, the relationship among these agencies is characterized as reactive in that one agency must act to accommodate a decision the other agency has made. Early communication is vital in changing the relationship from reactive to proactive. Local land use planning, regional water issues, and water management objectives are closely

related due to the overlap of issues present within the watershed management planning. Figure 10-1 shows land use for the region[77].

Local land use planning and water supply planning are coordinated through a patchwork of existing State laws and policies. Regional wholesalers such as MWD base their water supply plans of regional growth projections developed by regional planning agencies.

Urban Water Management Plans, as established by the Urban Water Management Planning Act, must be prepared by large water purveyors (3,000 acre-feet/year or 3,000 customers), must evaluate water supplies and demands over a 20-year period, and must be updated every five years. South OC WMA water districts routinely submit their UWMP to the state every 5 years and must consider land use in their water supply and demand projections.

[77] Southern California Association of Governments 2008 – Land Use Data

Figure 10-1: Land Use

Municipal water conservation efforts and landscaping programs integrate land use and water planning. For example, MWDOC's South OC WSL Project integrates water management with land use planning by proposing to implement an aggressive landscape improvement program on publicly owned and other commercial landscapes properties. This requires careful coordination between the participating City's and land/property owners. Operation and maintenance measures are also considerations for determining the appropriate locations for removing non-functional turf, upgrading antiquated irrigation timers to weather-based self-adjusting irrigation timers, and converting high-volume spray irrigation to low-volume irrigation. The Water Smart Landscape Project will also reduce maintenance costs on both the landscape itself as well as asphalt street material (over 84 acres of existing landscape are targeted for improvement through this program).

Senate Bills 610 and 221 (2001) were enacted by the State legislature to improve the coordination between land use planning and development and available long-term water supplies. These laws are intended to require assessment and verification, respectively, of water supply reliability prior to approval of specified large land use projects. SB 610 applies during the CEQA process, and SB 221 applies to subdivision approvals. Both laws require a demonstration of sufficient reliable 20-year water supplies to serve both the proposed project and other water users relying on the same water supplies, during normal, single dry, and multiple dry years. They require the water agencies responsible for water resource planning to work with the local land use agencies that often have little control over water supplies.

In addition to some changes in the Urban Water Management Planning Act since the last UWMPs were submitted in 2005, Governor Schwarzenegger in his 20x2020 Plan determined that for California to continue to have enough water support its growing population, it needs to reduce the amount of water each person uses per day (Per Capita Daily Consumption, which is measured in gallons per capita per day). This reduction of 20 percent per capita use by the year 2020 is supported by legislation passed in November 2009 SB x 7_7 (Steinberg).

Other State laws and policies play a more indirect role in coordinating land use and water supply planning. The OPR General Plan Guidelines encourages local governments to plan at a watershed level for better regional self-sufficiency and to consider adopting an optional water element in General Plans to address water supply and other water-related impacts of land use policies. Local agency formation commissions (LAFCOs) are regional agencies that approve local agency boundary changes; they perform municipal service reviews to evaluate how all services, including water, are delivered to developing areas of the state.[78]

Local land use plans have assisted in the development of this IRWM Plan. In this way the IRWM Plan is consistent with and reflects projects that are linked to land use planning in the Region. Refer to Figure 10-1 for the Land Use Map. Plans and information that have contributed to the IRWM Plan include city General Plans - Land

[78] California Water Plan Update 2009, Vol. 2, Chapter 24 – Land Use Planning and Management

Use Elements, Storm Water Elements, and Water/Wastewater Elements; County of Orange Land Use Planning documents; and Southern California Association of Governments (SCAG) land use data. The County of Orange General Plan also played a major role in evaluating projects for consistency with planned land use.

Much of the land use data has assisted in the regional planning and projections of water demands, water use classifications, infrastructure master planning, and reliability planning into the future. The IRWM Plan will continue the essential link to local land use plans, and can be considered a planning document in return for many local land use plans.

An exchange of knowledge, ideas, and expertise between land use and water resource managers in the Region is essential to improving planning efforts between the IRWM Plan and local land use plans. A high level of communication is necessary to ensure water managers and land use planners make informed, collaborative water management decisions on a region-wide basis.

To facilitate communication and coordination between water managers and land use managers in the Region, the IRWM Group includes local land use planners and agencies in meeting notices and informational emails regarding the IRWM planning process. Land use planners are encouraged to attend South Orange County IRWM Group meetings.

Managing multiple water demands throughout the Region, adapting water management systems to the effects of climate change, and potentially offsetting climate change impacts to the water supply can be improved by a collaborative and informed relationship between land use and water planners. Future opportunities for a better working relationship between water managers and land use decision makers include:

- Coordinate changes to the IRWM Plan with land use planners
- Improve communication mechanisms for interacting with the land use planning community
- Consider future forums, policies, and projects that could improve water management efforts, such as regular meetings between water managers and land use planners
- Consider existing and planned future land use designation when planning and managing various water supply and water quality projects.
- Apply the Ahwahnee Principles for Resource Efficient Land Use to advocate a more proactive relationship between land use and water management[79].
- Utilize current land use and water issues and identify planning strategies which may be implemented, or explored in the future through the IRWM process.

[79] www.lgc.org/ahwahnee/h2o_principles.html

11 STAKEHOLDER INVOLVEMENT

11.1 Process to Identify and Involve Stakeholders

As discussed in Section 2.3 and 2.4, the South Orange County IRWM Group has a diversity of stakeholders participating in the collaborative planning effort. The planning effort has required coordination of activities within the IRWM Region as well as neighboring regions. Refer to Section 2.6.2 for more information on Project Coordination, Sharing of Information, and IRWM Plan updates. For detailed information on Coordination with San Diego Funding Area and discussion on Tri-County FACC, refer to Section 2.8.1 of this Plan.

The South Orange County IRWM Group uses a variety of methods to engage the stakeholders and general public. They include participating in stakeholder workshops, inclusion in the IRWM process, communication via email and information sharing via the County's website www.ocwatersheds.com. The website also provides contact information and email links for the South Orange County IRWM Group.

The South Orange County WMA has implemented a public process that provides outreach and an opportunity to participate in IRWM Plan development and implementation to the appropriate local agencies and stakeholders, including the following:

- Wholesale and retail water purveyors
- Wastewater agencies
- Flood control agencies (including those agencies who submit applications for Proposition 1E funded Stormwater Flood Management Grants)
- Municipal and county governments and special districts
- Electrical corporations
- Native American tribes
- Self-supplied water users
- Environmental stewardship organizations
- Community organizations
- Industry organizations
- State, federal, and regional agencies or universities
- DAC members
- Any other interested group appropriate to the region

In 2004, the first meeting of the South Orange County IRWM Group was held. This meeting included multiple stakeholders in South Orange County, attended by the County, cities, and water and wastewater agencies. The South Orange County IRWM Group identified preliminary goals, objectives, and priorities for meeting the water resource needs of South Orange County, and set a schedule for future meetings.

Meetings were held at least twice a month through the development of the IRWM Plan, beginning September 13, 2004. The South Orange County IRWM Group continues to inform and invite additional stakeholders to the South Orange County IRWM Group meetings, and the South Orange County IRWM Group has grown to represent at least 30 entities. The stakeholders represent agencies and organizations that have developed an integrated approach to addressing the objectives and water management strategies of the IRWM Plan. Significant progress was made to identify the myriad of

projects that have been included in existing plans and incorporating those projects into the IRWM Plan.

The meetings focused on current IRWM efforts which include updating the South Orange County IRWM Plan, a Call for and review of Projects and an opportunity to receive input from stakeholders. As the South Orange County IRWM Plan was updated, iterations of the Draft South Orange County IRWM Plan were made available to the South Orange County IRWM Group and public stakeholders for review and comment. Comments were received, reviewed and discussed by multiple participants of the South Orange County IRWM Group prior to incorporation into the South Orange County IRWM Plan.

In June 2005, the South Orange County IRWM Group submitted the South Orange County Integrated Regional Water Management Plan for Proposition 50, Chapter 8 Integrated Regional Water Management Program Implementation Grant funds. In January 2007, the South Orange County IRWM Plan was one of seven statewide proposals recommended for funding. As a result, South Orange County received $25,000,000 for seven projects included in the South Orange County IRWM Plan. The South Orange County WMA has continued to successfully obtain state funding to date, as summarized in Section 2.6.1.

The South Orange County IRWM Group continues to meet to discuss IRWM Plan implementation, collaborative opportunities, status of existing projects, proposals for new projects, updates from the State, potential funding opportunities and the need for plan refinements. As mentioned previously the County of Orange will provide information and updates on the IRWM process through the OC Watersheds IRWM webpage at: www.ocwatersheds.com/wma_IRWM.aspx. Members of the IRWM Group have access to: IRWM work products; committee meeting schedules, agendas, and summaries; contact information; and links to relevant web pages and information.

The following is a list of the South Orange County IRWM Group meetings, including workshops, executive committee and management committee meetings, held to date:

September 14,2004	May 31, 2011
October 11, 2004	July 11, 2011
October 25, 2004	July 14, 2011
November 8, 2004	August 8, 2011
November 22, 2004	September 12, 2011
December 13, 2004	October 3, 2011
January 3, 2005	October 16, 2011
January 17, 2005	November 7, 2011
January 31, 2005	December 5, 2011
February 16, 2005	January 9, 2012
February 28, 2005	February 6, 2012
March 14, 2005	February 9, 2012
April 18, 2005	March 5, 2012

May 2, 2005	April 9, 2012
May 16, 2005	May 3, 2012
May 31, 2005	May 7, 2012
July 11, 2005	June 4, 2012
January 17, 2006	July 9, 2012
February 6, 2006	August 6, 2012
March 24, 2006	September 10, 2012
April 10, 2006	October 1, 2012
February 17, 2007	November 1, 2012
July 2, 2007	December 3, 2012
November 15, 2007	January 7, 2013
July 22, 2008	February 4, 2013
September 18,2008	February 7, 2013
October 15, 2008	March 4, 2013
November 20, 2008	April 1, 2013
April 15, 2009	April 30, 2013
May 4, 2010	May 2, 2013
May 25, 2010	June 24, 2013
March 30, 2010	July 1, 2013
April 7, 2011	July 18, 2013

Through County-led watershed stakeholder workshops, the South Orange County IRWM Group and regional stakeholders also discuss the WMA's subwatersheds and participants were encouraged to discuss how the IRWM Plan would be updated to reflect the new objectives of the WMA**.** These ongoing watershed stakeholder workshops are comprised of representatives from the County, Cities, water and wastewater districts, major landowners, environmental groups such as Clean Water NOW!, Sierra Club, Permaculture Institute, South Laguna Beach Civic Association, Orange County Coastkeeper, Surfrider Foundation, Native American tribes, and the general public. These workshops provide for wider public participation and are a great venue for discussing IRWM issues, projects, and updates. Through the watershed stakeholder workshops, as well as regular postings on the County's WMA website (http://www.ocwatersheds.com/wma_IRWM.aspx), the County provides an overview and update on the IRWM Plan.

Technology and Information Access

A PowerPoint presentation explaining the IRWM process was developed for South Orange County IRWM Group participants to use in educating their individual City Councils and Board of Directors. In addition, a fact sheet was developed and distributed to each participating stakeholder for use in informing their boards, councils, constituents and customers on the efforts of the South Orange County IRWM Group. The Fact Sheet explained that a diverse group of water, wastewater, and watershed agencies and professionals had come together as a single unit to create stronger regional partnerships and connectivity, to maximize the efficiency of their efforts, and to develop a South Orange County IRWM Plan.

The PowerPoint and fact sheet were frequently used by the South Orange County IRWM Group during the IRWM Plan development process. Over 100 presentations were provided at Public Stakeholder, Board of Directors, Board of Supervisors, City Council and Water Board meetings.

The South Orange County IRWM Group provided informational presentations on the status and progress of the South Orange County IRWM efforts in 2008:

- March 2008: Update on South Orange County IRWM Group Efforts presented to the County Board of Supervisors
- August 2008: Integrated Watershed Management Planning Efforts in the County provided to American Society of Civil Engineers

The County of Orange will continue to provide information and updates on the IRWM process through the OC Watersheds IRWM webpage at: www.ocwatersheds.com/wma_IRWM.aspx. This webpage provides information including: descriptions of County WMAs, the IRWM grant process, calls for projects and project information forms, Coastal Coalition meetings and presentations, IRWM Group meeting announcements, and IRWM Plan updates.

The IRWM Group can access and share planning documents and information via a project website maintained by a County consulting firm. The website contains meeting notes, presentations, and technical reports regarding the IRWM Plan and process.

In addition to sharing information and coordinating amongst themselves the South Orange County IRWM Group met with State Water Board, San Diego Regional Water Board and DWR staff throughout the South Orange County IRWM planning process. Local and Sacramento meetings were held to discuss planning efforts including coordination of the South Orange County IRWM Plan development, objectives, strategies, project prioritization and implementation. The South Orange County IRWM Group has developed a positive working relationship with IRWM Program staff at the State Water Board while administering the Prop 50 grant funds.

The South Orange County IRWM Group continues to coordinate with DWR staff regarding Proposition 84. During the RAP process, the County and members of the South Orange County IRWM Group met with DWR staff to discuss how the South Orange County WMA collaborates as a Region. Following the meeting, the South Orange County WMA was approved as a Region. DWR staff are invited to attend South Orange County IRWM Group meetings and have attended the March 30, 2010 meeting, two executive committee meetings on February 9, 2012 and May 3, 2012, and the stakeholder meeting on July 9, 2012.

11.2 Disadvantaged Communities

The IRWM Plan includes projects and programs aimed at protecting the population as a whole including residents who represent the disadvantaged population of the area. For example, El Toro Water District's Recycled Water Distribution System Expansion was funded by Proposition 84 Round 1 Implementation Grant and consists of constructing a new recycled water distribution system to serve the El Toro Water District Service Area

that includes disadvantaged communities in the City of Laguna Woods. The project would result in the conversion of approximately 75 existing potable water dedicated irrigation meters to recycled water. The conversions would reduce the amount of potable water imported by the District by as much as 300 acre feet per year. This Project would directly benefit disadvantaged community members.

Additionally, by addressing water quality issues in areas of recreational use, the IRWM Plan incorporates environmental justice in a way that provides every resident an equal opportunity and fair treatment in the regional water planning process. To further substantiate the importance of including regional minority communities, the South Orange County IRWM Group has collaborated with Juaneno Band of Mission Indians and Hispanic community groups, including the National Hispanic Environmental Council to encourage their involvement in the IRWM Plan.

The National Hispanic Environmental Council (NHEC) provided a letter of support for the 2005 IRWM Plan as a result of outreach efforts. In June 2012, NHEC was contacted and provided a copy of the 2005 letter of support. NHEC was subsequently invited to the July 9, 2012 Stakeholder Workshop for the IRWM Plan.

South Orange County includes two areas where the average median household income is less than 80 percent of the statewide annual median household income, and therefore deemed by the state as disadvantaged communities.[80] Refer to Figure 3-15 Disadvantaged Communities for the locations of these two areas which includes the City of Laguna Woods and the community of Laguna Woods Village. The Laguna Woods Village Professional Community Management (Homeowner's Association) was contacted and the July 9, 2012 Stakeholder Workshop announcement and link to the announcement on the OC Watersheds website were provided to Professional Community Management. The invite notice and link were posted on the HOA website on in July 2012. .

Areas of low cost housing and subsidized housing include South Orange County's disadvantaged communities. One clear measure of this community is that the Camino Health Center in San Juan Capistrano provides affordable, quality primary medical and dental care. The Center serves over 100,600 visits annually through its medical clinic, mobile medical vans, pediatric dental clinic, and Women, Infants and Children program of which the majority were Hispanics whose income is in line with the State's formula for disadvantaged populations.

Educational and public outreach activities implemented as part of the IRWM Plan will increase residents' understanding and appreciation of watersheds and other areas of significance, including how human interaction impacts habitat areas and other natural resources. Projects like the South OC Water Smart Landscape Project will assist in meeting the regional need for public education in the stewardship of watershed resources. The projects will fill educational and recreational purposes, and provide and

[80] Of the 598,000 residents in South Orange County, it is estimated that 2 percent of the population are disadvantaged and live at or below the poverty level.

demonstrate environmental benefits. The projects will inspire broad implementation of water quality and water conservation improvements across the community.

Latino Health Access

In order to develop a DAC Outreach Program that could be used countywide, OC Watersheds staff (Staff) partnered with Latino Health Access. Latino Heath Access (LHA) is a local nonprofit organization founded in 1993 to help meet the multiple health needs of the Latino community. LHA assists in improving the quality of health and life of uninsured, under-served people by providing them with quality preventive care services and educational programs.

As a result of OC Watersheds' targeted outreach in 2009, LHA submitted a project for inclusion in the Central Orange County IRWMP. The project was for the development of a pocket park in the 92701 zip code, one of Santa Ana's poorest communities. The park includes a basketball court, playground, community center with a multi-purpose room, full industrial kitchen, and a walking path. Located two blocks from downtown Santa Ana and next to Spectrum condominiums, the LHA Park and Community Center is within walking distance for most residents. In addition, LHA will offer nutrition and physical activity, English as a Second Language, and mental health support programs at the Center. In keeping with the social sustainability goals of the project, eco-friendly construction methods and materials were used to build the park and community center. The low-impact building incorporates various environmentally sustainable features. For example, the park's irrigation system utilizes the most water conscious approach available. Weather sensors are used to reduce water usage when rain is present and solar sensors automatically adjust irrigation timing to provide additional watering when extreme heat is present. Additionally, wind sensors detect strong winds and divert irrigation systems run times to a calmer period of the day, and play yards are cushioned by a recycled rubber play surface.

Although the LHA Project is located between the South Orange County and Central Orange County IRWM regions, the positive benefits spread beyond the project. OC Watersheds will continue to support this project by offering in-kind services, such as support from its staff who have been LEED certified and support for Site Cleanup events. Outreach to Latino Health Access was performed in June 2012 and they were invited to the July 9, 2012 Stakeholder Workshop. The new $3.6 million park and community center opened in 2013.

Latino Water Coalition

In an attempt to further connect with DACs and the organizations that serve them, OC Watersheds staff attended a Latino Water Coalition event in 2010 at the Orange County Water District. The California Latino Water Coalition (CLWC) advocates improving the State's water supply today to ensure economic prosperity for tomorrow. They believe additional water resources are directly linked to creating jobs, stability and opportunity throughout California. The CLWC engages in public education, outreach and events to generate support and understanding on water issues. Projects proposed as part of the IRWM Plan will provide positive impacts and benefits to organizations like the CLWC.

The organization's goal is to demonstrate the need for a comprehensive statewide water infrastructure plan, a program that includes groundwater and surface water storage capabilities, conservation and water resources stewardship, water recycling and desalinization. In June 2012, CLWC was contacted via phone, as well as email, and invited to attend the July 9, 2012 Stakeholder Workshop. Through implementing this IRWM Plan, South Orange County will contribute to this cause and provide positive benefits to the organization.

11.3 Native American Tribes

The South Orange County IRWM Group understands the importance of Native American Tribe Notification and incorporates this process into the IRWM Plan Update and CEQA review. The IRWM Group conducts ongoing outreach to tribal representatives throughout the region. The IRWM Group solicits to local tribes as part of the public outreach process. The public workshops aim to engage tribal representatives in identifying the major issues and priorities of their lands, and how the priority projects may impact them. Tribal notification will be a part of the CEQA process for efforts that are considered projects, as defined under CEQA.

Juaneño Band of Mission Indians

South Orange County is home to the Juaneño Band of Mission Indians and a large Hispanic population. Each of these groups includes large communities of disadvantaged residents therefore it was essential to include them in the IRWMP planning process. The Juaneño Band of Mission Indians have provided valuable information needed to identify the disadvantaged members of the South Orange County WMA. Ongoing outreach to Chief David Belardes, of the Juaneno Band of Mission Indians, has provided direct inclusion of the Indians in the South Orange County IRWM Planning process. In June 2012, Chief David Belardes was contacted and notified about the July 9, 2012 Stakeholder Workshop for the IRWM Plan.

The South Orange County IRWM Group will continue to actively involve regional minority communities, including the Juaneño Band of Mission Indians and other community groups to ensure IRWM Plan Implementation provides positive benefits and impacts to their community.

12 CLIMATE CHANGE

Climate change is a shift in the average weather that a given region experiences. This is measured by changes in the features that we associate with weather, such as temperature, wind patterns, precipitation, and storms. The Earth's climate has always been changing, however, the current climate change we are seeing today differs from previous climate change in both its rate and its magnitude. As part of this IRWMP Update, a climate change analysis was completed. The Climate Change and Vulnerability in the South Orange County IRWM Planning Region, provided in Appendix J, presents an assessment of the potential impacts of climate change on the water resources of South Orange County.

Because of the importance of imported water supply to South Orange County, potential impacts of climate change to water resources must be examined over a region broader than the IRWM planning area. Changes in observed climatic variables in this larger region representing the Western U.S. have been examined through data collected in the 20th century. Over this period, particularly in winter and spring, temperatures have risen significantly across western North America. In the second half of the 20th century, the warming in the mountainous western North America has led to a higher rain-to-snow ratio, lower snow water content, decline in March snow cover, and a shift toward earlier annual snowmelt timing by 5 to 30 days. These observations strongly support the need for incorporating climate change into long-term water resources planning efforts.

For estimating future climate conditions, global climate processes are represented using atmosphere-ocean general circulation models (AOGCMs or GCMs, also known as "global climate models"). Using these models, the projected data summary for the South OC IRWM planning region show a small decrease in precipitation of slightly over an inch per year by mid- to late-21st century periods (Table 12-1). They also show an increase in temperature from >2 to >5 ^{o}F over the same periods (Table 12-2). In general, climate models project more adverse conditions (i.e., warmer and drier) in the latter part of the 21st century compared to conditions observed in the second half of the 20th century.

Table 12-1: Average projected change in Precipitation in IRWM Region 16 GCMs

	Time period and average change		
Emission Scenario	2010-2039	2040-2069	2070-2099
A2	-0.37 inches	-1.06 inches	-1.54 inches
B1	0.02 inches	-0.67 inches	-0.94 inches

Table 12-2: Average projected change in temperature in IRWM Region 16 GCMs

	Time period and average change		
Emission Scenario	2010-2039	2040-2069	2070-2099
A2	1.59 ^{o}F	3.37 ^{o}F	5.81 ^{o}F
B1	1.58 ^{o}F	2.70 ^{o}F	3.73 ^{o}F

Several major planning studies have been performed in South OC water supply regions that consider the impacts of climate change. Projected climate change conditions, typically obtained from statistical downscaling of an ensemble of models, have been used for developing plans in in both regions. A key feature that stands out from the comprehensive analyses that have been performed is that both California and the Colorado Basin are severely water constrained, where it will be challenging to meet current allocations in future years. In both regions, planning model projections indicate years where deliveries will sometimes fall short of allocations, over planning horizons that range from 20 to 50 years into the future, under conditions where no changes are made to the existing operational infrastructure of the system. Because the regions jointly affected by these basins are continuing to experience relatively rapid population growth, and anticipated increased in municipal demands, water planners must address the dual challenge of reduced supplies and increased demand.

Although variable at different points along the coast due to regional factors, in general, sea levels are rising globally due to climate warming including expansion of ocean water and melting of land ice. Along the Pacific Coast, the highest values of sea level rise in Southern California have been reported at Newport Beach, near the study region, where the observed increase is 2.22 mm/year. These rates are projected to accelerate over the 21st century. A recent review of different calculation approaches by the National Academy of Sciences reported that global sea level is estimated to rise 8–23 cm (3-9 inches) by 2030 relative to 2000, 18–48 cm by 2050 (7-19 inches), and 50–140 cm (20-55 inches) by 2100. This review projects that sea level in Southern California is slightly higher than the global average because of land subsidence, and will rise 4–30 cm (2-12 inches) by 2030 relative to 2000, 12–61 cm (5-24 inches) by 2050, and 42–167 cm (17-66 inches) by 2100. Maps illustrating the effects of sea level rise to 2100 and a 100-year flood were developed for the South IRWM planning region to identify areas that are vulnerable. An example map is shown in Figure 12-1.

Figure 12-1: Zoomed-in area of South OC Coastline

Areas (identified in yellow on Figure 12-1) are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's base flood elevation values in feet.

Greenhouse gas emissions associated with the water sector were estimated for the South OC planning region. The General Reporting Protocol, Version 3.1, developed by the California Climate Action Registry is used to calculate indirect emissions of greenhouse gases (GHG) from electricity used for the water system in south Orange County. The water sector is the largest user of electricity in the state of California. The bulk of water for southern California specifically is transported over long distances up steep gradients and is therefore more energy expensive than local sources. Energy use for water is quantified via energy intensity, or the gross energy required for the water system to use a specific amount of water at a specific location. Under baseline conditions, the water sector in the region generates GHG emissions of over 93,000 metric tons in terms of carbon dioxide equivalent. The seven high priority projects identified in this IRWM were evaluated for their relationship to climate change and greenhouse gas emissions. The projects identified have the potential to save about

17,000 metric tons of CO_2-equivalent emissions annually, nearly 18% of the current total water sector emissions.

An overall assessment of vulnerability to climate change for South OC following a checklist presented in the Climate Change Handbook for Regional Water Planning, and specifically recommended for IRWM climate change planning was performed and is included in Appendix J. As noted above, the major water supply system vulnerabilities in this region are not unique, but are tied to the water supply system in California and the Colorado River Basin that are being evaluated through statewide or regional efforts. Besides water supply, other areas of potential concern for this planning region are coastal flooding due to sea level rise, increase in fire risk, and impacts to ecosystems.

Climate change assessment is an integral part of the water resources related planning in the South OC region, as well as the larger region, spanning the Southwestern U.S., that supplies its water. The best current understanding of climate change has been incorporated in the assessment of impacts, especially those relating to water supply and sea level rise. Looking forward, it is expected that these plans will be updated as better information on climate projections, including extreme events become available, and impacts to other sectors, such as water quality and habitats will be similarly evaluated.

12.1 Legislative and Policy Context

While there are numerous pieces of policy and legislation dealing with climate change, three pieces are important regarding the State's response to climate change, including how IRWM planning efforts analyze climate change on a project level. Executive Order (EO) S-3-05 and the California Global Warming Solutions Act of 2006 (AB 32; amending California Health and Safety Code Division 25.5, §38500, et seq.) lay the foundation for California's response to climate change. Senate Bill 97, signed by the Governor on August 24, 2007 initiated formal changes to the CEQA Guidelines that provides guidance for the way climate change is analyzed in CEQA documents by adding Section 21083.05 to the Public Resources Code.

EO S-3-05 made California the first state to formally establish GHG emissions reduction goals. EO S-3-05 includes the following GHG emissions reduction targets for California:

- By 2010, reduce GHG emissions to 2000 levels
- By 2020, reduce GHG emissions to 1990 levels
- By 2050, reduce GHG emissions to 80 percent below 1990 levels

The final emission target of 80 percent below 1990 levels would put the state's emissions in line with estimates of the required worldwide reductions needed to bring about long-term climate stabilization and avoidance of the most severe impacts of climate change (Intergovernmental Panel on Climate Change (IPCC, 2007).

AB 32 further details and codifies the mid-term GHG reduction target established in EO S-3-05. AB 32 also identifies the California Air Resources Board (CARB) as the state agency responsible for the design and implementation of emissions limits, regulations, and other measures to meet the target.

SB 97 directed the Governor's Office of Planning and Research (OPR) to develop CEQA Guideline amendments for the analysis of climate change in CEQA documents for the approval of the Natural Resources Agency.

12.2 Consideration of Effects of Climate Change to Region

The Integrated Regional Water Planning Act, CWC §10541(e)(10), states that IRWM plans must include an evaluation of the adaptability to climate change of water management systems in the region. However, tools to properly assess the risk of any one effect of climate change on a region are not developed, and the abilities of different regions to use these tools vary considerably.

Local governments and agencies within the South Orange County WMA play an essential role in fulfilling California's emissions reduction targets and in reducing the local effects of climate change in the Region. Local governments have broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect greenhouse gas emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations.

Land use planning and urban growth decisions are also areas where successful implementation of climate change strategies relies on local government. Local governments have primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth and the changing needs of their jurisdictions. Decisions on how land is used will have large impacts on the greenhouse gas emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas sectors.

A resource management strategy is a project, program, or policy that helps local agencies and governments manage their water and related resources[81]. Chapter 5 of this IRWM Plan outlines a comprehensive and diverse set of resource management strategies to help meet the water-related management needs of the Region. These strategies can be combined in various ways to meet the water management objectives of the Region. Future decisions will factor in strategies for adapting to and mitigating climate change impacts.

The IRWM Group understands that the Region's water supply is contingent upon amount, intensity, timing, quality, and variability of runoff and recharge, as well as on water imported from outside the region. Therefore, the IRWM Group is committed to addressing the effects of climate change on the Region's water supply by incorporating climate change considerations into the Region's resource management strategies. Likewise, as IRWM projects are developed and selected for implementation, consideration of adapting to the effects of climate change will be a part of the project review process (see Chapter 6).

[81] California Water Plan Update 2009

Among the various sources of information on climate change, the IRWM Group considered the following three documents during the development of resource management strategies and the selection of projects.

1. The *Climate Change Scoping Plan* that was adopted by CARB in 2008 discusses different business sectors including water management and recommends specific strategies that may help reduce GHG emissions.
2. DWR published a white paper, *Managing an Uncertain Future: Climate Change Adaption Strategies for California's Water (2008)*,urges a new approach to managing California's water and other natural resources in the face of climate change. The recommendations from the White Paper are incorporated into Volume 1 Chapter 7 of CWP Update 2009.
3. The California Natural Resource Agency (CNRA) has a report currently in draft form entitled *2009 California Climate Adaptation Strategy* that discusses statewide and sector specific vulnerability assessments.

When it comes to water management considerations, water managers must include both adaptation and mitigation into their planning strategies.

- **Adaptation** refers to the ways in which our society and culture will need to change to cope with a changing climate. Several of the resource management strategies and projects in this Plan will help the Region adapt to climate change.
- **Mitigation** refers to the reduction of GHG emissions from water-related energy use. Water management results in the consumption of significant amounts of energy in California and the accompanying production of GHG emissions, especially where water must be pumped from long distances; from the ground; or over significant elevations. Water utilities use energy to reliably provide quality water to customers, while wastewater utilities in turn use energy to safely collect, treat, and dispose of wastewater to protect public health and the environment. GHG emissions reduction is a critical responsibility of water managers, and efficiency in water and energy use should be pursued at every opportunity. At the same time, water provides California with hydroelectric power, the state's largest source of GHG emissions-free energy.

The IRWM Group is aware of the detriment and cost that inaction on climate change would have on the Region. A warming California climate would generate more smoggy days by contributing to ozone formation while also fostering more large brush and forest fires. Continuing increases in global greenhouse gas emissions at current rates would result, by late in the century, in California losing 90 percent of the Sierra snow pack, sea level rising by more than 20 inches, and a three to four times increase in heat wave days. These impacts will translate into real costs for California, including flood damage and flood control costs that could amount to several billion dollars in many regions. Water supply costs due to scarcity and increased operating costs would also increase.

Failing to address climate change also carries with it the risk of substantial public health costs, primarily as a result of rising temperatures. Sustained triple-digit heat waves increase the health risk for several segments of the population, especially the elderly.

But higher average temperatures will also increase the interactions of smog-causing chemicals with sunlight and the atmosphere to produce higher volumes of toxic byproducts than would otherwise occur. Low-income communities are disproportionately impacted by climate change, lacking the resources to avoid or adapt to these impacts. For example, low-income residents are less likely to have access to air conditioning to prevent heat stroke and death in heat waves. Taking action to help mitigate the impacts of climate change will help slow temperature rise. This in turn will likely result in fewer premature deaths from respiratory and heat-related causes, and many thousands fewer hospital visits and days of illness[82].

It is anticipated that as more information regarding the effects of climate change on the region becomes available, and as new technologies arise to slow or offset the impacts, the IRWM Group will revise and update this Plan accordingly.

[82] Climate Change Scoping Plan, CARB, October 2008

13 SALT AND NUTRIENT MANAGEMENT PLAN

The Salt and Nutrient Management Plan was prepared in response to the State Water Resources Control Board (SWRCB) adoption of the Recycled Water Policy (State Water Board Resolution No. 2009-0011) on February 3, 2009. The purpose of the Recycled Water Policy (Policy) is to protect groundwater resources and increase the beneficial use of recycled water from municipal wastewater sources in a manner consistent with state and federal water quality laws and regulations. The Policy provides direction to the Regional Water Quality Control Boards (Regional Water Boards), proponents of recycled water projects, and the public regarding the appropriate criteria to be used by the State Water Board and the Regional Water Boards in issuing permits for recycled water projects. The Policy recognizes the potential for increased salt and nutrient loading to groundwater basins as a result of increased recycled water use, and therefore, requires the development of regional or sub-regional salt and nutrient management plans.

In requiring such plans, the Policy acknowledges that recycled water may not be the sole cause of high concentrations of salts and nutrients in groundwater basins, and therefore regulation of recycled water alone will not address such conditions. The intent of this requirement is for salts and nutrients from all sources to be managed on a basin-wide or watershed-wide basis in a manner that ensures the attainment of water quality objectives and protection of beneficial use.

The Recycled Water Policy requires:

a) Every basin/sub-basin shall have a consistent salt and nutrient management plan (SNMP);
b) SNMPs shall be tailored to address the water quality concerns in each basin;
c) Shall be developed or funded pursuant to the provisions of Water Code sections 10750 et seq. or other appropriate authority;
d) SNMPs shall be completed and proposed to the Regional Water Board within five years from the adoption date of the Policy;
e) SNMPs are not required in areas where a Regional Water Board has approved a functionally equivalent salt and nutrient plan; and
f) SNMPs may address constituents other than salt and nutrients that adversely affect groundwater quality.

The following Sections provide a summary of the full SNMP, which is included in Appendix G.

13.1 Plan Focus

South Orange County Wastewater Authority's (SOCWA) Phase 1 Salt and Nutrient Management Plan (SNMP) effort included the following: identifying stakeholders and working groups and conducting initial interactions with them; identifying current study area projects and issues to help define ultimate water management goals; establishing definitions and concepts; compiling and performing initial analyses of data and reports; developing technical scopes of work for Phases 2 and 3; and estimating budget and schedule considerations for the Phase 2 and 3 scopes of work.

Phase 2 consisted of developing the SNMP itself, including: continuing the collaborative process; reviewing and refining Phase 1 findings; delineating groundwater management zones; computing ambient water quality and assimilative capacity; developing models and other tools to project future ambient water quality and assimilative capacity; identifying, evaluating, and recommending an SNMP program alternative; and preparing the SNMP report through the draft final stage for submittal to Region 9 of the California Regional Water Quality Control Boards (Region 9). Phase 3 included the final SNMP report based on Region 9 and other input. It also satisfies applicable CEQA requirements and provides for any Basin Plan amendments that may be prompted by the Phase 2 SNMP effort. Refer to Appendix G for the complete SNMP.

The SNMP study area is defined geographically by SOCWA's service area. This in turn is essentially the same as that portion of Region 9 that lies in Orange County with a relatively minor exception in the northern SOCWA boundary, where a small portion of SOCWA lies in Region 8. It is defined hydrologically to include the Aliso Creek and San Juan Creek drainage areas and that portion of San Mateo Creek drainage overlain by Santa Margarita Water District (Cristianitos).

SOCWA is a Joint Powers Authority (JPA) formed to provide regional wastewater treatment and recycled water use. SOCWA represents ten member agencies, cities and water districts, with service areas covering the southern coastal portion of Orange County. SOCWA holds two master recycled water waste discharge permit orders for portions of service area in Region 8 and Region 9. The SNMP effort focuses on the Region 9 service area covered under Region 9's Order No. 97-52.

In April 2009 SOCWA formed a Technical Advisory Committee (TAC) consisting of representatives from member agencies to provide input and direction to SOCWA's salt and nutrient management planning efforts.

The San Juan Groundwater Basin was designated as a Tier A Basin in Region 9's SNMP Guidelines, giving the basin a high priority for this planning effort. However, actual volumetric assessments indicate that this basin would be in a lesser tier. Pumping from the San Juan Basin is managed by the SJBA, which is comprised of four SOCWA member agencies: Santa Margarita Water District, City of San Juan Capistrano, South Coast Water District, and Moulton Niguel Water District. The San Juan Basin is located entirely within the Region 9 portion of SOCWA's service area and, based on their local significance, the San Juan Basin and areas tributary to the basin are a primary focus of the SNMP.

The City of San Clemente is represented on SOCWA's TAC and acts as an important stakeholder in the project, providing current and planned recycled water use information for the Prima Deshecha and Segunda Deshecha hydrologic sub areas.

A small portion of the San Mateo Canyon Hydrologic Area, Cristianitos Canyon, occupies the southeastern corner of the SOCWA service area. This portion is tributary to the Lower San Mateo Groundwater Basin. Based on historical SNMP considerations and the limited extent of planned development activity in this area, the Cristianitos sub area is given appropriate analytical consideration.

During Phase 1 an attempt was made to identify likely stakeholders and working groups with potential interest in SOCWA service area SNMP. Besides individual contacts, a general common workshop session was held to collect input and assess level of interest. No negative input was received with respect to the Phase 1 outline for SNMP.

13.2 Hydrologic / Hydrogeological

Except for some very limited groundwater sources associated with geological faults and perched supplies, groundwater basins in SOCWA's service area are alluvial in character. They are intimately connected with surface water drainage courses, and range in average depth from about 25 to 135 feet. They are typically several miles long and only 100 to 200 feet wide. They are comprised of relatively tight sedimentary materials, characterized by low transmissivities and relatively small storage volumes. These characteristics must be recognized in modeling and other analyses.

Four levels of analysis are contemplated in the SNMP, whose applications depend on the nature and significance of each basin as a groundwater resource. These levels are summarized as follows (with example applications indicated):

1. No significant groundwater resources and no significant downstream concerns (e.g., HA 1.1 and 1.3)
2. Marginally significant groundwater resources and significant downstream concerns (e.g., proposed HSA 1.42)
3. Modest groundwater resources and significant downstream concerns (e.g., HSA 1.21 – 1.25)
4. More significant groundwater resource (e.g., HSA 1.26 – 1.28)

13.3 Issues

Project-Related. A tentative summary listing of project considerations and related issues was developed. These items are shown along with current status in Table 13-1. These projects and issues shall be included as refined in the following analyses and program alternative development.

Table 13-1: Phase 1 SNMP Project/Issue Listing

Project/Issues	Status
Groundwater Pumping	Project
Recycled Water Irrigation	Project
Recycled Water Recharge	Issue
Urban Return Flow[1] Reuse & Recharge	Project/Issue
Storm Water Capture & Recharge	Issue
Iron/Manganese Limits	Issue/Project
Brackish Water Desalting	Project
Seawater Desalting	Project
Aliso Creek Restoration	Issue
Habitat Conservation	Issue
Groundwater Monitoring	Project
Regional Coordination	Issue/Project
Other Treatment	Issue
Water Conservation	Issue/Project
Groundwater Mineralization	Issue
NPDES/WDR Permit Integration	Issue

1. Includes all non-storm flows.

Water Quality. The groundwater in SOCWA's service area is naturally high in iron and manganese, which leads to levels of iron and manganese in the recycled water that frequently exceed the limits established in the Basin Plan and Order No. 97-52. The Basin Plan limits for iron and manganese were established in the early 1970s and based on Secondary Drinking Water Standards without regard to local groundwater quality. The SNMP presents management options for reducing water quality violations for iron, manganese and fluoride.

13.4 Water Quality

Input included regulatory as well as water agency and other stakeholder contributions. Several constituents of concern were identified during Phase 1 as listed in Table 13-2.

Table 13-2: Phase 1 Constituent Summary

Constituent	Handling
Total dissolved solids (TDS)	Direct
Manganese (Mn)	Direct
Iron (Fe)	Direct
Nitrate-nitrogen (NO_3-N)	Direct
Fluoride (F)	Direct
Constituents of emerging concern (CEC) as applicable	Indirect

The SNMP requires identification of sources of salt, nutrient and other constituents of concern and to estimate ambient groundwater quality conditions and determining assimilative capacities and water quality management planning. The primary constituents of focus for this effort are TDS and nitrate. However, as stated earlier this process addresses issues related to; iron, manganese, fluoride and remain open to other constituents of concern. CECs are considered in accordance with the relevant update to the State's 2009 Recycled Water Policy.

13.5 Plan Analyses

Methodologies. Modeling of the hydrologic units is split between two model types, based on the significance of groundwater resources and the level of analytical focus, as described above. The areas considered having no significant groundwater resources or marginally significant groundwater resources are analyzed using computational methods without modeling. The area considered to have modest groundwater resources is modeled using a historic salt-balance model developed prior to the 1994 Basin Plan amendments. The salt-balance model is updated and expanded throughout this project. The area considered to have more significant groundwater resources is modeled using constantly-stirred reactor model (CSRM). The two different types of models are integrated so the output from one model can serve as the input to the other, and vice versa.

Salt-Balance Model. The salt-balance model consists of a series of alluvial surface/subsurface drainage elements. For each drainage element, the inputs and outputs of salt from stormwater, non-storm surface water and subsurface flow are computed. The inputs from precipitation, potable irrigation return, recycled irrigation return, urban return, and geologic leaching are considered, as well as the outputs from evaporation, well/diversion, and deep percolation.

Constantly-Stirred Reactor Model. A computational method is used for estimating the current ambient concentration of each major water quality constituent in existing subbasins and management zones based on historical groundwater level and chemistry

data. All major current and future sources of salt and nutrient loading to each subbasin and management zone are identified. Loading is quantified for each source over a 50-year planning period. The loading projection was done using the spreadsheet model that was developed and applied for the 1994 Basin Plan amendments. Then a constantly-stirred reactor model (CSRM) was developed and applied to project groundwater salt and nutrient concentrations. The CSRM was formulated as an implicit finite-difference equation allowing for internal feedback from overlying land use, variable loading rates over time, and cascading interaction between subbasins and management zones. Using the current ambient water quality computation as the initial condition, the CSRM was used to project changes in the ambient concentration of major constituents for a baseline alternative and selected future water resources planning alternatives for a 50-year planning period. Each water management alternative simulated included implementation measures that manage salt and nutrient loading in the SOCWA service area in a sustainable manner. The results were compared against Basin Plan objectives and used to rank the management alternatives and prepare a recommended management plan. Table 13-3 shows how these methods are applied to each hydrologic area identified above.

Table 13-3: Application of Analytical Methodologies

Hydrologic Area Type	Analysis Level	Ambient Concentration Determination	Loading Analysis	Projection of Salt and Nutrient Concentrations	Anti-degradation Analysis
No significant groundwater resources and no significant downstream concerns	1	Not done	Not done	Not done	Not done
Marginally significant groundwater resources and significant downstream concerns	2	Not done	Perform loading analysis	Not done	Not yet determined
Modest groundwater resources and significant downstream concerns	3	Perform ambient water quality determination	Perform loading analysis	Develop salt and nutrient projections for groundwater	Make antidegradation findings as required
Significant groundwater resources	4	Perform ambient water quality determination	Perform loading analysis	Develop salt and nutrient projections for groundwater	Make antidegradation findings as required

13.6 Plan Outcome –Basin Plan Refinements

Existing Basin Plan

The initial study objective in realizing SOCWA's overall goal was demonstrating that increased use of recycled water for landscape irrigation could be accomplished without jeopardizing the continued or increased use of limited local groundwater supplies for beneficial purposes. This objective was satisfied when SOCWA's proposed Basin Plan amendments were approved by Region 9 and the State Water Resources Control Board in 1994.

SOCWA's final documentation for basin plan amendments recommended that the single set of groundwater quality objectives for the Mission Viejo HA be amended into four general sets. Region 9 staff agreed that TDS could be used as the indicator constituent for demonstrating projected impacts. Several TDS concentrations were considered for use as objectives to best fit the various circumstances of the hydrologic sub areas, while at the same time keeping the number of sets relatively small for the sake of administrative and operational simplicity. A concentration of 500 mg/L was selected for more pristine quality groundwater and is the general health department limit for regular direct domestic use. A concentration of 750 mg/L was selected for good but less pristine quality groundwater, where dilution or treatment may be planned to achieve general domestic use or where restricted or higher-quality direct non-potable use is planned. A concentration of 1,100 mg/L was selected for groundwater in a smaller sub area with existing and planned non-potable use. And a concentration of 1,200 mg/L was selected for all lower quality groundwater, even those whose quality was considerably poorer than the Basin Plan objective.

SOCWA experiences a large number of violations for exceeding manganese limits. Moulton Niguel Water District's Regional Treatment Plant and South Coast Water District's Coastal Treatment Plant recycled water consistently exceeds the daily and 12-month manganese limits established in SOCWA waste discharge order. Groundwater that infiltrates or is diverted into the wastewater collection systems tributary to these plants is naturally high in iron and manganese. Several management options exist that could be taken to eliminate the water quality violations without impacting beneficial uses of the groundwater. These are discussed. Total dissolved solids (TDS) limits have been exceeded during drought conditions when the imported potable water approaches or exceeds 700 mg/L TDS. Eliminating daily TDS violations and allowing longer averaging periods would improve water quality compliance without impacting beneficial uses.

APPENDICES

South Orange County
Integrated Regional Water Management Plan

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APPENDIX A
SOUTH ORANGE COUNTY IRWM GROUP COOPERATIVE AGREEMENT

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COOPERATIVE AGREEMENT FOR THE
SOUTH ORANGE COUNTY WATERSHED MANAGEMENT AREA

This AGREEMENT is made and entered into this 14th day of DECEMBER 2010, by and between the signatories, hereinafter referred to as PARTIES, all being either the County of Orange, cities, special districts, or other organizations operating in southern Orange County, California.

RECITALS

WHEREAS, the municipalities and special districts in Orange County developed a countywide Water Quality Strategic Plan that recommends the formation of three Watershed Management Areas to better coordinate and implement collective water resource management strategies.

WHEREAS, a water resource management strategy as defined in the California Water Plan Update 2009 is a project, program, or policy that helps local agencies and governments manage their water, and related sources; and

WHEREAS, South Orange County Watershed Management Area comprises six watersheds in the San Juan Hydrologic Region: Laguna Coastal Streams, Aliso Creek, Dana Point Coastal Streams, San Juan Creek, San Clemente Coastal Streams, and San Mateo Creek, and is hereinafter referred to as the South Orange County Watershed Management Area (WMA).

WHEREAS, the PARTIES are all currently organizations operating in the South Orange County WMA and desire to collaborate in protecting and managing water resources in the South Orange County WMA through coordinated implementation of an integrated approach; and

WHEREAS, the PARTIES collectively have made significant investments in planning for flood management; urban runoff management; watershed management; water use efficiency; water supply and reliability; recycled water; habitat preservation, conservation, and restoration; water quality protection and improvement; resource stewardship; and related water resource management strategies; and

WHEREAS, the PARTIES collectively cover the planning area that contains significant need for major public infrastructure and conservation projects; and

WHEREAS, the PARTIES are willing to act in the best interest of the South Orange County WMA; and

WHEREAS, the PARTIES are committed to conduct planning efforts in an open accessible process; and

WHEREAS, the PARTIES have the institutional and fiscal capacity and systems to carry out planning and implementation efforts; and

WHEREAS, this agreement is not intended to create a financial obligation on the part of any of the PARTIES and that the financial obligations of the PARTIES will be established through the annual budget developed pursuant to this agreement, which will be approved through each PARTIES' budget adoption process; and

WHEREAS, the agreement contemplates that individual projects will be governed by separate project implementation agreements that provide funding or in-kind assistance as generally described herein; and

WHEREAS, the PARTIES expect to benefit individually and/or collectively from their participation in this AGREEMENT; and

WHEREAS, the PARTIES will have voting authority; and

WHEREAS, the PARTIES recognize that there are entities within the South Orange County WMA that have responsibilities for water resource management, including but not limited to the San Diego Regional Water Quality Control Board, California Department of Fish and Game, California Department of Transportation, and Orange County Transportation Authority; and

WHEREAS, these other interested entities may be added to this AGREEMENT with approval of the Executive Committee and

WHEREAS, the PARTIES recognize that such entities may not be required to provide funding or in-kind assistance and will, therefore, not have voting authority and will be referred to as NON VOTING PARTIES.

NOW, THEREFORE, in consideration of the foregoing, the PARTIES agree as follows:

Section 1: Purpose

The purpose of this AGREEMENT is to establish the South Orange County WMA as a cooperative framework for planning and implementing water management strategies in the South Orange County WMA. Cooperative efforts include but are not limited to: addressing water quality impairments; establishing priorities for water resource needs; integrating water resource solutions across traditional disciplinary bounds; and jointly advocating for policies and funding that assist these goals.

Section 2: Governance and Committees

The South Orange County WMA shall be governed through the authority of this AGREEMENT with the provisions indicated below.

1. Executive Committee

The South Orange County WMA shall act through an Executive Committee and other committees established by the Executive Committee.

Each of the PARTIES shall appoint an elected or executive level official from its organization to serve as its member and alternate on the Executive Committee. Representatives will serve on the Executive Committee at the pleasure of their appointing PARTY.

Each of the PARTIES shall designate a senior staff person as the point of contact to fulfill the intended purpose of this AGREEMENT.

For NON VOTING PARTIES, the representative will be a director or officer of the organization.

On matters on which the Executive Committee votes, each voting member shall have one vote. Actions of the Executive Committee shall be approved upon the affirmative vote of a majority of the representatives present. A simple majority of the Executive Committee shall constitute a quorum.

The Executive Committee will have the following duties and powers:

a. Identify and prioritize water resource issues, problems and improvement projects.

b. Establish policy direction for the South Orange County WMA and its committees.

c. Approve an annual work plan for the South Orange County WMA.

d. Approve an annual cost-shared budget for the administration and activities of the South Orange County WMA, its committees, projects, or actions, including any administrative support for the South Orange County WMA (Annual Budget).

e. Approve significant amendments of the South Orange County Integrated Regional Water Management Plan (hereinafter "IRWMP") and its prioritized lists of projects and activities.

f. Approve grant applications for funding South Orange County WMA projects or programs.

g. Allocate any new non-grant revenue sources available for South Orange County WMA projects based on capital improvement plan priorities.

h. Encourage and facilitate voluntary agreements between the PARTIES to fund and implement South Orange County WMA projects and programs.

i. Review and report to the PARTIES as to whether adequate and reasonable progress is being made on water quality and water resource issues in the South Orange County WMA.

j. Elect a chair and vice-chair.

k. Meet upon the request of the chair, but at least every six months unless the PARTIES agree to meet less frequently.

l. Convene committees and workshops as deemed appropriate.

m. Establish procedures and rules of conduct for the group, as needed.

PARTIES acknowledge that the Executive Committee cannot bind the PARTIES' respective organizations. All recommendations of the Executive Committee requiring funding or action on behalf of any PARTY are subject to approval by the PARTIES' governing bodies and subject to the budget process governing those bodies.

2. Annual Cost-Share Budget

The Executive Committee shall approve an annual cost-shared budget for the administration and activities of the South Orange County WMA, its committees, projects, or actions, including any administrative support for the South Orange County WMA. The Annual Cost-Shared Budget requires approval by 80 percent of the members of the Executive Committee. The responsibility for payment of the Annual Cost Share Budget shall be distributed equally among the PARTIES. Each PARTY shall include their respective share of the Annual Cost-Shared Budget in their agency's annual budget.

The COUNTY shall invoice each city for its annual deposit at the beginning of each fiscal year. Each PARTY shall pay the deposit within 45 days of the date of the invoice. Each PARTY's deposit shall be based on their prorated share of the approved Annual Budget, reduced for any surplus identified in the prior fiscal year end accounting.

Interest earned on the PARTIES' deposits will not be paid to the PARTIES, but will be credited against the PARTIES' share of the program costs.

The COUNTY shall prepare a fiscal year end accounting within 60 days of the end of the fiscal year. If the fiscal year end accounting results in costs (net of interest earnings) exceeding the sum of the deposits, the COUNTY shall invoice each PARTY for its prorated share of the excess cost. Each PARTY shall pay the billing within 45 days of the date of the invoice. If the fiscal year end accounting results in the sum of the deposits exceeding costs (net of interest earnings), the excess deposits will carry forward to reduce the billings for the following year.

Upon termination of the program a final accounting shall be performed by the COUNTY. If costs (net of interest earnings) exceed the sum of the deposits, the COUNTY shall invoice each PARTY for its prorated share of the excess. Each PARTY shall pay the invoice within 45 days of the date of the invoice. If the sum of the deposits exceeds the costs, the COUNTY shall reimburse to each PARTY its prorated share of the excess, within 45 days of the final accounting. Interest earnings are used to offset the PARTIES' share of program costs and will not be refunded to the PARTIES.

3. Administrative Support

COUNTY will provide staff support for the South Orange County WMA and its committees and will perform services including planning activities, facilitating regional planning and coordination activities related to water resources, and general administration for the implementation of the South Orange County WMA's plans and work programs, as directed by the Executive Committee.

COUNTY or other PARTY designated by the Executive Committee (Designated Party) may receive and administer any funds received on behalf of the South Orange County WMA for the administration and implementation of its projects and programs.

Designated Party may retain qualified consultants for use on South Orange County WMA matters as directed by the Executive Committee, subject to the Designated Party's normal rules and procedures for procuring such services and subject to the annual work plan and Annual Budget approved by the Executive Committee.

Designated Party may undertake efforts directly on behalf of the South Orange County WMA as directed by the Executive Committee, if necessary.

Designated Party will endeavor to apply funds received through grants or from other sources to defray the expenses in the Annual Budget where practicable. The remaining expenses in the Annual Budget will be shared by the appropriate PARTIES according to an equitable allocation approved by the South Orange County WMA.

PARTIES will provide funds for implementation of the IRWMP and for the implementation of projects and activities in furtherance of the IRWMP through specific Implementation Agreements subject to approval by the COUNTY or other applicable PARTY and PROJECT PROPONENTS.

Section 3: Authority and Responsibilities

The PARTIES agree that the cooperative and integrated implementation of common water resource goals is in the best interests of the South Orange County WMA. The PARTIES agree to collaborate in good faith to seek funding and resources to implement the projects and activities in the South Orange County WMA and the associated work plans and programs.

The South Orange County WMA may authorize COUNTY or other designed PARTY to apply for grants or seek other funds to support the implementation of the IRWMP.

The South Orange County WMA through its Annual Budget will commit to continued IRWM planning on an appropriate annual basis to have an updated plan with a current list of projects and funding resources identified. This will ensure that the region is prepared for any funding opportunity that may arise.

Section 4: Project Implementation Agreements

Implementation of any cost-shared programs shall be accomplished through PROJECT IMPLEMENTATION AGREEMENTS. These PROJECT IMPLEMENTATION AGREEMENTS shall designate a Managing Party responsible for managing the program that is the subject of that PROJECT IMPLEMENTATION AGREEMENT. The PARTIES to this AGREEMENT may be participants in these PROJECT IMPLEMENTATION AGREEMENTS.

Section 5: Terms and Provisions

All information about individual projects or activities undertaken pursuant to this AGREEMENT is the responsibility of the project proponent PARTY or PARTIES. The PARTIES shall not disclose private or confidential data about the projects or activities.

The PARTIES agree that COUNTY will administer this AGREEMENT and the overall program of implementation, that COUNTY review of individual projects is discretionary, and PARTIES shall not assume that COUNTY will discover errors and/or omissions. While COUNTY may submit grant applications, factual reports, monitoring data, and the like to granting agencies on behalf of the South Orange County WMA, the PARTIES acknowledge their responsibility for the accuracy, completeness, and timely submittal of project information submitted to COUNTY for this purpose.

The PARTIES are assumed to be familiar with and shall observe and comply with all federal, state, and local laws, ordinances, rules and regulations in any manner affecting the implementation of this AGREEMENT or projects or activities hereunder.

Section 6: Additional PARTIES

It is recognized that there are other entities within the South Orange County WMA that may have commitments to or responsibility for water quality and water resource management. The PARTIES hereto agree to engage with other entities, as appropriate, on the water quality and water resource issues described above. Additional PARTIES may be added to the AGREEMENT with approval of the Executive Committee and upon execution of the AGREEMENT by the additional PARTY. If such entity contributes funding to the South Orange County WMA, such additional Party shall be a voting PARTY with all rights and obligations of a PARTY under this Agreement. If such entity does not contribute funding but intends to participate in merely an advisory capacity, that PARTY shall be NON VOTING PARTY to this Agreement. Entities may participate in PROJECT IMPLEMENTATION AGREEMENTS without being PARTIES to this AGREEMENT.

Section 7: Amendment

All Amendments other than the addition of Parties in accordance with Section 6 above shall be in writing with the approval of a majority of the PARTIES. Any such written modification shall be attached and incorporated hereto.

Section 8: Assignment

Neither this AGREEMENT, nor any duties or obligations under this AGREEMENT, shall be assigned by any PARTY without the prior written consent of the Executive Committee. Should an assignment or transfer occur, whenever COUNTY, PARTY or other entity are named such reference shall be deemed to include the successor to the powers, duties and functions that are presently vested in COUNTY and the PARTY, and all agreements and covenants required hereby to be performed by or on behalf of COUNTY and PARTY shall bind and inure to the benefit of the respective successors there of whether so expressed or not.

Section 9: Execution

This AGREEMENT may be executed in counterpart and the signed counterparts shall constitute a single instrument.

Section 10: Withdrawal of Parties

Any PARTY or NON VOTING PARTY may withdraw its participation in this AGREEMENT upon ninety (90) days prior written notice to all of the other PARTIES, such withdrawal to be effective ninety (90) days after the notice is received or deemed received. If COUNTY withdrawals from this AGREEMENT the South Orange County WMA agrees to designate a different PARTY to assume the administrative

role under this AGREEMENT who will assume all responsibilities of COUNTY. The balance of the PARTIES shall continue in the performance of the terms and conditions of this AGREEMENT unless and until the AGREEMENT is terminated.

Section 11: Term and Termination

The term of this AGREEMENT shall commence upon the date when all PARTIES have executed this document.

This AGREEMENT is subject to termination by majority vote of the Executive Committee.

Section 12: No Third Party Beneficiaries

Nothing in this AGREEMENT shall be construed to give any person, other than the COUNTY and PARTIES hereto, any legal or equitable right, remedy or claim under or in respect of this AGREEMENT or any provisions herein contained. This AGREEMENT and conditions and provisions hereof are intended to be and are for the sole and exclusive benefit of the COUNTY and PARTIES.

Section 13: Liability

It is mutually understood and agreed that, merely by the virtue of entering into this AGREEMENT, each PARTY neither relinquishes any rights nor assumes any liabilities for its own actions or the actions of other PARTIES. It is the intent of the PARTIES that the rights and liabilities of each PARTY shall remain the same, while this AGREEMENT is in force, as it was before this AGREEMENT was made, except as otherwise specifically provided in this AGREEMENT.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the dates opposite their respective signatures.

COUNTY OF ORANGE, a political subdivision of the State of California

Dated: 12-14-10 By: _____
Chairman of the Board of Supervisors

APPROVED AS TO FORM:
County Counsel

By: _____
Deputy

Dated: 10/15/2010

SIGNED AND CERTIFIED THAT A COPY OF
THIS AGREEMENT HAS BEEN DELIVERED TO
THE CHAIRMAN OF THE BOARD

By: _____
DARLENE J. BLOOM
Clerk of the Board of Supervisors of
Orange County, California

Date: 12-14-10

Signature Blocks for Each Agency Follow:

CITY OF ALISO VIEJO

By _____ Date 9-15-10

Name: Mark Pulone
Title: City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

CITY OF DANA POINT

By _____ Date 6-15-10

Name: Douglas C. Chotkevys

Title: City Manager

ATTEST:

Kathy M. Ward

City Clerk

APPROVED AS TO FORM:

City Attorney

8

CITY OF LAGUNA BEACH

By _____ Date 7/19/10
Name: Kenneth Frank
Title: City Manager

ATTEST:

Martha Anderson
City Clerk

APPROVED AS TO FORM:

City Attorney

CITY OF LAGUNA HILLS

By _____ Date July 13, 2010
Name: Bruce E. Channing
Title: City Manager

ATTEST:

_____
City Clerk
Peggy J. Johns

APPROVED AS TO FORM:

_____
City Attorney
Gregory E. Simonian

CITY OF LAGUNA NIGUEL

By _____ Date 9/21/10
Name: Tim Casey
Title: City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

CITY OF LAGUNA WOODS

By _____ Date 8/30/10
Name: Leslie A. Keane
Title: City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

CITY OF LAKE FOREST

By _____ Date 9/22/10
Name: Robert C. Dunek
Title: City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

CITY OF MISSION VIEJO

By _____ Date 6/23/10

Name: Dennis Wilberg

Title: City Manager

ATTEST:

_____

City Clerk

APPROVED AS TO FORM:

_____

City Attorney

CITY OF RANCHO SANTA MARGARITA

By _____ Date 9/21/10
Name: Steve Hayman
Title: City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

CITY OF SAN CLEMENTE

By _____ Date 07/06/10
Name: James Dahl
Title: Mayor

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

I, RITA MUELLER, RECORDS COORDINATOR FOR THE CITY CLERK DEPARTMENT OF THE CITY OF SAN CLEMENTE, STATE OF CALIFORNIA, HEREBY CERTIFY UNDER PENALTY OF PERJURY THE FOREGOING INSTRUMENT TO BE A FULL, TRUE AND CORRECT COPY OF THE ORIGINAL NOW ON FILE IN MY DEPARTMENT.

DATE: 9-2-10

RITA MUELLER
RECORDS COORDINATOR

BY _____

CITY OF SAN JUAN CAPISTRANO

By _____ Date 8/18/10
Name: Joe Tait
Title: City Manager

APPROVED AS TO FORM:

ATTEST:

_____ _____
City Clerk City Attorney of San Juan Capistrano

EL TORO WATER DISTRICT

By _____ Date 7/15/10
Name: Robert R. Hill
Title: General Manager

APPROVED AS TO FORM:
Redwine & SHERRICK

By _____ Date 7/15/10
Name:
Title:

MOULTON NIGUEL WATER DISTRICT

By Robert Gumerman Date 6-17-2010
Name: Bob Gumerman
Title: General Manager

APPROVED AS TO FORM: Bonie, Arneson, Wikes & Giannone

By Patricia B. Giannone Date 6-17-2010
Name: Patricia B. Giannone
Title: Attorney

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

By _____ Date 6/27/2011
Name: Kevin P. Hunt
Title: General Manager

APPROVED AS TO FORM:

By _____ Date _____
Name:
Title:

SANTA MARGARITA WATER DISTRICT

By _____ Date 9/27/10
Name: John J. Schatz
Title: General Manager

APPROVED AS TO FORM:

By _____ Date 9/27/10
Name:
Title:

SOUTH COAST WATER DISTRICT

By Michael Dunbar by BcB Date 9/14/2010
Name: Michael Dunbar
Title: General Manager

APPROVED AS TO FORM:

By B. Burnett Date 9/14/2010
Name: Betty Burnett
Title: District

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

By _____ Date 8/5/10
Name: Tom Rosales
Title: General Manager

APPROVED AS TO FORM: Bowie, Arneson, Wiles & Giannone

By Patricia B. Giannone Date 9-7-10
Name: PATRICIA B GIANNONE
Title: Legal Counsel, SOCWA

TRABUCO CANYON WATER DISTRICT

By _____ Date 9/12/2011
Name: Don Chadd
Title: General Manager

APPROVED AS TO FORM:

By _____ Date _____
Name:
Title:

IRVINE RANCH WATER DISTRICT

By _____ Date 8/5/10
Name: Paul D. Jones II
Title: General Manager

APPROVED AS TO FORM:

By _____ Date 8-4-10
Name: Joan Arneson
Title: Legal Counsel

APPENDIX B
TRI-COUNTY FACC MOU

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MEMORANDUM OF UNDERSTANDING FOR INTEGRATED REGIONAL WATER MANAGEMENT PLANNING AND FUNDING IN THE SAN DIEGO SUB-REGION FUNDING AREA

PARTIES:

This Memorandum of Understanding (MOU) is entered into this 28th day of April 2009 (Effective Date) among the Parties listed below:

1. San Diego County Regional Water Management Group (RWMG), hereinafter SDRWMG Planning Region Agencies, includes the following members:
CITY OF SAN DIEGO, hereinafter SD CITY; COUNTY OF SAN DIEGO, hereinafter SD COUNTY; and SAN DIEGO COUNTY WATER AUTHORITY, hereinafter SDCWA.

2. Orange County RWMG, hereinafter OCRWMG Planning Region Agencies, includes the following members: COUNTY OF ORANGE, hereinafter ORANGE COUNTY; MUNICIPAL WATER DISTRICT OF ORANGE COUNTY, hereinafter MWDOC; and SOUTH ORANGE COUNTY WASTERWATER AUTHORITY, hereinafter SOCWA.

3. Riverside County Upper Santa Margarita RWMG, hereinafter RCRWMG Planning Region Agencies, includes the following members: RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, hereinafter RCFCWCD; COUNTY OF RIVERSIDE, hereinafter RIVERSIDE COUNTY; and RANCHO CALIFORNIA WATER DISTRICT, hereinafter RCWD.

Agencies acting collectively under this agreement are the TRI-COUNTY FUNDING AREA COORDINATING COMMITTEE, hereinafter called the TRI-COUNTY FACC. The agencies also are sometimes referred to in this MOU collectively as “Parties” and individually as “Party.”

RECITALS:

A. Proposition 84, the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act (Public Resources Code, sections 75020-75029), authorizes the Legislature to appropriate funding for competitive grants for Integrated Regional Water Management (IRWM) projects. Funding is administered by the Department of Water Resources (DWR).
B. The intent of the Act is to encourage integrated regional strategies for management of water resources and to provide funding through competitive grants, for projects that protect communities from drought, protect and improve water quality, promote environmental stewardship, and improve local water security by reducing dependence on imported water.
C. The San Diego Sub-Region, also known as the San Diego Funding Area, comprises the three Parties – the SDRWMG, OCRWMG and RCRWMG. The boundaries of the SDRWMG, OCRWMG and RCRWMG are shown in Attachment A, and coordinated through this MOU.
D. 1. The San Diego Sub-Region has been allocated $91 million through Proposition 84.
2. For the purposes of this agreement, the formula for allocating funds among the Parties will be based on a combination of land area and population as of 2007. The division of funding shall be consistent with Attachment B.
E. DWR may establish standards to guide the selection of IRWM projects within the funding areas identified in the measure and shall defer to approved local project selection,

reviewing projects only to ensure they are consistent with Public Resources Code section 75028 (a).

F. Each Party has prepared an accepted IRWM plan and desires close coordination to enhance the quality of planning, identify opportunities for supporting common goals and projects, and improve the quality and reliability of water in the Funding Area. The Parties will coordinate and work together with their advisory groups to identify projects of value across planning regions, identify funding for highly ranked projects, and support implementation.
G. The San Diego Funding Area will balance the necessary autonomy of each planning region to plan for itself at the appropriate scale with the need to coordinate among themselves to improve inter-regional cooperation and efficiency. By consensus, the Parties have developed an agreement to improve the IRWM planning process in the Funding Area to coordinate planning across planning region lines and facilitate the appropriation of funding for IRWM projects by DWR.
H. The Parties will coordinate on grant funding requests to ensure that the sum of the total grant requests does not exceed the amount identified for the funding region.

The RECITALS are incorporated herein and the PARTIES hereby mutually agree as follows:

1. Definitions

The following terms and abbreviations, unless otherwise expressly defined in their context, shall mean:

A. **Funding Area** – The 11 regions and sub-regions referenced in Public Resources Code section 75027(a) and allocated a specific amount of funding to support IRWM activities. The San Diego Funding Area incorporates lands in the San Diego Regional Water Quality Control Board jurisdiction as of 2004, including portions of San Diego, Orange and Riverside counties.
B. **RWMG –**An RWMG is comprised of at least three agencies, two of which must have statutory authority over water management. An RWMG is the documented leader of IRWM planning and implementation efforts in a planning region.
C. **Planning Region –** Planning regions integrate stakeholders, agencies and projects in their regions and coordinate with other planning regions and DWR. The boundaries of the three planning regions in the San Diego Funding Area shown in attachment A.
D. **Tri-County Funding Area Coordinating Committee (Tri-County FACC) –**Will comprise at least one representative from each recognized RWMG in the Funding Area. The Tri-County FACC will meet periodically to discuss issues pertaining to the Funding Area and make recommendations to the RWMGs.
E. **Watershed Overlay Areas –** Identified areas within a watershed that cross planning region boundaries. Watershed Overlay Areas will be subject to special coordination and collaboration between the appropriate planning regions to ensure maximum watershed benefits in the IRWM plans of the Funding Area. The Santa Margarita and the San Mateo Watershed Overlays are shown in Attachment A.
F. **Watershed Overlay Subcommittee –**.The overlay subcommittee will be formed to identify projects that pertain to the watershed overlay areas and recommend them to the Tri-County FACC. The Subcommittee will comprise a representative of each Party in the watershed overlay area as well as other stakeholders agreed upon by the parties. The overlay subcommittee will meet at least twice during the update planning process to coordinate planning and project review; further meetings will occur as necessary. Meetings of the subcommittee will be open to all Tri-County FACC members.
G. **Watershed Overlay Projects** – Projects identified in an Watershed Overlay Area identified as valuable and benefiting from cross boundary coordination.

H. **Common Programs** – Programs eligible for IRWM funding that are identified by the Tri-County FACC as benefiting the entire Funding Area and have participation from at least two Planning Regions.

I. **Advisory Committee–** The recognized committee of stakeholders advising a planning region's RWMG and/or governing agencies on key issues related to IRWM planning and grant applications.

2. General Planning Cooperation via Tri-County FACC

All planning regions will meet at least twice per year through the Tri-County FACC. The actual number of meetings will depend on the amount and intensity of planning and coordination efforts of the Planning Regions. The efforts of the Tri-County FACC will be to enhance the quality of planning, identify opportunities for supporting common goals and projects, and to improve the quality and reliability of water in the Funding Area. The planning efforts will support the watershed-based approach through integration and coordination across planning regions in the watershed overlay areas.

3. Mutual Plan Reference and Consistency

Each plan prepared in the funding area will contain references to the entire Funding Area, to the coordination that is occurring among planning regions, and to this MOU. Each planning region will share its description of these matters with other planning regions to promote consistency with the goal of using common language as the IRWM plans are modified. The three RWMGs also will seek to place these common sections in the same location in their plans. Further consistency or cooperative efforts may be added with the agreement of the Parties.

4. Coordination of Submittals and Applications

To facilitate DWR's review process, all planning regions will coordinate their Region Acceptance Process submittals and IRWM grant applications. To the greatest extent practicable, the planning regions will develop common sections, tables and maps and place them in the same locations in their submittals and applications. The planning regions will preface their submittals and applications with information noting the common material and its location in the documents.

5. Watershed Overlay Areas

Through the Tri-County FACC or the overlay subcommittee, the planning regions will cooperate in identifying Overlay Projects that cross Planning Region boundaries. Overlay Projects that benefit multiple planning regions will be identified and may be jointly funded, administered, or implemented. A watershed overlay subcommittee of the Tri-County FACC will be formed for the Santa Margarita Watershed and the San Mateo Creek Watershed overlay areas as shown in Attachment A. Overlay Projects of importance to the Watershed Overlay Area planning regions would be recommended for coordination and due consideration in those Planning Regions' project selection processes.

6. Common Programs

The common programs found by the Tri-County FACC to be of high value for all planning regions will be identified and recommended for high priority placement in the planning regions' ranking of projects for funding. While each planning region will select projects in accordance with its own process, the regions will cooperate on the implementation of common projects programs if these efforts are selected for funding.

7. Advisory Committee Cross Membership
Each planning region with an advisory committee will invite the other advisory committees in the Funding Area to participate as a non-voting member in its committee to promote understanding, communication and coordination.

8. Scope of the Agreement
Nothing contained within this MOU binds the parties beyond the scope or term of this MOU unless specifically documented in subsequent agreements, amendments or contracts. Moreover, this MOU does not require any commitment of funding beyond that which is voluntarily committed by separate board actions, but recognizes in-kind contributions of RWMG agencies and stakeholders. Non-substantive or minor changes to this MOU that have the support of all RWMG agencies may be documented to become part of this MOU.

9. Term of Agreement
The term of this MOU is from its Effective Date shown above to December 31, 2014 unless extended by mutual agreement of the Parties.

10. Modification or Termination
This MOU may be modified or terminated with the concurrence of the RWMG agencies and effective upon execution of the modification or termination by all the RWMG agencies.

11. Withdrawal
Any PARTY may withdraw from the Tri-County FACC after giving a written 60-day notice to the other Parties.

12. Notice
Any notices sent or required to be sent to any party shall be mailed to the following addresses:

SDRWMG Agencies
Ken Weinberg, Director of Water Resources
San Diego County Water Authority
4677 Overland Ave., San Diego CA 92129

Marsi Steirer, Deputy Director of Water Resources and Planning
City of San Diego
600 B Street, Suite 400, San Diego CA 92101

Kathleen Flannery, CAO Project Manager
County of San Diego
1600 Pacific Highway, Room 212, San Diego CA 92101

OCRWMG Agencies
Mary Anne Skorpanich, Director, OC Watersheds
Orange County Public Works
333 W. Santa Ana Blvd., 5th Floor, Santa Ana, CA 92701

Karl Seckel, Assistant General Manager
Municipal Water District of Orange County
18700 Ward Street, Fountain Valley, CA 92708

Tom Rosales, General Manager
South Orange County Wastewater Authority
34156 Del Obispo Street, Dana Point, CA 92629

RCRWMG Agencies
Perry Louck, Director of Planning
Rancho California Water District
42135 Winchester Road, Temecula, CA 92590

Mike Shetler, Senior Management Analyst
County of Riverside
4080 Lemon Street 4th floor, Riverside, CA 92501

Warren D. Williams
Riverside County Flood Control and Water Conservation District
1995 Market St. Riverside, CA 92501

13. Funding Uncertainties

The RWMG agencies cannot be assured of the results of these coordination efforts and applications for funding. Nothing within this MOU should be construed as creating a promise or guarantee of future funding. No liability or obligation shall accrue to the Parties if DWR does not provide the funding. The Parties are committed to planning and coordinating notwithstanding IRWM funding. The form of such coordination may change based on the sources of funding.

14. Indemnification

To the fullest extent permitted by law, each Party shall defend, indemnify and hold harmless the other Parties, their consultants, and each of their directors, officers, agents, and employees from and against all liability, claims, damages, losses, expenses, and other costs including costs of defense and attorneys' fees, arising out of or resulting from or in connection with work performed pursuant to this MOU. Such obligation shall not apply to any loss, damage, or injury, as may be caused by the sole negligence or willful misconduct of a Party, its directors, officers, employees, agents, and consultants.

15. Other Provisions

The following provisions and terms shall apply to this agreement.

A. This MOU is to be construed in accordance with the laws of the State of California. Any action at law or in equity brought by any of the Parties shall be brought in a court of competent jurisdiction in Riverside, Orange or San Diego Counties, and the parties hereto waive all provisions of law providing for change of venue in such proceedings to any other county.
B. If any provision of this MOU is held by a court to be invalid, void or unenforceable, the remaining provisions shall be declared severable and shall be given full force and effect to the extent possible.
C. This MOU is the result of negotiations between the parties hereto and with the advice and assistance of their respective counsels. No provision contained herein shall be construed against any Party because of its participation in preparing this MOU.
D. Any waiver by a Party of any breach by the other of any one or more of the terms of this MOU shall not be construed to be a waiver of any subsequent or other breach of the same or of any other term hereof. Failure on the part of any of the respective Parties to require

from the others exact, full and complete compliance with any terms of the MOU shall not be construed to change the terms hereof or to prohibit the Party from enforcement hereof.

E. This MOU may be executed and delivered in any number of counterparts or copies, hereinafter called "Counterpart", by the parties hereto. When each Party has signed and delivered at least one Counterpart to the other parties hereto, each Counterpart shall be deemed an original and, taken together, shall constitute one and the same MOU, which shall be binding and effective as to the Parties hereto.

F. This MOU is intended by the parties hereto as their final expression with respect to the matters herein, and is a complete and exclusive statement of the terms and conditions thereof. This MOU shall not be changed or modified except by the written consent of all Parties hereto.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the dates shown on the attached counterpart signature pages:

San Diego County agencies

/S/ Approved March 26th 2009
Ken Weinberg, Director of Water Resources
San Diego County Water Authority
4677 Overland Ave., San Diego CA 92129

/S/ Approved March 26th 2009
John L. Snyder, Director
Department of Public Works
County of San Diego
5555 Overland Ave, Bldg.2, Mailstop O332 San Diego, CA 92123

/S/ Approved April 7th 2009
J. M. Barrett
Director of Public Utilities
City of San Diego
600 B Street, Suite 400, San Diego CA 92101

Orange County agencies

/S/ Approved April 28th 2009
Chairman Pat Bates
County of Orange Board of Supervisors
Orange County Flood Control District
333 W. Santa Ana Blvd., 5th Floor
Santa Ana, CA 92701

/S/ Approved April 15th 2009
Wayne Clark, President (Maribeth Goldsby, Secretary)
Municipal Water District of Orange County
18700 Ward Street
Fountain Valley, CA 92708

/S/ Approved April 2nd 2009
Matt Disston, Chairman
South Orange County Wastewater Authority
34156 Del Obispo Street
Dana Point, CA 92629

Riverside County agencies

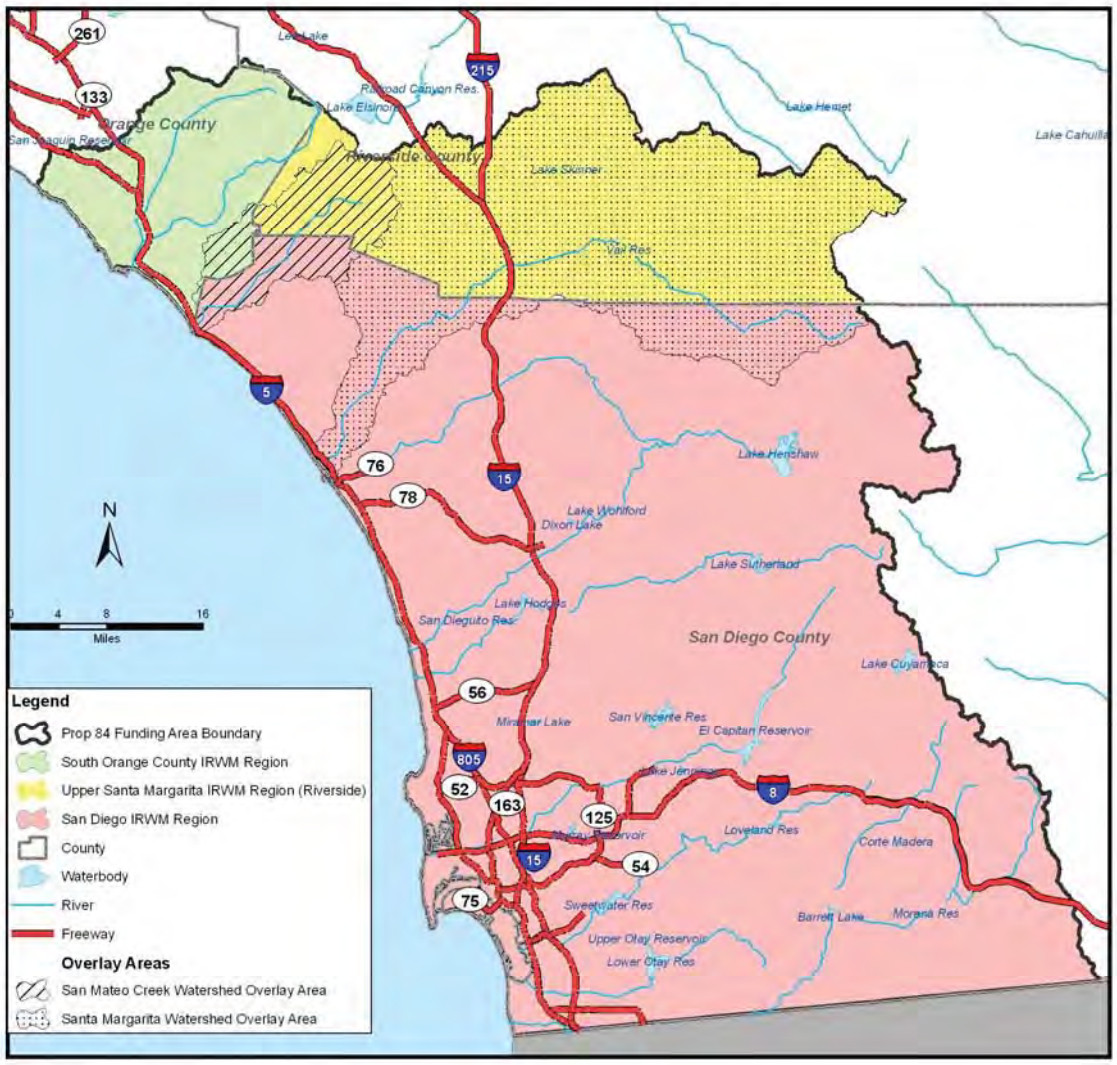
/S/ Approved April 9th 2009
Matt Stone, General Manager
Rancho California Water District
42135 Winchester Road, Temecula, CA 92590

/S/ Approved March 30th 2009
Jeff Stone, Chairman
Supervisor Third District
Riverside County Board of Supervisors
4080 Lemon St.
Riverside, CA 92501

/S/ Approved March 30th 2009
Marion Ashley, Chairman
Supervisor, Fifth District
Riverside County Flood Control & Water Conservation District
1995 Market St
Riverside, CA 92501

Attachment A
Funding Area and Planning Region Boundaries with Watershed Overlay Areas

The San Diego, Orange County and Riverside County Upper Santa Margarita planning regions are of an appropriate scale to allow integrated planning and provide for proper local interaction. The creation of planning regions larger than those outlined in the map below would limit local involvement and reduce the value of the planning to the region, the funding area, and the state.



Attachment B
Allocation of Proposition 84 Funds

Each of the three planning regions has IRWM project and program needs that far exceed the funding allocated to the funding area. Significant local match funding for selected projects is available in each planning region. Funding for planning and timing of implementation may vary among the planning regions. Because of these factors and because not all of the Proposition 84 funding will be made available at the same time, the Tri-County FACC members will cooperate and coordinate on individual funding cycle applications to ensure that the sum of the total grant requests does not exceed the amount identified for the funding region in any given cycle. Total allocations to the parties will be divided according to the schedule below. The allocations are based on a formula that is similar to that used to allocate funding in the Proposition 84 bond language. (Note: Proposition 84 allocates $91 million to the San Diego Funding Area. DWR has indicated it will spend approximately 5 percent of the funds for program delivery costs. Therefore, the allocations to the three planning regions are indicated in percentages of the total funds that will be available over the life of the program.)

			Allocations (in % of $ totals)		
Planning Region	**Population**	**Acres Area**	**$25 M on Land**	**$66 M on Population**	**Total**
Riverside Upper Santa Margarita	253,329	405,233	16.4%	6.4%	9.1%
South Orange County	597,348	168,192	6.8%	15.2%	12.9%
San Diego County	3,092,351	1,901,203	76.9%	78.4%	78%
Total	**3,943,028**	**2,474,628**	**100%**	**100%**	**100%**

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APPENDIX C
PROJECT FORM

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South Orange County Integrated Regional Water Management Group

Project Information Form for Inclusion in the South Orange County Integrated Regional Water Management Plan

1. Agency Information

Agency or Organization:

Contact Name First: **Last:**

Mailing Address:

City: **State:** **Zip:**

Email: **Phone:** **Fax:**

2. General Project Information

Project Type: ☐ Construction/Acquisition ☐ Planning

Project Cost:

Project Description:

Project Location:

Landowner: Name:
Permission secured to implement project? ☐ Yes ☐ No

Project is an:

☐ Independent operable project

☐ Operable segment of larger project

Larger Project Name

Annual Water Yield (AF): Annual yield = 3 X Storage

Are there any significant institutional barriers to project? (If yes, describe)

☐ Yes

☐ No

Has your agency/organization constructed similar projects in the past?

☐ Yes

☐ No

Has CEQA been completed? If yes, date of completion.

☐ Yes

☐ No

Provide estimated date of construction contract award:

3. Project Funding Source

What percentage of the project funding is expected from?

Funding	$ Amount	Source of Funding	Is Funding Secured?
State Grants			
Local matching funds			
Other matching funds			
Total			

Describe any other funding opportunities available to the project:

Is your agency/organization able to fund pre-construction work, design, CEQA, etc., if not already completed?

☐ Yes

☐ No

4. Additional Information Needed for Projects Requesting Consideration for Proposition 84 Funding

Factors affecting eligible project types include funding source, DAC status, and BMP implementation. Eligible projects must yield multiple benefits and include one or more of the following elements (PRC 75026.(a))

Please indicate which element(s) apply to your project and explain how.

☐ Water supply reliability, water conservation, and water use efficiency:

☐ Storm water capture, storage, treatment, and management:

☐ Removal of non-native plants, the creation and enhancements of wetlands, and the

acquisition, protection, and restoration of open space and watershed lands:

☐ Non-point source pollution reduction, management and monitoring

☐ Groundwater recharge and management projects

☐ Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users

☐ Water banking, exchange, reclamation, and improvement of water quality

☐ Planning, implementation of multipurpose flood control management programs

☐ Watershed protection and management

☐ Drinking water treatment and distribution

☐ Ecosystem and fisheries restoration and protection

Project Review Process

The IRWM Plan must contain a process to select projects for inclusion in the IRWM Plan. The project review process must, at a minimum, consider the following factors.

How does the project contribute to the South Orange County IRWM Plan objectives?

How the project is related to the resource management strategies of the IRWM Plan?

Describe the technical feasibility of the project.

Describe the specific benefits to Disadvantaged Communities (DAC) water issues.

Describe Environmental Justice considerations.

Describe economic feasibility, including water quality and water supply benefits and other expected benefits and costs.

Describe the contribution of the project in adapting to the effects of climate change in the region.

Describe the contribution of the project in reducing greenhouse gas emissions as compared to project alternatives.

Describe the critical negative impacts of not implementing the project.

For water quality projects, describe how the project will contribute to the long-term attainment and maintenance of water quality standards and will eliminate or significantly reduce pollution into impaired waters and sensitive habitats.

Demonstrate there is sufficient baseline data and technical knowledge to manage the

project.

Describe performance measures you will use to determine the effectiveness of the project. How will the monitoring component integrate into statewide monitoring efforts?

Please describe how you will support the long term O&M of the project both operationally and financially.

Please describe your experience with implementation of similar projects of both size and type. Give examples of projects you have completed successfully

Does the project consider statewide and San Diego Region strategic planning goals (basin wide objectives, reduce water rights conflicts, TMDLs, RWQCB Watershed Initiative Chapters, CALFED ROD Objectives, floodplain management, desalination task force, environmental justice or statewide needs)

Miscellaneous Project Information

Is your project located within a Disadvantaged Community (census tracts with annual income < 80% California statewide annual median of $61,021). **If so, please indicate the city/town the disadvantaged community is in and the general area of the community. If none, leave blank.**

Add any additional information about your project or any comments you have on this form:

Reports/Studies/Planning Documents

List reports/studies/planning documents that are relevant to this effort along with cost.

Report	Cost
Report	Cost
Report	Cost
Report	Cost

Project Benefits Information

Using the BMS Project Benefits List provided, select up to 6 possible benefits for the project - 1 (primary/greatest benefit)-6. For each benefit selected, we must complete the following table:

Project Benefit Type	Benefit Type (examples provided for your consideration)	Measurement (Acre-Feet)	Description of Benefit and Measurement
Primary			
Secondary			
Tertiary			
Quaternary			
Quniary			
Septary			

ELIGIBILITY

Q.12 Eligibility - Have any urban water suppliers listed in Q10 recently submitted AB 1420 compliance tables and supporting documentation to DWR for a different grant program within the past three months? If so, please list the urban water supplier and the grant program. An urban water supplier must submit AB 1420 compliance documentation to DWR. If the urban water supplier has not submitted AB 1420 documentation, or that documentation was determined to be incomplete by DWR, the urban water supplier's projects will not be considered eligible for grant funding.

Q.15 Eligibility - Does the IRWM region receive water supplied from the Sacramento-San Joaquin Delta? Please answer yes or no and explain.

PROGRAM PREFERENCES

Please describe the certainty and the breadth and magnitude to which your project will meet the specific program preferences below:

I. Include Regional Projects or Programs

II. Integrate Water Management Programs and Projects within the San Juan Hydrologic Unit, San Diego Regional Water Quality Control Board region.

III. Effectively resolve significant water-related conflict within or between regions

IV. Contribute to attainment of the CALFED Bay-Delta Program Objectives

V. Address critical water supply or water quality needs of disadvantaged communities within the region

VI. Effectively integrate water management with land use planning

VII. Stormwater Flood Management Funding, projects which provide multiple benefits, including, but not limited to water quality improvements, ecosystem benefits, reduction of instream erosion and sedimentation, and groundwater recharge

VIII. Address Statewide Priorities, including the following:

a. Drought Preparedness

b. Use and Reuse Water More Efficiently

c. **Climate Change Response Actions**

d. **Expand Environmental Stewardship**

e. **Practice Integrated Flood Management**

f. **Protect Surface and Groundwater Quality**

g. **Improve Tribal Water and Natural Resources**

h. **Ensure Equitable Distribution of Benefits**

MONITORING, ASSESSMENT, AND PERFORMANCE MEASURES

Provide a preview of the info that would go into a monitoring plan by completing the following:

Describe the performance measures that will be used to quantify and verify project performance.

Provide a discussion of the monitoring system to be used to verify project performance with respect to the project analyses to be used.

Include discussion of how monitoring data will be used to measure the performance in meeting the overall goals and objectives of the IRWM Plan.

Complete the table below for each Project:

Note: Measurement parameters (metrics) may include additional acre-feet of water supply, improved water supply reliability and flexibility, water quality measurements, measurement-based estimates of pollution-load reductions, acres of habitat

successfully restored, feet of stream channel stabilized, groundwater level measurements, stream flow measurements, improved flood control, or other quantitative measures or indicators.

A sample of the information that will be incorporated in each Project Assessment and Evaluation Plan (PAEP) is provided in this attachment. The following Project Performance Measures Tables provide information regarding each Project.

SAMPLE:

1. WATER USE EFFICIENCY PROGRAM EXPANSION (WUEPE) – Municipal Water District of Orange County

(a) Table 1: Project Performance Measures for the WUEPE SmarTimer Installations

Project Goals	Desired Outcomes	Output Indicators – Measures to Effectively Track Output	Outcome Indicators – Measures to evaluate change that is a direct result of the work	Measurement Tools and Methods	Targets – Measurable targets that are feasible to meet during the life of the Proposal
1. Install the SmarTimer Evapotranspiration (ET) Controllers (SmarTimers); perform irrigation system evaluations in new and existing residential and commercial settings. A rebate program will be used as an incentive.	Installation of the SmarTimers in up to 23% more sites for a total of up to 33% (10% has already been achieved) of the study area, which is the Poche Beach area.	Visual verification of installed SmarTimers.	Rebate usage.	Installation of SmarTimers, and irrigation system evaluations, rebate incentives for installation services, and visual installation verifications.	Installation of the SmarTimers devices and performance of irrigation system evaluations in ≥23% new/existing residential and commercial settings in the Poche Beach study area.
2. Perform a water savings evaluation as a result of the installation of the SmarTimers in new and existing residential and commercial settings in the Poche Beach study area.	Determination of total water savings as a result of the installation of the SmarTimers in new and existing residential and commercial settings in the Poche Beach study area.	Visual verification of installed SmarTimers devices; water savings evaluation.	Reduction in water consumption.	Analysis of water consumption (e.g. water meter levels) before and after device installations and evaluations for savings evaluation.	Reduced and more efficient water usage practices; less need for imported water.
3. Reduction of residential and commercial runoff by 50% with the installation of SmarTimers in the Poche Beach study area.	Reduction of residential and commercial runoff by 50% with the installation of SmarTimers in the Poche Beach study area.	Continuous flow monitoring report.	50% reduction in flow from residential and commercial sources in the Poche Beach area, during the dry weather season.	Continuous flow monitoring and water quality monitoring.	Reduction of residential and commercial runoff by 50% with the installation of SmarTimers in the Poche Beach study area.
4. 50% reduction of non-point source pollution in residential and commercial runoff with the installation of SmarTimers in the Poche Beach study area.	50% reduction of non-point source pollution in residential and commercial runoff with the installation of SmarTimers in the Poche Beach study area.	Water quality monitoring data report.	50% reduction in non-point source pollution in runoff from residential and commercial sources in the Poche Beach study area, during the dry weather season.		50% reduction of non-point source pollution in residential and commercial runoff with the installation of SmarTimers in the Poche Beach study area.

APPENDIX D

RESOLUTIONS AND/OR LETTERS OF ACCEPTANCE/ADOPTION/SUPPORT/APPROVAL FOR THE SOUTH ORANGE COUNTY IRWM PLAN

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RESOLUTION NO. 2013 - 27

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ALISO VIEJO, CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

WHEREAS, the mission of the City of Aliso Viejo includes management of water resources and environmental quality throughout its service area; and

WHEREAS, the City of Aliso Viejo has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City of Aliso Viejo is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005, IRWM Group developed an Integrated Regional Management Plan for South Orange County Area; and

WHEREAS, in 2005, the City Council of the City of Aliso Viejo adopted the 2005 IRWMP by Resolution No. 2005-035; and

WHEREAS, Whereas, the Board of Supervisors has reviewed and accepted the said Plan with its staff and general public at its regular Board meeting on June 7, 2005; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM

Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013, the Executive Committee for South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City of Aliso Viejo, hereby adopt the updated 2013 South Orange County Integrated Regional Water Management Plan.

PASSED, APPROVED AND ADOPTED this 7th day of August, 2013.

Carmen Cave
Mayor

ATTEST:

Susan A. Ramos
City Clerk

APPROVED AS TO FORM:

City Attorney

STATE OF CALIFORNIA)
COUNTY OF ORANGE) ss.
CITY OF ALISO VIEJO)

I, SUSAN A. RAMOS, City Clerk of the City of Aliso Viejo, California, DO HEREBY CERTIFY that foregoing Resolution No. 2013-27 was duly passed and adopted by the City Council of the City of Aliso Viejo at their regular meeting held on the 7th day of August 2013, by the following vote, to wit:

AYES:	COUNCIL MEMBERS:	MAYOR CAVE, MAYOR PRO TEM TSUNODA, COUNCILMEMBERS CHUN, MUNZING AND PHILLIPS
NOES:	COUNCIL MEMBERS:	NONE
ABSENT:	COUNCIL MEMBERS:	NONE

Susan A. Ramos
SUSAN A. RAMOS
CITY CLERK

(SEAL)

I hereby certify that the foregoing is the original of Resolution No. 2013-27 duly passed and adopted by the Aliso Viejo City Council at their regular meeting held August 7, 2013.

Susan A. Ramos
SUSAN A. RAMOS
CITY CLERK

(SEAL)

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ORANGE COUNTY BOARD OF SUPERVISORS
MINUTE ORDER
September 17, 2013

Submitting Agency/Department: OC PUBLIC WORKS

Adopt resolution updating South Orange County Integrated Regional Watershed Management Plan; authorizing Director or designee to accept amendments and approve minor modifications; and make California Environmental Quality Act findings - District 5

The following is action taken by the Board of Supervisors:

APPROVED AS RECOMMENDED ☒ OTHER ☐

Unanimous ☒ (1) NGUYEN: **Y** (2) MOORLACH: **Y** (3) SPITZER: **Y** (4) NELSON: **Y** (5) BATES: **Y**
Vote Key: Y=Yes; N=No; A=Abstain; X=Excused; B.O.=Board Order

Documents accompanying this matter:

☒ Resolution(s) 13-089
☐ Ordinances(s)
☐ Contract(s)

Item No. 21

Special Notes:

Copies sent to:

OCPW: Isela Martinez
Eric Swint

9-20-13

I certify that the foregoing is a true and correct copy of the Minute Order adopted by the Board of Supervisors , Orange County, State of California.
Susan Novak, Clerk of the Board

By: _____
Deputy

RESOLUTION OF THE BOARD OF SUPERVISORS OF
ORANGE COUNTY, CALIFORNIA

September 17, 2013

WHEREAS, the mission of the OC Public Works Department includes regional resources and environmental quality throughout Orange County; and

WHEREAS, OC Public Works has led development of the South Orange County Integrated Regional Watershed Management (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality, quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC §79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the South Orange County IRWM Group was formed with cities and water/special districts located within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, the Board of Supervisors has reviewed and accepted said Plan with its staff and general public at its regular Board meeting on June 7, 2005 and provided for minor modifications to the Plan at its regular Board meeting on May 23, 2006; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection

Bond Act (PRC §75001-75130) which requires that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, OC Public Works has led the update of the South Orange County IRWM Plan to Proposition 84 guidelines; and

WHEREAS the Board of Supervisors have reviewed said Plan with its staff and general public at its regular Board meeting on September 17, 2013.

NOW, THEREFORE, BE IT RESOLVED that this Board does hereby:

1. Adopt the South Orange County Integrated Regional Watershed Management Plan for the purposes of serving as a guidance document for the South Orange County Watershed Management Area, and
2. Authorize the Director of the OC Public Works Department, or his designee, to accept amendments such as appendices and updated project lists and approve minor modifications to the Plan on an annual basis.

The foregoing was passed and adopted by the following vote of the Orange County Board of Supervisors, on September 17, 2013, to wit:

AYES:	Supervisors:	JOHN M.W. MOORLACH, PATRICIA BATES, JANET NGUYEN TODD SPITZER, SHAWN NELSON
NOES:	Supervisor(s):	
EXCUSED:	Supervisor(s):	
ABSTAINED:	Supervisor(s):	

CHAIRMAN

STATE OF CALIFORNIA)
)
COUNTY OF ORANGE)

I, SUSAN NOVAK, Clerk of the Board of Orange County, California, hereby certify that a copy of this document has been delivered to the Chairman of the Board and that the above and foregoing Resolution was duly and regularly adopted by the Orange County Board of Supervisors .

IN WITNESS WHEREOF, I have hereto set my hand and seal.

SUSAN NOVAK
Clerk of the Board
County of Orange, State of California

Resolution No: 13-089

Agenda Date: 09/17/2013

Item No: 21

I certify that the foregoing is a true and correct copy of the Resolution adopted by the Board of Supervisors , Orange County, State of California

Susan Novak, Clerk of the Board of Supervisors

By: _____
Deputy

RESOLUTION NO. 13-09-17-01

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF DANA POINT, CALIFORNIA, ACCEPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the mission of the City of Dana Point includes providing a safe and healthy environment and ensuring a high quality life for our residents, businesses and visitors in a sound economical and efficient manner.

WHEREAS, the City of Dana Point has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWMP) pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWMP; and

WHEREAS, the City of Dana Point is a member of the South Orange County Watershed Management Area (SOCWMA), which was formed with cities, County, and water/sewer districts located within the SOCWMA, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said IRWMP by participants in the SOCWMA that have authority to implement the Plan; and

WHEREAS, in 2005, SOCWMA Group developed an Integrated Regional Management Plan (IRWMP) for South Orange County Area; and

WHEREAS, the Orange County Board of Supervisors reviewed and accepted the original IRMWP with its staff and general public at its regular Board meeting on June 7, 2005; and

WHEREAS, in 2005, the City Council of the City of Dana Point adopted the 2005 "South Orange County Integrated Regional Water Management Plan" by Resolution No. 05-06-08-03; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWMPs be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, significant changes to the Integrated Watershed Management Plan will require formal approval by the City Council, on-going addition or deletion of projects in the Plan does not require formal approval of the Plan; and,

WHEREAS, on July 18, 2013, the Executive Committee for SOCWMA adopted the updated 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City of Dana Point does hereby adopt the updated 2013 South Orange County Integrated Regional Water Management Plan in continued coordination with the SOCWMA Group.

PASSED, APPROVED, AND ADOPTED this 17th day of September, 2013.

STEVEN H. WEINBERG, MAYOR

ATTEST:

KATHY M. WARD, CITY CLERK

STATE OF CALIFORNIA)
COUNTY OF ORANGE) ss
CITY OF DANA POINT)

I, Kathy M. Ward, City Clerk of the City of Dana Point, California, DO HEREBY CERTIFY that the foregoing is a true and correct copy of Resolution No. 13-09-17-01 adopted by the City Council of the City of Dana Point, California, at a regular meeting thereof held on the 17th of September, 2013, by the following vote:

AYES:	Council Members Brough, Olvera, Schoeffel, Mayor Pro Tem Bartlett, and Mayor Weinberg
NOES:	None
ABSENT:	None

(SEAL)

Kathy M. Ward

KATHY M. WARD, CITY CLERK

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RESOLUTION NO. 13-8-1
RESOLUTION OF THE BOARD OF DIRECTORS OF
THE EL TORO WATER DISTRICT
ADOPTING THE 2013 SOUTH ORANGE COUNTY
INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the mission of the El Toro Water District includes management of water resources and environmental quality throughout its service area.

WHEREAS, El Toro Water District has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the El Toro Water District is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005 the IRWMP Group developed an Integrated Regional Watershed Management Plan for South Orange County area; and

WHEREAS, in 2005, the El Toro Water District adopted the 2005 IRWMP by Resolution No. 05-6-3; and

WHEREAS, the Orange County Board of Supervisors reviewed and accepted the 2005 Plan with its staff and general public at its regular Board meeting on June 7, 2005 and provided for minor modifications to the Plan at its regular meeting on May 23, 2006; and

WHEREAS, the Orange County board of Supervisors will review and consider adoption of the 2013 Integrated Regional Watershed Management Plan at its regular meeting on September 10, 2013; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013 the Executive Committee of the South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, BE IT RESOLVED that this Board does hereby adopt the 2013 South Orange County Integrated Regional Watershed Management Plan in continued coordination with the South OC IRWM Group.

ADOPTED, SIGNED AND APPROVED, this 22nd day of August 2013.

TED F. MARTIN, President
E Toro Water District and of the
Board of Directors thereof

(SEAL)

ATTEST:

ROBERT R. HILL, Secretary
El Toro Water District and of the
Board of Directors there of

STATE OF CALIFORNIA)
)
COUNTY OF ORANGE)

I, ROBERT R. HILL, Secretary of the Board of Directors of the El Toro Water District, do hereby certify that the above and foregoing is a full, true and correct copy of Resolution No. 13-8-1 of said Board, and that the same has not been amended or repealed.

DATED: August 22, 2013

ROBERT R. HILL, Secretary
El Toro Water District and of
the Board of Directors thereof

(SEAL)

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RESOLUTION NO. 2013- 33

RESOLUTION OF THE BOARD OF DIRECTORS OF THE
IRVINE RANCH WATER DISTRICT, ORANGE COUNTY, CALIFORNIA
ADOPTING THE SOUTH ORANGE COUNTY INTEGRATED
REGIONAL WATER MANAGEMENT PLAN

WHEREAS, regional planning has become an important function in watersheds throughout California as regional stakeholders work to solve watershed challenges in a more collaborative fashion; and

WHEREAS, many stakeholders in south Orange County including the County of Orange, cities and water agencies have worked collaboratively to understand the watershed challenges in their watershed; and

WHEREAS, in 2004, those stakeholders in south Orange County formed the South Orange County Integrated Regional Watershed Management Group, prepared an Integrated Regional Watershed Management Plan (IRWMP), applied for and received $25 million in Prop. 50 grant funds to help implement several projects; and

WHEREAS, in September 2009, the California Department of Water Resources, through its "Region Acceptance Process," recognized the south Orange County as a region and the South Orange County Integrated Regional Watershed Management Group as the program administrator for the IRWMP; and

WHEREAS, in 2010, Irvine Ranch Water District became a member of the South Orange County Watershed Management Group and adopted the 2005 IRWMP; and

WHEREAS, in 2010, the SOCWMG received State Planning Grant funds to update the IRWMP and to include new elements as required by the State; and

WHEREAS, there is value in continually improving the IRWMP to reflect new projects and new priorities for the region; and

WHEREAS, Irvine Ranch Water District, which serves a portion of the south Orange County region, views the IRWMP for south Orange County as an important regional planning document for matters commonly addressed in regional watershed management plans and wants to work with the South Orange County Integrated Regional Watershed Management Group to continually improve the IRWMP.

NOW, THEREFORE, the Board of Directors of the Irvine Ranch Water District DOES HEREBY RESOLVE, DETERMINE AND ORDER as follows:

The Irvine Ranch Water District approves the South Orange County Integrated Regional Water Management Plan as the integrated watershed plan for the area referred to by the County of Orange as the South Watershed Management Area.

ADOPTED, SIGNED and APPROVED this 26th day of August, 2013.

President, IRVINE RANCH WATER DISTRICT
and of the Board of Directors thereof

Secretary, IRVINE RANCH WATER DISTRICT
and of the Board of Directors thereof

APPROVED AS TO FORM:
BOWIE, ARNESON, WILES & GIANNONE
Legal Counsel - IRWD

By

STATE OF CALIFORNIA)
) SS.
COUNTY OF ORANGE)

I, Nancy Savedra, Assistant Secretary of the Board of Directors of Irvine Ranch Water District, do hereby certify that the foregoing Resolution was duly adopted by the Board of Directors of said District at a regular board meeting of said Board held on the 26th day of August 2013, and that it was so adopted by the following vote:

AYES:	DIRECTORS	LaMar, Matheis, Reinhart, Swan and Withers
NOES:	DIRECTORS	None
ABSTAIN:	DIRECTORS	None
ABSENT:	DIRECTORS	None

(SEAL)

Assistant Secretary of IRVINE RANCH WATER DISTRICT
and of the Board of Directors thereof

STATE OF CALIFORNIA)
) SS.
COUNTY OF ORANGE)

I, Nancy Savedra, Assistant Secretary of the Board of Directors of Irvine Ranch Water District, do hereby certify that the above and foregoing is a full, true and correct copy of Resolution No. 2013-33 of said Board, and that the same has not been amended or repealed.

Dated: 8/27/13

Assistant Secretary of IRVINE RANCH WATER DISTRICT
and of the Board of Directors thereof

(SEAL)

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RESOLUTION NO. 2013-08-27-1

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAGUNA HILLS, CALIFORNIA, ACCEPTING AND ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

The City Council of the City of Laguna Hills, California, hereby finds, determines, declares, and resolves as follows:

WHEREAS, a mission of the City of Laguna Hills is the management of water resources and environmental quality throughout its service area; and

WHEREAS, the City of Laguna Hills has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWMP) pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002, to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality, quantity, and reliability of water resources; and

WHEREAS, in November 2002, California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (California Water Code §79560 to §79565), to fund competitive grants for projects consistent with an adopted IRWMP; and

WHEREAS, the City of Laguna Hills is a member of the South Orange County IRWMP Group (Group), which was formed with cities and water/special districts located within the South Orange County Watershed Management Area as adopted by the State's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County, with the County of Orange Public Works Department serving as the Group's lead; and

WHEREAS, in November 2006, California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act (PRC Section 75001-75130) which required that an IRWMP be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, the Group has updated the IRWMP to the new guidelines required by Proposition 84 and has identified the updated IRWMP as the "2013 South Orange County Integrated Regional Water Management Plan."

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LAGUNA HILLS, CALIFORNIA, DOES RESOLVE, DECLARE, DETERMINE, AND ORDER AS FOLLOWS:

SECTION 1. The City Council of the City of Laguna Hills does hereby accept and adopt the 2013 South Orange County Integrated Regional Water Management Plan.

PASSED, APPROVED, AND ADOPTED this 27th day of August 2013.

BARBARA D. KOGERMAN, MAYOR

ATTEST:

PEGGY J. JOHNS, CITY CLERK

STATE OF CALIFORNIA)
COUNTY OF ORANGE) ss
CITY OF LAGUNA HILLS)

I, Peggy J. Johns, City Clerk of the City of Laguna Hills, California, DO HEREBY CERTIFY that the foregoing is a true and correct copy of Resolution No. 2013-08-27-1 adopted by the City Council of the City of Laguna Hills, California, at a Regular Meeting thereof held on the 27th day of August 2013, by the following vote:

AYES: Council Members Bressette, Carruth, Gilbert, Mayor Pro Tempore Blount, and Mayor Kogerman

NOES: None

ABSENT: None

ABSTAIN: None

(SEAL)

PEGGY J. JOHNS, CITY CLERK

RESOLUTION NO. 13.051

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAGUNA BEACH CALIFORNIA ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

WHEREAS, the mission of the City of Laguna Beach includes management of water resources and environmental quality throughout its service area; and

WHEREAS, the City of Laguna Beach has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWMP) pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWMP; and

WHEREAS, the City of Laguna Beach is a member of the South Orange County Integrated Regional Watershed Management Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with Orange County Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said IRWMP by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005, Integrated Regional Watershed Management Group developed an Integrated Regional Management Plan for South Orange County Area; and

WHEREAS, the Board of Supervisors has reviewed and accepted the said Plan with its staff and general public at its regular Board meeting on June 7, 2005; and

WHEREAS, on July 18, 2013, the Executive Committee for South Orange County

Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LAGUNA BEACH does further RESOLVE to adopt the updated 2013 South Orange County Integrated Regional Water Management Plan.

ADOPTED this 20th day of August 2013,

Kelly Boyd

Kelly Boyd, Mayor

ATTEST:

City Clerk

I, LISETTE CHEL-WALKER, City Clerk of the City of Laguna Beach, California, do hereby certify that the foregoing Resolution No.13.051, was duly adopted at a Regular Meeting of the City Council of said City held on August 20, 2013, by the following vote:

AYES: COUNCILMEMBER(S): Whalen, Iseman, Dicterow, Boyd

NOES: COUNCILMEMBER(S): None

ABSENT: COUNCILMEMBER(S): Pearson

City Clerk of the City of Laguna Beach, CA

RESOLUTION NO. 2013-35

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAKE FOREST, CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the mission of the City of Lake Forest ("City") includes management of water resources and environmental quality throughout its jurisdiction; and

WHEREAS, the City has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan in accordance with Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, which encourages local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (Wat. Code Sections 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City is a member of the South Orange County IRWM Group, which was formed by cities, water districts, and special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board's region, which includes in the County of Orange; and

WHEREAS, SB 1672 provides for the acceptance of an IRWM plan by participants in the IRWM Group that have authority to implement an IRWM plan; and

WHEREAS, in 2005, the IRWM Group developed an Integrated Regional Management Plan for South Orange County Area; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act (Pub. Resources Code Sections 75001-75090) which requires that IRWM Plans be updated with new guidelines, such as addressing flood management and climate change, in order to be eligible for Proposition 84 grant funding; and

APPROVED AS TO FORM:

SCOTT C. SMITH
CITY ATTORNEY

STATE OF CALIFORNIA)
COUNTY OF ORANGE) SS
CITY OF LAKE FOREST)

I, Stephanie D. Smith, City Clerk of the City of Lake Forest, California, do hereby certify that the foregoing Resolution No. 2013-35 was duly passed and adopted at a regular meeting of the Lake Forest City Council on the 3rd day of September 2013, by the following vote, to wit:

AYES:	COUNCIL MEMBERS:	HERZOG, MCCULLOUGH, NICK, ROBINSON, VOIGTS
NOES:	COUNCIL MEMBERS:	NONE
ABSENT:	COUNCIL MEMBERS:	NONE
ABSTAIN:	COUNCIL MEMBERS:	NONE

STEPHANIE D. SMITH, CMC
CITY CLERK

WHEREAS, on July 18, 2013, the Executive Committee for the South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Watershed Management Plan.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LAKE FOREST, DOES HEREBY RESOLVE, AS FOLLOWS:

SECTION 1. Incorporation of Recitals. The foregoing recitals are true and correct and are incorporated herein and made an operative part of this Resolution.

SECTION 2. Adoption of Plan. The City hereby adopts the updated 2013 South Orange County Integrated Regional Water Management Plan.

SECTION 3. CEQA. The City Council finds that this Resolution is not subject to the California Environmental Quality Act (CEQA) pursuant to Sections 15060(c)(2) (the activity will not result in a direct or reasonably foreseeable indirect physical change in the environment) and 15060(c)(3) (the activity is not a project as defined in Section 15378) of the CEQA Guidelines, California Code of Regulations, Title 14, Chapter 3, because it has no potential for resulting in physical change to the environment, directly or indirectly.

SECTION 4. Severability. If any provision of this Resolution is held invalid, the remainder of this Resolution shall not be affected by such invalidity, and the provisions of this Resolution are severable.

SECTION 5. Effective Date. This Resolution shall become effective immediately upon its adoption.

SECTION 6. Certification. The Mayor shall sign this Resolution and the City Clerk shall certify the adoption thereof.

PASSED, APPROVED AND ADOPTED this 3rd day of September, 2013.

SCOTT VOIGTS
MAYOR

ATTEST:

STEPHANIE D. SMITH, CMC
CITY CLERK

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RESOLUTION NO. 2013-1107

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAGUNA NIGUEL, CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

WHEREAS, the mission of the City of Laguna Niguel includes management of surface water resources and environmental quality throughout its jurisdiction; and

WHEREAS, the City of Laguna Niguel has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water resources to improve the quality, quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City of Laguna Niguel is a member of the South Orange County IRWM Group, which was formed by cities and water districts in the South Orange County Watershed Management Area within the jurisdictional boundary of the San Diego Regional Water Quality Control Board, and was accepted by the State's Regional Acceptance Program, with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005, the IRWM Group developed an Integrated Regional Management Plan for the South Orange County Area; and

WHEREAS, in 2005, the City Council of the City of Laguna Niguel accepted the 2005 IRWM Plan in concept on June 7, 2005 by Resolution No. 2005-811; and

WHEREAS, the Board of Supervisors reviewed and accepted the said Plan at its regular Board meeting on June 7, 2005; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013, the Executive Committee for South Orange County Watershed Management Area adopted the 2013 updates to the South Orange County IRWM Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City of Laguna Niguel, hereby adopts the updated 2013 South Orange County Integrated Regional Water Management Plan.

PASSED, APPROVED AND ADOPTED this 3rd day of September, 2013.

Robert Ming,
Mayor

ATTEST:

Pam Lawrence
Deputy City Manager/Acting City Clerk

CERTIFICATION

STATE OF CALIFORNIA)
COUNTY OF ORANGE)SS
CITY OF LAGUNA NIGUEL)

I, Pam Lawrence, Deputy City Manager/Acting City Clerk of the City of Laguna Niguel, California, do hereby certify that the foregoing is Resolution No. 2013-1107 which was adopted at a regular meeting of the City Council of the City of Laguna Niguel, California, held September 3, 2013 by the following vote:

AYES:	Council Members Davies, McCloskey, Slusiewicz and Mayor Pro Tem Lindholm
NOES:	Mayor Ming
ABSTENTIONS:	None
ABSENT:	None

Pam Lawrence

Pam Lawrence,
Deputy City Manager/Acting City Clerk

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RESOLUTION NO. 13-15

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF LAGUNA WOODS, CALIFORNIA ADOPTING THE SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the mission of the City of Laguna Woods includes management of water resources and environmental quality throughout its jurisdiction; and

WHEREAS, the City of Laguna Woods has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City of Laguna Woods is a member of the South Orange County IRWM Group, which was formed with cities, water, and special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, Senate Bill 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, the Laguna Woods City Council has reviewed and accepted the said Plan with its staff and general public at its regular City Council meeting on August 21, 2013; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal

Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF LAGUNA WOODS, CALIFORNIA, DOES HEREBY RESOLVE, DECLARE, DETERMINE AND ORDER AS FOLLOWS:

SECTION 1. The City Council hereby adopts the South Orange County Integrated Regional Water Management Plan in continued coordination with the South Orange County IRWM Group.

SECTION 2. The Deputy City Clerk shall certify to the adoption of this resolution.

PASSED, APPROVED AND ADOPTED ON this 21st day of August 2013.

ROBERT B. RING, Mayor

ATTEST:

MARC DONOHUE, Deputy City Clerk

STATE OF CALIFORNIA)
COUNTY OF ORANGE) ss.
CITY OF LAGUNA WOODS)

I, MARC DONOHUE, Deputy City Clerk of the City of Laguna Woods, do HEREBY CERTIFY that the foregoing **Resolution No. 13-15** was duly adopted by the City Council of the City of Laguna Woods at a regular meeting thereof, held on the 21st day of August 2013, by the following vote:

AYES: COUNCILMEMBERS: Conners, Hack, Hatch, Robbins, Ring
NOES: COUNCILMEMBERS:
ABSENT: COUNCILMEMBERS: Hatch

MARC DONOHUE, Deputy City Clerk

RESOLUTION NO. 13-19

RESOLUTION OF THE BOARD OF DIRECTORS OF THE MOULTON NIGUEL WATER DISTRICT ADOPTING THE UPDATED "SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN"

WHEREAS, the Moulton Niguel Water District ("MNWD") includes within its mission the provision of a reliable water supply to the MNWD service area and in carrying out this particular mission over the past several years has completed considerable work with respect to improving water system reliability in South Orange County; and

WHEREAS, MNWD recognizes that on-going coordination among local agencies in South Orange County with responsibilities for managing water supplies, additional development of local resources, efficient utilization of existing resources and vigilant protection of imported water resources is necessary to maximize the quality and quantity of water available to meet the region's agricultural, domestic, industrial, and environmental needs; and

WHEREAS, MNWD has participated in the development of the South Orange County Integrated Regional Water Management Plan (IRWMP) pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002; and

WHEREAS, MNWD is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, over the past year, MNWD staff has participated in updating the IRWMP; and

WHEREAS, the MNWD Board of Directors has now reviewed the updated IRWMP with its staff and the general public at its Engineering and Operations Committee meeting on September 16, 2013, and supports the IRWMP and its goals.

NOW, THEREFORE, the Board of Directors of Moulton Niguel Water District does hereby **RESOLVE, DETERMINE** and **ORDER** as follows:

Section 1. The Moulton Niguel Water District Board of Directors does hereby adopt the South Orange County Integrated Regional Water Management Plan in continued coordination with the South OC IRWM Group.

ADOPTED, SIGNED and **APPROVED** this 19th day of September, 2013.

President/Vice President
MOULTON NIGUEL WATER DISTRICT
and of the Board of Directors thereof

Secretary
MOULTON NIGUEL WATER DISTRICT
and of the Board of Directors thereof

APPROVED AS TO FORM:

BOWIE, ARNESON, WILES & GIANNONE
Legal Counsel - Moulton Niguel Water District

By: _____
Patricia B. Giannone

RESOLUTION 13-48

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MISSION VIEJO, CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN (IRWMP)

WHEREAS, the mission of the City of Mission Viejo includes management of water resources and environmental quality throughout its service area; and

WHEREAS, the City of Mission Viejo has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWMP) pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002, to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality, quantity, and reliability; and

WHEREAS, in November 2002, California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City of Mission Viejo is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the State's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with the County of Orange Public Works serving as the group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005, the IRWM Group developed an Integrated Regional Management Plan for South Orange County Area; and

WHEREAS, on June 6, 2005, the City Council of the City of Mission Viejo accepted the 2005 IRWMP by Resolution No. 05-057; and

WHEREAS, in November 2006, California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act (PRC Section 75001-75130), which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013, the Executive Committee of the South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City of Mission Viejo, hereby adopts the updated 2013 South Orange County Integrated Regional Water Management Plan.

PASSED, APPROVED AND ADOPTED this 3rd day of September, 2013.

Rhonda Reardon
Mayor

I, KAREN HAMMAN, City Clerk of the City of Mission Viejo, hereby certify that the foregoing resolution was duly adopted by the City Council of the City of Mission Viejo at a regular meeting thereof, held on the 3rd day of September, 2013, by the following vote of the Council:

AYES:	Kelley, Leckness, Schlicht, and Ury
NOES:	None
ABSENT:	Reardon

ATTEST:

Karen Hamman
City Clerk

RESOLUTION NO. 1964

RESOLUTION OF THE BOARD OF DIRECTORS MUNICIPAL WATER DISTRICT OF ORANGE COUNTY ADOPTING THE UPDATED "SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN"

WHEREAS, the mission of the Municipal Water District of Orange County (MWDOC) is to provide a reliable supply of water to its service area and, in carrying out this mission, has consistently worked to improve system and supply reliability throughout Orange County; and

WHEREAS, MWDOC is coordinating the Orange County Regional Urban Water Management Plan, has completed the South Orange County Water Reliability Study, and is participating as an implementing entity (along with the 30 retail agencies we serve) in Metropolitan Water District of Southern California's Integrated Resources Plan, all of which will help ensure the continued reliability of supplies to Orange County; and

WHEREAS, MWDOC recognizes that improved coordination among local agencies with responsibilities for managing water supplies, development of additional local resources, efficient utilization of existing resources, and vigilant protection of our imported resources are necessary to maximize the supplies available to meet the region's agricultural, urban, industrial, and environmental needs; and

WHEREAS, a regional water management group was formed in South Orange County, facilitated by the County of Orange and in which MWDOC is participating, with the intent of developing an Integrated Regional Watershed Management Plan; and

WHEREAS, MWDOC staff has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWMP) in 2005, which was prepared in accordance with Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Watershed Management Planning Act of 2002; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality and Supply , Flood Control, River and Coastal Protection Bond Act, which requires that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, over the past year, MWDOC staff has participated in updating the IRWMP, and

WHEREAS, adopting the IRWMP does not commit MWDOC to implementation of any project; determinations to proceed with individual projects are made by the individual agencies, and

WHEREAS, the MWDOC Board of Directors has now reviewed the updated IRWMP with its staff and the general public at its Planning & Operations Committee meeting on

August 5, 2013, and at its regular Board meeting on August 21, 2013, and supports the IRWMP and its goals.

NOW, THEREFORE, be it resolved that the Board of Directors of the Municipal Water District of Orange County does hereby adopt the South Orange County Integrated Regional Watershed Management Plan for the purposes of moving forward with the proposed projects and programs included therein and in continued coordination with the IRWMP Management Committee and Executive Committee, under the coordination with the County of Orange as the Administrator of the IRWMP.

Adopted at the regular meeting of the Board of Directors held August 21, 2013, by the following roll call vote:

AYES:	Directors Barbre, Clark, Dick, Hinman, Osborne and Thomas
NOES:	None
ABSENT:	Director Finnegan
ABSTAIN:	None

I hereby certify that the foregoing is a true and correct copy of Resolution No. 1964 adopted by the Board of Directors of Municipal Water District of Orange County at its meeting held on August 21, 2013.

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

By: _____
Secretary

RESOLUTION NO. 13-09-11-02

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RANCHO SANTA MARGARITA CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

The City Council of the City of Rancho Santa Margarita, California, hereby finds, determines, declares, and resolves as follows:

WHEREAS, the City of Rancho Santa Margarita has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWMP) pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City of Rancho Santa Margarita is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with Orange County Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWMP Group that have authority to implement the Plan; and

WHEREAS, in 2005, IRWM Group developed an Integrated Regional Watershed Management Plan for South Orange County Area; and

WHEREAS, in 2005, the City Council of the City of Rancho Santa Margarita adopted the 2005 IRWMP by Resolution No. 05-06-22-02; and

WHEREAS, Whereas, the County Board of Supervisors has reviewed and accepted the said Plan with its staff and general public at its regular Board meeting on June 7, 2005; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013, the Executive Committee for South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF RANCHO SANTA MARGARITA, CALIFORNIA, DOES RESOLVE, DECLARE, DETERMINE, AND ORDER AS FOLLOWS:

SECTION 1. The City Council of the City of Rancho Santa Margarita does hereby accept and adopt the 2013 South Orange County Integrated Regional Water Management Plan.

PASSED, APPROVED AND ADOPTED THIS 11TH DAY OF SEPTEMBER, 2013.

L. ANTHONY BEALL, MAYOR

ATTEST:

MOLLY MCLAUGHLIN, CITY CLERK

State of California)
County of Orange) ss
City of Rancho Santa Margarita)

I, Molly McLaughlin, City Clerk of the City of Rancho Santa Margarita, California, DO HEREBY CERTIFY that the foregoing is a true and correct copy of Resolution No. 13-09-11-02, adopted by the City Council of the City of Rancho Santa Margarita, California, at a regular meeting thereof, held on the 11th day of September, 2013, by the following vote:

AYES:	5	COUNCIL MEMBERS:	Baric, McGirr, Petrilla, Mayor Pro Tempore Gamble and Mayor Beall
NOES:	0	COUNCIL MEMBERS:	None
ABSTAIN:	0	COUNCIL MEMBERS:	None
ABSENT:	0	COUNCIL MEMBERS:	None

MOLLY MCLAUGHLIN, CITY CLERK

RESOLUTION NO. 13-36

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN CLEMENTE, CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

WHEREAS, the mission of the City of San Clemente includes management of water resources and environmental quality throughout its service area; and

WHEREAS, the City of San Clemente has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the City of San Clemente is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005, IRWM Group developed an Integrated Regional Management Plan for South Orange County Area; and

WHEREAS, in 2005, the City Council of the City of San Clemente adopted the 2005 IRWMP by Resolution No. 05-42; and

WHEREAS, Whereas, the Board of Supervisors has reviewed and accepted the said Plan with its staff and general public at its regular Board meeting on June 7, 2005; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013, the Executive Committee for South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, BE IT RESOLVED that the City of San Clemente, hereby adopts the updated 2013 South Orange County Integrated Regional Water Management Plan.

PASSED AND ADOPTED this 3rd day of September, 2013.

ATTEST:

City Clerk of the City of
San Clemente, California

Mayor of the City of San
Clemente, California

STATE OF CALIFORNIA)
COUNTY OF ORANGE) §
CITY OF SAN CLEMENTE)

I, JOANNE BAADE, City Clerk of the City of San Clemente, California, do hereby certify that Resolution No. 13-36 was adopted at a regular meeting of the City Council of the City of San Clemente held on the 3rd day of September, 2013, by the following vote:

AYES: BROWN, DONCHAK, EVERT, HAMM, MAYOR BAKER

NOES: NONE

ABSENT: NONE

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the City of San Clemente, California, this 5TH day of SEPT, 2013.

CITY CLERK of the City of
San Clemente, California

Approved as to form:

/s/ Jeff Goldfarb
City Attorney

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SOUTH COAST WATER DISTRICT

RESOLUTION NO. 5-13/14

A RESOLUTION OF THE BOARD OF DIRECTORS OF SOUTH COAST WATER DISTRICT ADOPTING THE SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the mission of the South Coast Water District includes management of water resources and environmental quality throughout its service area; and

WHEREAS, South Coast Water District has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the South Coast Water District is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, the Board of Directors has reviewed and accepted the said Plan with its staff and general public at its regular Board meeting on August 8, 2013; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding.

NOW, THEREFORE, BE IT RESOLVED that this Board of Directors of South Coast Water District does hereby adopt the South Orange County Integrated Regional Water Management Plan in continued coordination with the South OC IRWM Group.

PASSED AND ADOPTED this 8th day of August 2013.

President

ATTEST:

Secretary

SOUTH COAST WATER DISTRICT

Serving the Public Since 1932

Certification

I, Betty Burnett, Secretary of the SOUTH COAST WATER DISTRICT, Orange County, California, do hereby certify that the foregoing **Resolution No. 5-13/14** was duly adopted at a regular meeting of the Governing Board of said District, held on the 8th day of August 2013 by the following vote of members of the Board:

AYES: Erkeneff, Moore, Rayfield, Runge

NOES:

ABSENT: Dietmeier

ABSTAIN:

and I further certify that Wayne Rayfield, as President, and Betty Burnett, as Secretary Pro Tem, signed and approved said **Resolution No. 5-13/14** on the 8th day of August 2013.

Betty Burnett
Secretary of the Board
South Coast Water District

(District Seal)

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RESOLUTION NO. 13-09-03-02

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN JUAN CAPISTRANO, CALIFORNIA ADOPTING THE SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the Mission of the City of San Juan Capistrano includes management of water resources and environmental quality throughout its service area; and,

WHEREAS, the City of San Juan Capistrano has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and,

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and,

WHEREAS, the City of San Juan Capistrano is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and,

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and,

Whereas, the City Council has reviewed and accepted the said Plan with its staff and general public at its regular Council meeting on September 3rd, 2013; and,

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and,

WHEREAS, changes to the Integrated Watershed Management Plan will require formal approval by the City Council, on-going addition or deletion of projects in the Plan does not require formal approval of the Plan; and,

NOW THEREFORE BE IT RESOLVED, that the City Council of the City of San Juan Capistrano hereby adopt the updated 2013 South Orange County Integrated Regional Water Management Plan in continued coordination with the South OC IRWM Group.

PASSED, APPROVED AND ADOPTED this 3rd day of September 2013.

JOHN TAYLOR, MAYOR

ATTEST:

Deputy

MARIA MORRIS, CITY CLERK

STATE OF CALIFORNIA)
COUNTY OF ORANGE) ss.
CITY OF SAN JUAN CAPISTRANO)

I, MARIA MORRIS, appointed City Clerk of the City of San Juan Capistrano, do hereby certify that the foregoing **Resolution No. 13-09-03-02** was duly adopted by the City Council of the City of San Juan Capistrano at a Regular meeting thereof, held the 3rd day of September 2013, by the following vote:

AYES: COUNCIL MEMBERS: Byrnes, Kramer, Allevato and Mayor Taylor
NOES: COUNCIL MEMBER: Reeve
ABSENT: COUNCIL MEMBER: None

Deputy

MARIA MORRIS, City Clerk

RESOLUTION NO. 2013-09-02

A RESOLUTION OF THE BOARD OF DIRECTORS OF SANTA MARGARITA WATER DISTRICT, COUNTY OF ORANGE, CALIFORNIA, ADOPTING THE 2013 SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

WHEREAS, the mission of Santa Margarita Water District (District) includes management of water resources and environmental quality throughout its service area; and

WHEREAS, the District has participated in the development of the South Orange County Integrated Regional Watershed Management (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality, quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the District is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in 2005, IRWM Group developed an Integrated Regional Management Plan for South Orange County Area; and

WHEREAS, in 2005, the District adopted the 2005 IRWM Plan by Resolution No. 05-05-07; and

WHEREAS, Whereas, the Board of Supervisors has reviewed and accepted the said Plan with its staff and general public at its regular Board meeting on June 7, 2005; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

WHEREAS, on July 18, 2013, the Executive Committee for South Orange County Watershed Management Area adopted the 2013 South Orange County Integrated Regional Water Management Plan; and

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Santa Margarita Water District, hereby adopt the updated 2013 South Orange County Integrated Regional Water Management Plan.

APPROVED AND ADOPTED this 13th day of September, 2013.

By: _____
Saundra Jacobs
President, Board of Directors
Santa Margarita Water District

ATTEST:

_____
Joyce Crosthwaite
Secretary, Board of Directors
Santa Margarita Water District

STATE OF CALIFORNIA)

COUNTY OF ORANGE)

ss

I, Joyce Crosthwaite, Secretary of the Board of Directors of the Santa Margarita Water District, do hereby certify that the foregoing Resolution was duly adopted by the Board of Directors said District at a regular meeting held on the 13th day of September, 2013 and that it was so adopted by the following vote:

AYES: DIRECTORS: Wilson, Jacobs, Gibson, McCusker

NOES: DIRECTORS:

ABSENT: DIRECTORS: Olson

ABSTAIN: DIRECTORS:

Joyce Crosthwaite
Secretary, Board of Directors
Santa Margarita Water District

I, Joyce Crosthwaite, Secretary of the Board of Directors of the Santa Margarita Water District, do hereby certify that the above and forgoing is a full, true, and correct copy of Resolution No. 2013-09-02 of said Board, and that the same has not been amended or repealed.

DATED: September 13, 2013

Joyce Crosthwaite
Secretary, Board of Directors
Santa Margarita Water District

(Seal)

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RESOLUTION NO. 2013-12

**RESOLUTION OF THE BOARD OF DIRECTORS
OF THE
SOUTH ORANGE COUNTY WASTEWATER AUTHORITY
ADOPTING THE SOUTH ORANGE COUNTY INTEGRATED
REGIONAL WATERSHED MANAGEMENT PLAN**

WHEREAS, the mission of the South Orange County Wastewater Authority includes management of wastewater, recycled water and the highest level of environmental stewardship throughout its service area; and

WHEREAS, the South Orange County Wastewater Authority has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the South Orange County Wastewater Authority is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, in November 2006 California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, river and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors as follows:

Section 1. The South Orange County Wastewater Authority Board of Directors does hereby adopt the South Orange County Integrated Regional Water Management Plan in continued coordination with the South OC IRWM Group.

ADOPTED, SIGNED AND APPROVED this 1st day of August 2013.

Chairman/Vice-Chairman
SOUTH ORANGE COUNTY WASTEWATER AUTHORITY
and the Board of Directors thereof

Secretary/Assistant Secretary
SOUTH ORANGE COUNTY WASTEWATER AUTHORITY
and the Board of Directors thereof

APPROVED AS TO FORM:

BOWIE, ARNESON, WILES & GIANNONE
Legal Counsel – South Orange County Wastewater Authority

By: _____
Patricia B. Giannone

RESOLUTION NO 2013-1191

RESOLUTION OF THE BOARD OF DIRECTORS OF TRABUCO CANYON WATER DISTRICT ADOPTING THE SOUTH ORANGE COUNTY INTEGRATED REGIONAL WATERSHED MANAGEMENT PLAN

WHEREAS, the mission of the Trabuco Canyon Water District includes management of water resources and environmental quality throughout its service area.

WHEREAS, Trabuco Canyon Water District has participated in the development of the South Orange County Integrated Regional Watershed Management Plan (IRWM) Plan pursuant to Senate Bill 1672 (SB 1672) of the State of California, known as the Integrated Regional Water Management Planning Act of 2002, approved by the Governor on September 20, 2002 to encourage local agencies to work cooperatively to manage local and imported water supplies to improve the quality quantity, and reliability; and

WHEREAS, in November 2002 California voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (CWC Section 79560-79565) to fund competitive grants for projects consistent with an adopted IRWM Plan; and

WHEREAS, the Trabuco Canyon Water District is a member of the South Orange County IRWM Group, which was formed with cities, water/special districts located within the South Orange County Watershed Management Area, adopted by the state's Regional Acceptance Program, within the San Diego Regional Water Quality Control Board boundary in Orange County with OC Public Works serving as the Group's lead; and

WHEREAS, SB 1672 provides for the acceptance of said Plan by participants in the IRWM Group that have authority to implement the Plan; and

WHEREAS, the Board of Directors has reviewed and accepted the said Plan with its staff and general public at its Regular Board Meeting on August 21, 2013; and

WHEREAS, in November 2006, California voters passed Proposition 84, the Safe Drinking Water, Water Quality, and Supply, Flood Control, River and Coastal Protection Bond Act (PRC Section 75001-75130) which required that IRWM Plans be updated to new guidelines in order to be eligible for Proposition 84 grant funding; and

Now, therefore, be it resolved that the Board of Directors of Trabuco Canyon Water District does hereby adopt the South Orange County Integrated Regional Water Management Plan in continued coordination with the South OC IRWM Group.

ADOPTED, SIGNED, and APPROVED this 21st day of August, 2013, by the Board of Directors of the Trabuco Canyon Water District.

TRABUCO CANYON WATER DISTRICT:

President/Vice President

District Secretary

STATE OF CALIFORNIA)

) ss.

COUNTY OF ORANGE)

I, Michael Perea, District Secretary of the Trabuco Canyon Water District, do hereby certify that the foregoing resolution was duly adopted by the Board of said District at a meeting of said Board held on the 21st day of August, 2013, of which meeting all of the members of the Board had due notice and at which a quorum thereof were present and acting throughout and for which notice and an agenda was prepared and posted as required by law and that at said meeting such resolution was adopted by the following vote:

AYES:	Mandich, Haselton, Acosta, Dopudja, Safranski
NOES:	None
ABSTAIN:	None
ABSENT:	None

District Secretary,
Trabuco Canyon Water District

STATE OF CALIFORNIA)
) ss.
COUNTY OF ORANGE)

I, Michael Perea, District Secretary of the Trabuco Canyon Water District, do hereby certify that the foregoing is a full, true and correct copy of Resolution No. 2013-1191 of such Board and that the same has not been amended or repealed.

Dated this 21st day of August, 2013.

District Secretary,
Trabuco Canyon Water District

APPENDIX E

SOUTH ORANGE COUNTY IRWM PLAN
LETTERS OF SUPPORT FROM NON-AGENCY ORGANIZATIONS, COMMUNITY GROUPS, AND OTHERS

Organizations, community groups and others have provided Letters of Support in coordination, development and implementation of the South Orange County Integrated Regional Water Management Plan. Copies of the letters are included on the following pages.

- Audubon California, Starr Ranch Sanctuary
- Fluvial Tech Inc.
- MIOCEAN
- Penny Elia, Environmental Advocate
- South Laguna Civic Association
- Surfrider Foundation

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Audubon CALIFORNIA

Starr Ranch Sanctuary
100 Bell Canyon Road
Trabuco Canyon, CA

February 5, 2013

Marilyn Thoms,
Manager, Environmental Engineering
OC Watersheds Program
2301 N. Glassell
Orange, CA 92865
(714) 955-0610

Dear Mrs. Thoms:

I am pleased to write this letter of support for the South Orange County Integrated Regional Water Management (IRWM) projects that seek Proposition 84 funding. The National Audubon Society is an over 100 year old 501(c)3 nonprofit organization whose mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity. At Audubon Starr Ranch, we've worked to restore and monitor a 125-acre riparian corridor, Bell Creek, that is an important tributary of San Juan Creek. Thus, our strong interest in and support for the South Orange County Integrated Regional Water Management plan.

The IRWM takes a progressive and inclusive approach to water conservation in the region. Audubon Starr Ranch is proud to offer its support for the South Orange County IRWM.

Sincerely,

Sandy DeSimone

Sandra DeSimone, Ph.D.
Director – Research and Education
949-858-0309
sdesimone@audubon.org

June 26, 2013

Mrs. Marilyn Thoms,
Manager, Environmental Engineering
OC Watersheds Program
2301 N. Glassell
Orange, CA 92865
(714) 955-0610

Subject: FluvialTech Letter of Support for South Orange County IRWM Plan Adoption

Dear Mrs. Thoms:

FluvialTech Inc. supports the update and implementation of the South Orange County Integrated Regional Water Management Plan (IRWM Plan). Through participation in workshops and meetings FluvialTech contributed in the development of the IRWM Plan, and supports the IRWM Plan update in accordance with CWC §10543.

FluvialTech appreciates the opportunity to be part of the IRWM Group along with numerous South County cities, special districts, the County of Orange, and other stakeholders.

FluvialTech recognizes that improved coordination among local agencies with shared responsibilities for watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources are necessary to support our mission of Integrated, Healthy and Balanced Watersheds.

The IRWM Group, facilitated by the County of Orange, has prepared a comprehensive IRWM Plan covering the South Orange County Watershed Management Area, a Region adopted by the state in 2009. FluvialTech supports ongoing funding and implementation of the IRWM Plan and will formally adopt the 2013 IRWM Plan by May 2013.

Sincerely,

FluvialTech Inc.

Hasan Nouri, P.E., Hoover Medalist

President

FluvialTech Inc., 310 Avenida Del Mar, Suite 6, San Clemente, CA 92672, Tel: (949)633-5035, hasan.nouri@fluvialtechinc.com

miocean

June 28, 2013

Marilyn Thoms
Manager, Environmental Engineering
OC Watersheds Program
2301 N. Glassell
Orange, CA 92865
(714) 955-0610

RE: Letter of Support for South Orange County IRWM Plan Adoption

Dear Mrs. Thoms:

The Miocean Foundation supports the update and implementation of the South Orange County Integrated Regional Water Management Plan (IRWM Plan). As you know, Miocean is a 501(c)3 non-profit foundation focused entirely on raising private sector funds to fortify local government efforts to remove ocean pollution in Orange County.

We recognize and applaud the IRWM Plan which facilitates improved coordination among local agencies with shared responsibilities for watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources. Miocean welcomes the organization that the IRWM Plan brings to prioritize and effectually implement projects that improve watersheds in South Orange County.

There are many worthly projects throughout the south coast area, we look forward to future collaborations. Thank you for your interest in Miocean.

Best Regards,

MIOCEAN

Patrick R. Fuscoe
Chairman

P.O. Box 14246 * Irvine, California * 92623-4246 * t. 949.271.4386 * t. 888.4MIOCEAN * www.miocean.org

July 8, 2013

Marilyn Thoms
Manager, Environmental Engineering
OC Watersheds Program
2301 N. Glassell
Orange, CA 92865
(714) 955-0610

Subject: Letter of Support and Encouragement for South Orange County IRWM Plan Adoption

Dear Ms. Thoms:

Please allow this letter to serve as my personal support for the update and implementation of the South Orange County Integrated Regional Water Management Plan (IRWM Plan). I participated in the development of the IRWM Plan, and support the IRWM Plan update in accordance with CWC §10543.

I appreciate the opportunity to be part of the IRWM Group along with other important stakeholders that understand the importance of working together towards solutions. It is a daunting job and our goals are not always achieved, but we must continue to work together. We may sometimes differ on the details, but we all agree that water quality and resources are a priority.

Improved coordination among local agencies with shared responsibilities for watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources are necessary to support the goal of Integrated, Healthy and Balanced Watersheds.

The IRWM Group, facilitated by the County of Orange, has prepared a comprehensive IRWM Plan covering the South Orange County Watershed Management Area, a Region adopted by the state in 2009. I support ongoing funding and implementation of the IRWM Plan and the 2013 IRWM Plan adoption.

Sincerely,

Penny Elia
Environmental Advocate
Laguna Beach, CA 92651
greenp1@cox.net

June 25, 2013

Marilyn Thoms,
Manager, Environmental Engineering
OC Watersheds Program
2301 N. Glassell
Orange, CA 92865

Subject: South Laguna Civic Association
Letter of Support for South Orange County IRWM Plan Adoption

The South Laguna Civic Association (SLCA), established in 1946, supports the update and implementation of the South Orange County Integrated Regional Water Management Plan (IRWM Plan). The SLCA has participated in the development of the IRWM Plan over several decades in a variety of iterations and supports the IRWM Plan update in accordance with CWC §10543.

As the community most impacted by shortcomings in management of the Aliso Creek Watershed, we remain dedicated to being part of the IRWM Group along with numerous South County cities, special districts, the County of Orange, and other stakeholders. SLCA input on watershed issues since the early 1970's promotes restoring creek flows to pre-development levels as guaranteed by inland development Conditions of Approval. While the IRWM is deficient in expanding recycled wastewater for regional wildland fire suppression, we look forward to improved service to all of Laguna Beach and high fire risk areas in Laguna Canyon and Aliso Canyon. More strategic use of recycled water means less ocean pollution.

The South Laguna Civic Association recognizes that improved education about impacts to coastal receiving waters and coordination among local agencies with shared responsibilities for watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources are necessary to support the mission of Integrated, Healthy and Balanced Watersheds. Allowing the flow of polluted summer urban runoff into local creeks must be aggressively abated to achieve mission objectives and to assure healthy beaches and a clean, clear ocean.

The IRWM Group, facilitated by the County of Orange, has prepared a comprehensive IRWM Plan covering the South Orange County Watershed Management Area, a Region adopted by the state in 2009. The SLCA supports ongoing funding and implementation of the IRWM Plan and the 2013 IRWM Plan adoption while advocating for restoration of natural processes in the watershed. Studies confirm restoration of natural features including the Aliso Beach Estuary Wetlands and reforestation of Aliso & Wood Canyons with native flora and fauna is the most efficacious, cost-effective, long term solution to improved bioregional watersheds.

Significant work remains to restore functioning watersheds. The support of stakeholders and sufficient funding targeted to achieve IRWD goals are central to success. Thank you for your dedicated efforts to promote healthier, natural watersheds throughout South Orange County.

Michael Beanan
Vice President
South Laguna Civic Association mike@southlaguna.org

June 24, 2013

Marilyn Thoms,
Manager, Environmental Engineering
OC Watersheds Program
2301 N. Glassell
Orange, CA 92865
(714) 955-0610

Subject: Surfrider Foundation Letter of Support for South Orange County IRWM Plan Adoption

Dear Ms. Thoms:

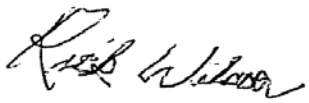
Surfrider Foundation and our South Orange County Chapter support the update and implementation of the South Orange County Integrated Regional Water Management Plan (IRWM Plan). Surfrider Foundation participated in the development of the IRWM Plan, and supports the IRWM Plan update in accordance with CWC §10543.

Surfrider Foundation and our South Orange County Chapter appreciate the opportunity to be part of the IRWM Group along with numerous South County cities, special districts, the County of Orange, and other stakeholders.

Surfrider Foundation recognizes that improved coordination among local agencies with shared responsibilities for watershed management, clean water programs, water supplies, development of local resources, and protection of our natural resources are necessary to support the goal of Integrated, Healthy and Balanced Watersheds.

The IRWM Group, facilitated by the County of Orange, has prepared a comprehensive IRWM Plan covering the South Orange County Watershed Management Area, a Region adopted by the state in 2009. Surfrider Foundation supports ongoing funding and implementation of the IRWM Plan and the 2013 IRWM Plan adoption.

Sincerely,



Rick Wilson
Coastal Management Coordinator
Surfrider Foundation
rwilson@surfrider.org

Global Headquarters
P.O. Box 6010
San Clemente, CA
USA 92674-6010
Phone: (949) 492 8170
Fax: (949) 492 8142

APPENDIX F
IRWM PROJECTS

This section includes the comprehensive list of projects reviewed for inclusion in the IRWM Plan. Each project was reviewed through the process described in Chapter 6 Projects. From the comprehensive list, priority projects were selected to undergo a self-ranking and evaluation process. This prioritized project matrix is also included below.

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South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
1	Habitat Restoration	City of Aliso Viejo	Aliso Creek Watershed Urban Runoff Capture and Reuse	End of the pipe capture and reuse of dry weather runoff. This will apply to a total of 3 storm drain outfalls located within Aliso Creek. A sedimentation basin will be installed at each outfall with treatment and irrigation systems (BMP).	$4,500,000	7/1/11
2	Water Conservation	City of Aliso Viejo	Wood Canyon Creek Watershed Urban Runoff Capture and Reuse	End of the pipe capture and reuse of dry weather runoff. This will apply to a total of 2 storm drain outfalls located within Wood Canyon Creek. A sedimentation basin will be installed at each outfall with treatment and irrigation (BMP).	$4,500,000	7/1/11
3	Water Conservation	City of Aliso Viejo	Aliso Viejo Ranch Exterior Landscape Improvements	Removal of existing landscaping to replace with drought tolerant species and installation of a water efficient irrigation system. A landscape architect will complete the design of the irrigation system and plantings.	$310,000	7/1/13
4	Water Conservation	City of Dana Point	Microbial Source Tracking Study Investigations- Salt Creek	Microbial Source Tracking & Research Study(ies) (Planning)	$400,000	2 months from funding
5	Water Conservation	City of Dana Point	Crystal Cove & Lantern Bay Park Xeriscape Demonstration Gardens	Construct two separate xeriscape demonstration gardens. Project will replace water thirsty plants with drought tolerant plants, help meet TMDL requirements and protect beneficial uses of surface and ground waters, implement public education programs by implementing a demonstration component to the xeriscape gardens, conserving water and energy.	$14,000	Within 3 months of funding
6	Water Quality	City of Dana Point	Niguel, Stonehill, Acapulco Landscape Retrofit Project	The project will modify irrigation system with smartimer, flow meter, valves, nozzles to provide for an efficient system and re-landscape with drought tolerant plants, improve hardscape with a pervious material (in certain area). Overspray and runoff will be significantly reduced or eliminated. The Project would conserve water, and reduce pavement damage as well as discharge of nitrates, phosphates and other pollutants in recycled water. This stand alone project could be included in a Regional Action Project.	$75,000	As soon as money is awarded
7	Water Quality	City of Dana Point	Blue Lantern Irrigation Improvement Project	This project would modify an existing high priority publicly-owned median irrigation system that uses recycled water and is a steep slope. The project will modify slope, re-landscape with drought tolerant plants, modify irrigation system with smartimer, flow meter, valves, nozzles to provide for an efficient system, and provide retaining wall. Overspray and runoff will be significantly reduced or eliminated. The project would conserve water, and reduce pavement damage as well as discharge of nitrates, phosphates, and other pollutants in recycled water. This stand alone project could be included in a Regional Action Project.	$200,000	As soon as money is awarded

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
8	Water Quality	City of Dana Point	San Juan Creek Storm Drain LO1SO2 BMPs	A high priority storm drain diversion with actuator in the San Juan Creek, LO1SO2.By eliminating polluted runoff and preventing it from impacting receiving waters, this project help meet TMDL pollutant load requirements and protect beneficial uses of surface and ground waters of San Juan Creek and the Pacific Ocean.	$770,000	Within 4 months of funding
9	Water Quality	City of Dana Point	Improvement of Diversion Operations with Automation	Automate 12 diversion units throughout the City of Dana Point to allow remote activation which will allow the diversions to operate throughout the entire year instead of only the dry season of May through October as currently feasible. Note: total project may be divided into smaller separate projects. By eliminating polluted runoff and preventing it from impacting receiving waters, this project help meet TMDL pollutant load requirements and protect beneficial uses of surface and ground waters of San Juan Creek and the Pacific Ocean. Automation will provide for year-round elimination of polluted runoff.	$1,080,000	Within 6 months of funding
10	Water Quality	City of Dana Point	San Juan Creek Watershed Diversions- Multiple Locations	Multiple diversions in the San Juan Creek Watershed/Harbor. Note: Diversions could be separated into individual projects. Dana Point, mulitple locations along San Juan Creek.	$7,750,000	Within 6 months of funding
11	Water Quality	City of Dana Point/County of Orange/SCWD/SOCWA/CA State Parks, Doheny	Repair/Replace Sanitary Sewer System	Repair/Replace Sanitary Sewer System (Construction)	$900,000	Fall 2013
12	Water Quality	City of Dana Point/County of Orange/SCWD/SOCWA/CA State Parks, Doheny	Repair/Replace Sanitary Sewer System	Repair/Replace Sanitary Sewer System (Construction)	$7,750,000	
13	Flood Management	City of Laguna Beach	Automation of Dumond Terrace and Cleo Street Diversion units	Automate two diversion units at Dumond Terrace and Cleo Street to allow remote activation. This diversion serves to capture flow from two large 175 & 209 acre watersheds including portions of the South Coast Highway, commercial, residential and a significant drainage course. Part of Laguna Beach Urban Runoff Diversion Program.	$180,000	1/1/11
14	Water Quality	City of Laguna Beach	Santa Cruz Lift Station Elimination Project	Eliminate a lift station by installing a gravity pipeline, approximately 800 feet, to a newer portion of the City's collection system. Part of Laguna Beach Urban Runoff Diversion Program $800,000 7/1/2018	$800,000	7/1/2018
15	Water Quality	City of Laguna Beach	Upgrade Laguna Canyon Channel Diversion at Main Beach	Install a large sump in Laguna Canyon Channel at Main Beach for diversion optimization. Part of Laguna Beach Urban Runoff Diversion Program.	$150,000	12/1/10
16	Water Quality	City of Laguna Beach	Mountain and Gaviota Outfall Diversions	Install two new stormwater diversions at Mountain Road and Gaviota Drive beach outfalls. Part of Laguna Beach Urban Runoff Diversion Program.	$670,000	1/1/2012
17	Water Quality	City of Laguna Beach	Bluebird Canyon Outfall Diversion Upgrade	Upgrade the nuisance water diversion at the Bluebird Canyon beach outfall with a new fiberglass door and associated frame/appurtenances for improved operation and seasonal deployment. This diversion serves to capture flow from a large 402 acre watershed including the South Coast Highway, commercial, residential and a blue line drainage course. Part of Laguna Beach Urban Runoff Diversion Program.	$200,000	1/1/12

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
18	Habitat Restoration	City of Laguna Hills	La Paz Open Space Project from 1,370' north of Moulton Parkway to 2,740' northerly	Conversion of portions of 5 acres of low value landscaping and weeds to high value upland and wetland riparian habitat. From 1,370' north of Moulton Parkway to 2,740' northerly	$1,013,888	Within 6 months of funding approval
19	Habitat Restoration	City of Laguna Hills	La Paz Open Space Project from 2,740' north of Moulton Parkway to 4,110' northerly	Conversion of portions of 5 acres of low value landscaping and weeds to high value upland and wetland riparian habitat. From 2,740' north of Moulton Parkway to 4,110' northerly	$1,013,888	Within 6 months of funding approval
20	Habitat Restoration	City of Laguna Hills	La Paz Open Space Project from 4,110' north of Moulton Parkway to 5,480' northerly	Conversion of portions of 5 acres of low value landscaping and weeds to high value upland and wetland riparian habitat. From 4,110' north of Moulton Parkway to 5,480' northerly	$1,013,888	Within 6 months of funding approval
21	Habitat Restoration	City of Laguna Hills	La Paz Open Space Project from 5,480' north of Moulton Parkway to 6,850' northerly	Conversion of portions of 5 acres of low value landscaping and weeds to high value upland and wetland riparian habitat. From 5,480' north of Moulton Parkway to 6,850' northerly	$1,013,888	Within 6 months of funding approval
22	Habitat Restoration	City of Laguna Hills	La Paz Open Space Project from 6,850' north of Moulton Parkway to 8,220' northerly	Conversion of portions of 5 acres of low value landscaping and weeds to high value upland and wetland riparian habitat. From 6,850' north of Moulton Parkway to 8,220' northerly	$1,013,888	Within 6 months of funding approval
23	Habitat Restoration	City of Laguna Hills	La Paz Open Space Project from Moulton Parkway to 1,370' northerly	Conversion of portions of 5 acres of low value landscaping and weeds to high value upland and wetland riparian habitat. From Moulton Parkway to 1,370' northerly	$1,013,888	Within 6 months of funding approval
24	Water Conservation	City of Laguna Hills	*City of Laguna Hills - Moulton Parkway Median Island Rehabilitation from 600' n/o Glenwood to Laguna Hills Drive*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.5 mile of median island.	$875,000	Within 3 months of funding approval
25	Water Conservation	City of Laguna Hills	*City of Laguna Hills - Moulton Parkway Median Island Rehabilitation from Laguna Hills Drive to Via Lomas*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.5 mile of median island.	$875,000	Within 3 months of funding approval
26	Water Conservation	City of Laguna Hills	*City of Laguna Hills - Oso Parkway Median Island Rehabilitation from Westhaven Drive to Nellie Gail Road*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.6 miles of median island.	$1,062,500	Within 3 months of funding approval

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
27	Water Conservation	City of Laguna Hills	*City of Laguna Hills - Oso Parkway Median Island Rehabilitation from Nellie Gail Road to Bridlewood Drive*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.6 miles of median island.	$1,062,500	Within 3 months of funding approval
28	Water Conservation	City of Laguna Hills	*City of Laguna Hills - Paseo De Valencia Median Island Rehabilitation from El Toro Road to Los Alisos Blvd*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.75 miles of median island.	$1,295,000	Within 3 months of funding approval
29	Water Conservation	City of Laguna Hills	*City of Laguna Hills - Paseo De Valencia Median Island Rehabilitation from Los Alisos Blvd to Laguna Hills Drive*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.75 miles of median island.	$1,295,000	Within 3 months of funding approval
30	Habitat Restoration	City of Laguna Hills	North side of La Paz Road from Paseo De Valencia to west of Alameda Avenue	Conversion of portions of 30 acres of low value landscaping and weeds to high value upland and wetland riparian habitat.	$6,083,333	Within 6 months of funding approval
31	Habitat Restoration	City of Laguna Niguel	Oso Creek Multi-Use Trail Project	Construction of demonstration project for green infrastructure, replacing roadway pavement along Oso Creek with permeable bikeway and walking surfaces and native landscaping areas, and providing stormwater hydromodification facilities and groundwater recharge, for new creekside trailways that offer access from multi-use transit-oriented redeveloped land uses of the Gateway area, to the Metrolink Station in Laguna Niguel, and to regional trail and bus route links.	$3,000,000	Spring 2014
32	Habitat Restoration	City of Laguna Niguel	Salt Creek Corridor Habitat Restoration	The project includes restoration of artichoke-thistle-infested riparian, native grassland and coastal sage habitats on up to 200 acres within the Salt Creek Corridor Open Space area. Potential species of interest include southwestern pond turtles, bobcats, gnatcatchers, cactus wren, and many-stemmed dudleya.	$2,100,000	TBD
33	Water Quality	City of Lake Forest	Install treatment vault/filter at 51-inch outfall	Install treatment vault/filter at 51-inch outfall to achieve removal of urban runoff pollutants including indicator bacteria, sediments, metals, and nutrients		
34	Water Quality	City of Mission Viejo	Saddleback Valley Unified School District Transportation Yard Pervious Pavement / Underground Retention Basin Construction	Partner with the Saddleback Valley School District to reconstruct the school bus parking lot and servicing facility to incorporate storm water / urban runoff retention and infiltration techniques to increase perviousness on-site, which is a key component of hydro-modification management measures in Low Impact Development techniques. Specifically, the project proposes to install pervious pavement to allow for the infiltration of urban and storm water runoff, and an underground chamber system to store the first 24 hours of water produced by a storm event to allow for infiltration. This will at the same time help improve water quality by preventing parking lot pollutants from reaching English Creek, a 303(d) listed water body impaired for bacteria, nutrients, and toxicity.	$2,500,000	8/16/10

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
35	Water Conservation	City of San Clemente	Regional Median drought tolerant planting project	Removal of turf from median, replant with drought tolerant shrubs and plant material.	$35,000	7/1/12
36	Water Quality	City of San Clemente	Reservoir No. 1 Expansion	Replacement and upsizing of Reservoir No. 1 to provide storage and detention time for local supply well water and improve operational and emergency storage for the service area	$3,500,000	9/1/11
37	Water Quality	City of San Juan Capistrano	San Juan Capistrano Fats, Oils & Grease (FOG) Retrofit Program (NEED UPDATED PROJECT FORM)	Retrofitting of 45 existing food facilities with grease interceptors to prevent grease build-up that leads to sewage spills. City is tributary to San Juan Creek, an impaired water body on 303(d) List for bacteria.	$675,000	As soon as funding is available
38	Water Quality	City of San Juan Capistrano	San Juan Capistrano Recycled Water Transmission System Improvements (NEED UPDATED PROJECT FORM)	Construction of recycled water transmission mains and recycled water reservoir to improve the City of San Juan Capistrano's recycled water system. The City currently has an existing system which serves Zones 425N and 350C and is supplied by Non-Domestic Wells. This project proposes improvements which will serve Zone 420S and Zone 250C, the largest and most demanding areas for recycled water in the City of San Juan Capistrano. The use of recycled and local non-domestic water will reduce demand on domestic water and reduce the overall cost of service to the City's customers.	$20,800,000	
39	Water Quality	County of Orange	Munger Drain (J01P01) Urban Runoff BMP Retrofit	Retrofit improvements are proposed for the existing urban runoff structural BMP at Munger Drain in Lake Forest (J01P01). Improvements to the Munger Drain sand filter treatment system involve expansion of the undersized treatment component. The runoff conveyance component is fully sized and installed, the treatment effectiveness of the sand filter treatment technology has been successfully demonstrated through on onsite pilot scaled performance evaluation, and the County has sufficient property ownership adjacent to the original system to accommodate an expansion of the treatment component. The project includes design, permitting, and construction of the expanded treatment component.	$850,000	1/1/12
40	Water Supply	El Toro Water District	Recycled Water Distribution Expansion Project	Construction of approximately 30,000 linear feet of recycled water distribution pipelines to expand the District's Recycled Water Distribution System. The project would result in the conversion of approximately 75 existing potable water dedicated irrigation meters to recycled water. The conversions would reduce the amount of potable water imported by the District by as much as 300 acre feet per year. The project is further described on the attached Exhibit 1.	$7,000,000	TBD
41	Water Supply	Irvine Ranch Water District	Automated Dissolved Oxygen Control for LAWRP	The project consists of designing and installing an automated system to control the dissolved oxygen levels in the treatments ponds at the Los Alisos Water Recycling Plant. The automated system would ensure that adequate dissolved oxygen levels are maintained for the effective treatment of the wastewater, while minimizing energy usage. The project is estimated to result in a reduction of 243 metric tons of CO2 annually and save apporximately 836,000 kW-h of electricity annually.	$350,000	

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
42	Water Supply	Irvine Ranch Water District	Lake Forest Zone B East Reservior Cover	The project consists of designing and constructing a cover for the Lake Forest Zone B East Reservoir. The reservoir is currently a 3.2-million-gallon open storage reservoir for recycled water. The construction of the cover for the reservoir would improve water quality and reduce evaporation from the reservoir.	$800,000	
43	Water Supply	Irvine Ranch Water District	Lake Forest Well No. 3 and Lake Forest Well No. 7	The project includes the planning, and construction of two replacement wells and associated disinfection facilities located in the City of Lake Forest. It is estimated that Lake Forest Well No. 3 (LF-3) will produce approximately 350 gallons per minute (gpm) and Lake Forest Well No. 7 (LF-7) will produce approximately 120gpm. The existing wells have reached the end of their useful life and need to be replaced. Both LF-3 and LF-7 would provide potable water to the domestic water system after being disinfected on the replacement well site.	$4,500,000	
44	Water Supply	Irvine Ranch Water District (lead agency) in partnership with ETWD, MNWD, SMWD, TCWD	Baker Water Treatment Plant	The Project includes design and construction of a new membrane surface water treatment plant with 28 million gallons per day (mgd) capacity that will increase water supply reliability for nearly one million people that reside in the south Orange County communities, from Lake Forest to San Clemente. The Baker Plant will be base-loaded and operated on a continuous basis. The project will utilize both local and imported raw waters that cannot be currently used for potable uses. Imported raw water from Metropolitan Water District's (MWD) Lake Mathews will be supplied to the plant through the MWD Lower Feeder and the Santiago Lateral Turnout OC-33 via the Baker Pipeline. Alternately, raw water and local runoff water stored in Irvine Lake can also be supplied to the plant via the Baker Pipeline. Irvine Ranch Water District (IRWD) is the lead agency for the project.	$78,500,000	5/1/13
45	Water Supply	Moulton Niguel Water District	MNWD Phase 5 Recycled Water Distribution Expansion	Construction of pipelines, reservoirs, pump stations and service connections. Includes Cities of Laguna Niguel, Aliso Viejo, Mission Viejo and Laguna Hills. Part of MNWD Recycled Water Distribution System.	$14,000,000	Ongoing
46	Water Supply	Municipal Water District of Orange County	South Orange Coastal Ocean Desalination Project	Construction of a 15 mgd ocean desalination facility.	$161,000,000	1/1/14
47	Water Supply	Municipal Water District of Orange County	Second Lower Cross Feeder Project	Involves a pipeline and pump station connecting MET's Second Lower Feeder and the East Orange County Feeder No. 2 (hence the project name – Second Lower Cross Feeder) to provide imported supplies into central and south Orange County in the event of an outage of the Diemer Plant. The same system can also be used to move groundwater or previously stored imported water around the county during emergency situations. The reliability improvements when the Diemer Plant are down are most important to South Orange County; moving groundwater around would be most important to OCWD or their agencies.	$50,000,000	2014/15

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
48	Water Conservation	Municipal Water District of Orange County	Landscape Water Use Efficiency through Low-Precipitation Rate Irrigation	The program will encourage the conversion of 50,000 high-volume conventional spray irrigation heads to low-precipitation-rate irrigation equipment (rotating nozzles and drip). These improvements will result in water savings, a reduction of dry-weather runoff, pollution prevention, and reduced maintenance costs. The spray heads will be replaced with an estimated 45,000 rotating nozzles and 300,000 square feet of drip irrigation at both commercial and residential sites with existing landscape are targeted for comprehensive improvements through this program. This will result in an expected total water savings of more than 244-acre-feet per year or 2,445 acre-feet over the 10-year life of the landscape improvements.	$729,240	Immediately
49	Water Conservation	Municipal Water District of Orange County	Landscape Water Use Efficiency through Smart Timers	The program will upgrade 1,500 antiquated irrigation timers to smart water application irrigation controllers (smart timers). These improvements will result in water savings, a reduction of dry-weather runoff, pollution prevention, and reduced maintenance costs. Both commercial sites with existing landscape are targeted for improvements through this program, with an expected total water savings of more than 83 acre-feet per year or 828 acre-feet over the 10-year life of the landscape improvements.	$726,059	Immediately
50	Water Conservation	Municipal Water District of Orange County	Landscape Water Use Efficiency through Turf Removal	The program will encourage the removal of 10.3 acres of non-functional turf replaced with California Friendly landscape. These improvements will result in water savings, a reduction of dry-weather runoff, pollution prevention, and reduced maintenance costs. An estimated 443 sites of non-functional turf are targeted for replacement with California Friendly landscapes through this program, with an expected total water savings of more than 60.5 acre-feet per year or 605 acre-feet over the 10-year life of the landscape improvements.	$767,070	Immediately
51	Habitat Restoration	Orange County Coastkeeper (NGO)	Dana Point Harbor Copper Investigation/Reduction Program	This project will address the impaired waterbody listing for copper in Dana Point Harbor. The project will also address the Aquatic Ecosystem and Watershed Management objective by implementing a program to bring dissolved copper concentrations in Dana Point Harbor to a level that optimizes the healthy functioning of the harbor ecosystem.		
52	Flood Management	Orange County Flood Control District	Trabuco Creek Channel (L02) Phase 8, 300-feet upstream the Del Obispo Street to 1600-feet upstream Del Obispo Street	This project consists of driving steel sheet piles (SSP) along the top of the embankment to a depth of approximately 60 feet along 1,880 linear feet of Trabuco Creek Channel (L02).	$12,300,000	5/31/15
53	Flood Management	Orange County Flood Control District	San Juan Creek Channel (L01) Phase 6, upstream Stonehill Dr to 2100' Stonehill Dr (Left side only)	This project consists of driving steel sheet piles (SSP) along the top of the embankment to a depth of approximately 60 feet along 2,100 linear feet of the left side of San Juan Creek Channel (L01).	$7,300,000	5/31/16
54	Flood Management	Orange County Flood Control District	Trabuco Creek Channel (L02) Phase 7, 300-feet upstream the Confluence with L01 to 300 feet upstream Del Obispo Street	This project consists of driving steel sheet piles (SSP) along the top of the embankment to a depth of approximately 60 feet along 2,320 linear feet of Trabuco Creek Channel (L02).	$13,500,000	5/31/12

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
55	Flood Management	Orange County Flood Control District	San Juan Creek Channel (L01) Phase 4 & 5, upstream Stonehill Dr to 6035' Stonehill Dr (Right side only)	This project consists of driving steel sheet piles (SSP) along the top of the embankment to a depth of approximately 60 feet along 6,035 linear feet of the right side of San Juan Creek Channel (L01).	$18,500,000	5/31/13
56	Flood Management	Orange County Flood Control District	San Juan Creek Channel (L01) Phase 9, upstream 2100-feet upstream Stonehill Dr to I-5 Freeway and Trabuco Creek Channel (L02) from downstream to upstream confluence with L01 Phase 9	This project consists of increasing the height of channel wall on top of the newly placed pile caps to the steel sheet piles in order to convey the 100-year storm event.	$1,856,000	5/31/18
57	Water Conservation	City of Mission Viejo	DRPP - Demand Runoff & Pollution Prevention	Encourages structural conversion of existing landscape features that have a high impact on urban runoff quantity/quality and water demand	$1,549,741	8/16/10
58	Water Conservation	City of Mission Viejo	*City of Mission Viejo - Marguerite Parkway Median & Slope Improvements*	Marguerite Parkway is the City of Mission Viejo's principal north-south arterial highway. The portion of the higway between Jeronimo Road and Los Alisos Blvd has approximately 3.6 acres of median islands planted exclusively in turf consuming approximately 14 AF per year. Additionally, many of the hillsides adjoining the highway lack mature landscaping leading to erosion problems during rainstorms, while a few areas have high water use slope coverings. The median conversion portion of teh project is expected to save 11 AF per year of water by completely removing the existing turf grass in the median and installing a palate of native, drought-tolerant vegetation and ET controllers. Irrigation runoff will be prevented through the use of laser drip irrigation systems rather than traditional rotating or spray nozzles. Urban runoff qulaity will be improved by reducing the application of nutrient-rich fertilizers. The anticipated water savings from this work is estimated to be 15 AF per year.	$2,500,000	6/30/13
59	Water Conservation	City of Laguna Niguel	*City of Laguna Niguel - Turfgrass Replacement in Crown Valley Parkway (NEED UPDATED PROJECT FORM)*	The project would remove 4.5 acres of turfgrass in medians along 5 miles of Crown Valley Parkway, replacing turf with drought tolerant plants and/or inert groundcoverings. The change to would reduce potable and recycled water use by 7 acre-feet per year.	$500,000	8/1/13

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
60	Water Conservation	City of Mission Viejo	*City of Mission Viejo - Trabuco Road Median Improvements*	Trabuco Road is a major City of Mission Viejo highway with 1.67 acres of median islands planted in turf consuming approximately 7 AF per year. The median conversion portion of the project is expected to save 4.5 AF per year of water by completely removing the existing turf grass in the median and installing a palate of native, drought-tolerant vegetation and ET controllers. Irrigation runoff will be prevented through the use of laser drip irrigation so that "over splash" during irrigation does not occur. Urban runoff quality will be improved by reducing the application of nutrient-rich fertilizers.	$535,000	8/16/10
61	Water Conservation	REGIONAL ACTION PROJECT 2	*City of Laguna Niguel - Irrigation Retrofits (NEED UPDATED PROJECT FORM)*	Key target sites in Laguna Niguel include Crown Valley Park, slopes along Golden Lantern, etc.	$100,000	2012
62	Water Conservation	**REGIONAL ACTION PROJECT 2**	Irrigation Retrofits on Public Systems (Cities/County) (NEED UPDATED PROJECT FORM)	This project would modify existing publicly-owned irrigation systems that use recycled or potable water, to eliminate overspray and runoff adjacent to roads and parking lots. The project would conserve water, and reduce pavement damage as well as discharge of nitrates, phosphates and other pollutants in recycled water.	$3,000,000	2012
63	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements – Glennmeadows Drive*	BMP retrofit improvement project for the street median and parkway including removal of high-water use turf grass, replacement with drought tolerant plant palette, replace irrigation controllers with ET controllers and retrofit irrigation distribution system to provide setbacks and low water emitting/high efficiency heads.	$7,900	
64	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements-Normandale*	BMP retrofit improvement project for the street median and parkways including removal of high-water use turf grass, replacement with drought tolerant plant palette, replace irrigation controllers with ET controllers and retrofit irrigation distribution system to provide setbacks and low water emitting/high efficiency heads.	$12,540	
65	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements – Trabuco Road*	BMP retrofit improvement project for the street median and parkways including removal of high-water use turf grass, replacement with drought tolerant plant palette, replace irrigation controllers with ET controllers and retrofit irrigation distribution system to provide setbacks and low water emitting/high efficiency heads.	$40,300	
66	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements – Summerwood Way*	BMP retrofit improvement project for the street median including removal of high-water use turf grass, replacement with drought tolerant plant palette, replace irrigation controllers with ET controllers and retrofit irrigation distribution system to provide setbacks and low water emitting/high efficiency heads.	$37,260	
67	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Residential Area near San Remo Drive Synthetic Landscape Turf installations*	Conversion of 16 median islands from natural turf to synthetic turf	$815,000	Within 3 months of funding approval

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
68	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements-Rimgate Park*	LID improvements for municipal park that may include construction of construction of curb notches to allow flows into bioswales, infiltration swales, dry creeks. Construct pervious pavement. Install biotreatment units to capture and treat stormwater flows. Install cisterns for capture and reuse. Installation of drought tolerant plant palette, ET controllers, and high-efficient irrigation heads.	$170,000	
69	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements-Ridge Route*	LID improvements for street project including removal of impervious road surface and replacement with pervious median landscaped with drought tolerant plant palette, ET controllers, include, curb notches, bioswales, infiltration swales, and cisterns when reasonable.	$846,000	
70	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Lake Forest - Street LID Improvements – Portola Hills*	Partner with MWDOC to expand a pilot BMP program to provide homeowner incentives for ET irrigation controller retrofits, turf grass/plant pallet switches to low water use plants, and irrigation system upgrades. The purpose of the project is to study BMP implementation and affects on dry weather irrigation runoff reductions, pollutant loading reductions and water use reductions.	$0	
71	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Cabot Road Synthetic Landscape Turf installations*	Remove concrete channel and replace with a bio swale and native plants along with 3 storm treat systems to treat and infiltrate nuisance low flows.	$200,000	Within 3 months of funding approval
72	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - La Paz Road Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 1,800 lf of median island.	$470,000	Within 3 months of funding approval
73	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Moulton Parkway Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.5 mile of median island. (Moulton Pkwy from Laguna Hills Dr to Via Lomas)	$875,000	Within 3 months of funding approval
74	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Moulton Parkway Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 0.5 mile of median island. (Moulton Pkwy from 600' north of Glenwood to Laguna Hills Dr)	$875,000	Within 3 months of funding approval
75	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Oso Parkway Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 1.2 miles of median island.	$2,125,000	Within 3 months of funding approval
76	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Paseo De Valencia Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 1.5 miles of median island.	$2,590,000	Within 3 months of funding approval

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77	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Alicia Parkway Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 3,800 lf of median island.	$825,000	Within 3 months of funding approval
78	Water Conservation	REGIONAL ACTION PROJECT 3	*City of Laguna Hills - Laguna Hills Drive Median Island Rehabilitation*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along 3,800 lf of median island.	$1,230,000	Within 3 months of funding approval
79	Water Conservation	City of Dana Point	PCH/Del Prado right of way improvement low impact development retrofit project	LID techniques include the installation of planter treatment BMPs, efficient irrigation, drought tolerant plants, etc. The project would reduce nuisance runoff and storm runoff and reduce potential for fertilizer pollutants and provide treatment	$19,000,000	
80	Water Conservation	City of Laguna Niguel	*City of Laguna Niguel - Turf grass Replacement at Crown Valley Park and Clipper Cove Park*	This project would replace turf grass with drought-tolerant vegetation and mulch, and modify irrigation at approximately 35,000 square feet of sloped areas within two parks. The areas all drain directly to streets or parking lots. The project would reduce nuisance runoff and storm runoff and reduce potential for fertilizer pollutants. Project is potentially a Regional Action Project including similar projects in other cities; budget is adjustable and could be pro-rated across participating communities.	$100,000	1/1/13
81	Water Conservation	REGIONAL ACTION PROJECT 4	*City of Laguna Niguel - Rainbarrel Rainwater Harvesting Pilot Project*	Project to offer rebates to property owners to install rainwater-harvesting rainbarrels and/or downspout diversions to rain gardens on existing developed property. Harvested water would be usable for landscape irrigation and reduce stormwater runoff impacts. At $300 per rainbarrel (including program marketing/administration), a maximum $3million grant funding would be sufficient for 10,000 55-gal rainbarrels.	$200,000	7/4/05
82	Water Quality	City of Mission Viejo	English Creek Aquatic Restoration Project	Similar projects potentially available in Laguna Niguel and other cities could be funded; at $5/sf for construction, Maximum $3 million grant would create treatment/biofiltration stormwater wetlands totaling approximately 14 acres across all Cities/County.	$2,835,826	
83	Water Quality	REGIONAL ACTION PROJECT 5	*City of Laguna Niguel - Constructed Treatment & Biofiltration Wetlands at Camino del Avion/South Peak Drive*	Camino Del Avion/South Peak Drive Wetland (Salt Creek Watershed): This project would divert stormwater and nuisance runoff from a major arterial roadway (Camino del Avion) and from collector street South Peak Drive into a new one-acre treatment wetland for biofiltration, with flow then discharging to Salt Creek.	$145,000	6/1/14
84	Water Quality	REGIONAL ACTION PROJECT 5	*City of Laguna Niguel - Constructed Treatment & Biofiltration Wetlands at Pooch Park*	Pooch Park Treatment Wetland (Salt Creek Watershed in Laguna Niguel) would construct a 2,500 sq. ft. extended detention basin/treatment wetland to reduce bacteria in rainwater coming from the City's dog park and its parking lot. Project is potentially a Regional Action Project including similar projects in other cities; budget is adjustable and could be pro-rated across participating communities.	$40,000	6/1/14

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Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
85	Water Quality	REGIONAL ACTION PROJECT 5	*City of Laguna Niguel - Constructed Treatment & Biofiltration Wetlands at Chaparossa Park*	This project would divert low-flow and first-flush water from two locations within Chaparossa Park: 1) from the low end of the parking lot and Chaparossa Park Drive, feeding flow into a new 2,500 square riparian wetland area for biofiltration before discharge to Salt Creek; and 2) from the storm drain serving Parc Vista Drive draining the Marina Hills neighborhood, feeding flow into a new 4,000'-long x 10' wide riparian biofiltration channel that will replace an existing concrete trapezoidal drainage ditch alongside the Salt Creek trail/maintenance road. Project is potentially a Regional Action Project including similar projects in other cities; budget is adjustable and could be pro-rated across participating communities.	$350,000	1/1/15
86	Habitat Restoration	**REGIONAL ACTION PROJECT 6**	Arundo Removal at San Juan Creek Watershed	The project consists of control of invasive non-native plants (arundo removal) and restoration of riparian habitat with planting of native species from San Juan Creek Watershed, South Orange County.	$25,000,000	Sep-11
87	Water Supply	Santa Margarita Water District	Ortega Recycled Water Seasonal Storage Reservoir	Construction of a reservoir for seasonal storage of recycled water to serve SMWD, MNWD, Cities of SJC and San Clemente	$35,000,000	5/1/12
88	Water Supply	Santa Margarita Water District (SMWD) [Designated Project Lead between County of Orange, Rancho Mission Viejo, and SMWD]	Ortega Recycled Seasonal Water Storage Reservoir (with appurtenant pumping, pipeline, and treatment facilities)	The Project is to construct a recycled water storage reservoir which will provide seasonal storage for the SMWD existing and proposed recycled water system within the southerly portion of the District. Water supplies will be provided by expansion of the Chiquita Water Reclamation Plant (CWRP) and may be supplemented by other potential non-domestic water supply sources. The proposed Project also includes the water supply facilities required to provide recycled water from the CWRP to the proposed reservoir. These facilities include a pump station at the CWRP and transmission main from the CWRP to the proposed reservoir. The reservoir project is currently included as a "covered activity" in the Southern Subregion Natural Community Conservation Plan/ Master Streambed Alteration Agreement/ Habitat Conservation Plan (NCCP/MSAA/ HCP) and Joint Environmental Impact Report/ Environmental Impact Statement (EIR/EIS).which were approved in late 2006.	$45,000,000	2014/15
89	Water Conservation	SCWD	Water Harvesting on Aliso Creek	Utilizes Mobile Urban Runoff Filtration technology to intercept and treat contaminated urban runoff and produce a high purity recycled water product	$1,200,000	3/1/2011
90	Water Quality	SOCWA	Regional Treatment Plant Fats, Oils & Grease Waste to Energy Project	This project would install a receiving station, mixing and pumping equipment, to take Fats, Oils & Grease (FOG) waste from local restaurant grease interceptors. The FOG would be heated and mixed then co-digested with the existing biosolids waste stream in the facility's anaerobic digesters providing additional biogas that would increase the production of renewable power in the facility's cogeneration plant. The project would also install a biogas treatment process to remove impurities from the biogas and reduce engine air pollutant emissions. This project is described more detail in the section 'Miscellaneous Project Information'.	$4,400,000	7/1/2012

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91	Water Supply	SOCWA	Coastal Treatment Export Sludge System Rehabilitation	The project involves the replacement of two aging sludge export force mains with one new force main and a sludge equalization tank on the Coastal Treatment Plant site. The sludge export force mains convey sludge from the Coastal Treatment Plant to Regional Treatment Plant.	$4,500,000	7/1/2012
92	Water Supply	SOCWA	Coastal Zone Effluent Utilization & Salinity Reduction Study	Along the coastal zone of Southern California there is pressure from a variety of sources to reduce the dependency on imported water, increase all forms of water reuse, reduce the amount of water discharged to the ocean (used once), reduce urban runoff impacts on bathing beach standards exceedances, reduce the GHG emissions associated with excessive water importation. This study would identify the most favorable reuse options for the effluent treated by the coastal zone wastewater treatment plants in South Orange County. Additionally this study would look at the impacts to and contributing sources of salinity in the influent of coastal zone wastewater plants in South Orange County	$100,000	1/1/2011
93	Water Supply	SOCWA	Plant 3A Aeration Upgrade Project	This project would replace one aeration blower and the aeration diffuser system with more energy efficient equipment. See 'Miscellaneous Project Information for a more detail description of this multi-faceted project.	$1,400,000	3/1/2011
94	Water Supply	SOCWA	Aeration System/Cogeneration Upgrade Project	This project would use an alternative energy source, digester gas, to power two 300 kilowatt fuel cells. Energy consumption would be reduced via the installation of high efficiency aeration diffusers and blowers. The utilization of more efficient equipment would create two empty aeration basins that could then be used in a future water recycling project.	$8,220,000	10/1/2011
95	Water Supply	South Coast Water District	Fuel Station (Gas, Diesel & CNG) on District Property	Design, Permit & Construct a Fueling Station (Gas, Diesel & CNG) on District Property at San Juan Creek (Planning). To provide fuel for District Operations during Regular & Emergency Events.	$200,000	1/1/14
96	Water Supply	South Coast Water District	Fuel Station (Gas, Diesel & CNG) on District Property	Design, Permit & Construct a Fueling Station (Gas, Diesel & CNG) on District Property at San Juan Creek (Construction). To provide fuel for District Operations during Regular & Emergency Events.	$2,000,000	1/1/14
97	Water Conservation	South Coast Water District	Water Conservation, Implementation of Targeted Programs	The project will achieve significant reductions in water demand through public education, rebate programs for landscaping and plumbing fixture replacements, increased leak detection activites and increases in staff allocated to implement and carry out these activites.	$750,000	6/1/13
98	Water Quality	South Coast Water District	Tunnel Stabilization & Pipeline Replacement	Tunnel Stabilization & Pipeline Replacement (Planning) This project will repair aging sewer system infrastructure and prevent a major sewer spill to the Pacific Ocean environment.	$50,000,000	6/1/13
99	Water Quality	South Coast Water District	Tunnel Stabilization & Pipeline Replacement	Tunnel Stabilization & Pipeline Replacement (Construction/Acquisition) This project will repair aging sewer system infrastructure and prevent a major sewer spill to the Pacific Ocean environment.	$50,000,000	6/1/13

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
100	Water Supply	South Coast Water District	Solar Energy Panels on District Property	Design, Permit & install Solar Energy Panels on District property to provide renewable energy power source. Power will be utilized at Groundwater Recovery Facility (Construction/Acquisition)	$2,000,000	12/1/14
101	Water Supply	South Coast Water District	Groundwater Recovery Plant Expansion	Increase water supply by utilizing additional resource of brackish water as potable water source (Planning).	$760,000	6/1/13
102	Water Supply	South Coast Water District	Groundwater Recovery Plant Expansion	Increase water supply by utilizing additional resource of brackish water as potable water source (Construction).	$4,432,000	1/1/16
103	Water Supply	South Coast Water District	3rd Well - Groundwater Recovery Facility	Design of potable water production well (Planning).	$737,000	6/1/13
104	Water Supply	South Coast Water District	3rd Well - Groundwater Recovery Facility	Construct potable water production well (Construction).	$2,455,750	6/1/13
105	Water Supply	South Coast Water District	Sentry Well - Groundwater Recovery Facility	Design and construct monitoring well (Planning & Construction).	$406,000	6/1/13
106	Water Supply	South Coast Water District	Replace Lift Station No. 2 and Forcemains, Restore Adjacent Areas of Aliso Creek [In cooperation with the City of Laguna Beach]	Replace Lift Station No. 2 and Forcemain (Planning)	$2,000,000	6/1/13
107	Water Supply	South Coast Water District	Replace Lift Station No. 2 and Forcemains, Restore Adjacent Areas of Aliso Creek [In cooperation with the City of Laguna Beach]	Replace Lift Station No. 2 and Forcemain (Construction)	$15,000,000	6/1/13
108	Water Supply	South Coast Water District	Conversion of Salt Creek Runoff to Recycled Water - Facility Construction [In cooperation with the City of Dana Point]	Engineering, Design, CEQA and Permitting of infrastructure to recycle and reuse up to 1.29 million gallons per day of treated runoff from Dana Point's Salt Creek Ozone Treatment Plant partnering with the City of Dana Point and County of Orange (Planning)	$1,000,000	N/A
109	Water Supply	South Coast Water District	Conversion of Salt Creek Runoff to Recycled Water Facility - [In cooperation with the City of Dana Point]	Construction of infrastructure to recycle and reuse up to 1.29 million gallons per day of treated runoff from Dana Point's Salt Creek Ozone Treatment Plant partnering with the City of Dana Point and County of Orange (Construction)	$6,000,000	N/A
110	Water Supply	South Coast Water District	Sea Terrace Park Reservior for Recycled Water - [In cooperation with the City of Dana Point]	Storage of Recycled Water (Planning & Construction)	$2,500,000	7/1/13

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
111	Water Supply	South Coast Water District	Expand Recycled Water Distribution System - for City of Dana Point and Orange County Harbor	Engineering, Design, CEQA and Permitting for a multiple component project to convert existing potable water irrigation customers to recycled water, expand existing recycled water infrastructure to serve additional customers, implement provisions for exchange of salt-based water softners, and conduct ongoing public education programs to inform our ratepayers about all of the above. (Planning)	$400,000	12/1/15
112	Water Supply	South Coast Water District	Expand Recycled Water Distribution System - for City of Dana Point and Orange County Harbor	Conversion of existing Potable Water irrigation customers to Recycled Water, expansion of existing Recycled Water Infrastructure to serve additional customers, implement provisions for exchange of salt-based water softners and conduct ongoing public education programs. (Construction)	$5,600,000	12/1/15
113	Water Supply	South Coast Water District	Electrical Power Generator for Back-Up at Groundwater Recovery Facility	Specify and procure electrical power generator for back-up power at Groundwater Pumping and Treatment Facility (Planning & Construction)	$500,000	1/1/13
114	Water Supply	South Coast Water District	Solar Energy Panels on District Property	Design, Permit & install Solar Energy Panels on District property to provide renewable energy power source. Power will be utilized at Groundwater Recovery Facility (Planning)	$200,000	12/1/14
115	Water Supply	South Coast Water District	Relocation of Joint Transmission Main (JTM) at Crown Valley	Design, Permit & Relocate (new construction) 2,150 feet of 36" Waterline known as the Joint Transmission Main (JTM) due to age, limited access for maintenance and repair and proximity to structures (Planning)	$576,000	12/1/14
116	Water Supply	South Coast Water District	Relocation of Joint Transmission Main (JTM) at Crown Valley [for the following JTM/JRWSS Projects please list as partners: El Toro WD, IRWD, MNWD, San Juan, San Clemente, SONGS, Camp Pendleton, San Clemente State Park]	Design, Permit & Relocate (new construction) 2,150 feet of 36" Waterline known as the Joint Transmission Main (JTM) due to age, limited access for maintenance and repair and proximity to structures (Construction)	$1,624,000	12/1/14
117	Water Supply	South Coast Water District	Joint Regional Water Supply System (JRWSS) - Stonehill Drive - [for the following JTM/JRWSS Projects please list as partners: El Toro WD, IRWD, MNWD, San Juan, San Clemente, SONGS, Camp Pendleton, San Clemente State Park]	Design, Permit, Relocate (new construction) 1,850 feet of JRWSS JTM 30" Waterline known as the Joint Transmission Main (JTM) due to age, limited access for maintenance and repair and proximity to structures (Planning)	$500,000	12/1/15

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
118	Water Supply	South Coast Water District	Joint Regional Water Supply System (JRWSS) - Stonehill Drive - [for the following JTM/JRWSS Projects please list as partners: El Toro WD, IRWD, MNWD, San Juan, San Clemente, SONGS, Camp Pendleton, San Clemente State Park]	Design, Permit & Relocate (new construction) 1,850 feet of JRWSS JTM 30" Waterline known as the Joint Transmission Main (JTM) due to age, limited access for maintenance and repair and proximitity to structures (Construction)	$5,500,000	12/1/15
119	Water Supply	South Coast Water District	Joint Regional Water Supply System (JRWSS) - Alicia Parkway - [for the following JTM/JRWSS Projects please list as partners: El Toro WD, IRWD, MNWD, San Juan, San Clemente, SONGS, Camp Pendleton, San Clemente State Park]	Phase 1: Design, Permit, Relocate (new construction) 5,914 feet and Phase 2: Design, Permit, Relocate (new construction) 6,624 feet of JRWSS JTM 42" Waterline known as the Joint Transmission Main (JTM) due to location next to and in creek bed susceptible to high scour and erosion and there is limited access for maintenance and repairs (Planning)	$3,504,000	12/1/16
120	Water Supply	South Coast Water District	Joint Regional Water Supply System (JRWSS) - Alicia Parkway - [for the following JTM/JRWSS Projects please list as partners: El Toro WD, IRWD, MNWD, San Juan, San Clemente, SONGS, Camp Pendleton, San Clemente State Park]	Phase 1: Design, Permit, Relocate (new construction) 5,914 feet and Phase 2: Design, Permit, Relocate (new construction) 6,624 feet of JRWSS JTM 42" Waterline known as the Joint Transmission Main (JTM) due to location next to and in creek bed susceptible to high scour and erosion and there is limited access for maintenance and repairs (Construction)	$10,279,000	12/1/16
121	Habitat Restoration	South Orange County Wastewater Authority	Reconstruction of embankments on east and west sides of Aliso and Sulphur Creeks at the confluence of the two creeks	The project includes construction of gabions along the embankments with subsequent fill with rip-rap and soil with revegetation between and above the gabion structures. The project also involves reconstruction of drainage system which collects and directs urban runoff to Sulphur Creek. The area will be reconfigured as a constructed wetland. The modified area will serve as a trailhead for the County of Orange Aliso and Wood Canyon Wilderness Park. The project covers 1000 feet of stream bank (each side) at the confluence of Aliso and Sulphur Creeks directly to the west of Alicia Parkway in Laguna Niguel.	$3,000,000	7/1/15
122	Water Supply	Trabuco Canyon Water District	Bell Trail Urban Water Recovery Project	Construct pump station and pipeline to capture dry season runoff for reuse. Temporary runoff storage will be in existing lake.	$520,000	2011-2012 FY
123	Water Supply	Trabuco Canyon Water District	Joshua Drive Dry Season Runoff Capture and Collection System (Joshua Drive Urban Water Recovery Project) Urban Water Recovery Project	Construct pump station and pipeline to capture dry season runoff for reuse. Temporary runoff storage will be in existing lake.	$520,000	2011-2012 FY

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
124	Water Quality	Trout Unlimited (NGO)	Trabuco Creek Fishway at I-5 and Camino Capistrano	This project entails construction of a step pool steelhead migration channel (fishway) to bypass a major fish barrier on Trabuco Creek, a high priority watershed in Orange County. The barrier exists at a public road under-crossing (culvert), containing a steep, concrete spillway. The project involves modifying the existing concrete channel above and below the I-5 Northbound Bridge and the Camino Capistrano Bridge, including reshaping the existing mid-channel bar weir and constructing a structural concrete fish ladder composed of a series of 24 pools separated by vortex weirs.	$2,740,000	7/1/2011
125	Water Conservation		*City of Mission Viejo - Los Alisos Boulevard Runoff Prevention and Water Conservation Project*	Los Alisos Blvd is the principal west-east arterial highway servicing Lake Forest, Mission Viejo, and unincorporated Orange County. The portion of the highway between Jeronimo Road and Marguerite Parkway has approximately 3.9 acres of median islands planted exclusively in turf consuming approximately 15 AF per year. Additionally, many of the hillsides adjoining the highway lack mature landscaping leading to erosion problems during rainstorms, while few areas have high water use slope coverings. The median conversion portion of the project is expected to save 12 AF per year of water by completely removing the existing turf grass in the median and installing a palate of native, drought-tolerant vegetation and ET controllers. Irrigation runoff will be prevented through the use of laser drip irrigation systems rather than traditional rotating or spray nozzles. Urban runoff quality will be improved by reducing the application of nutrient-rich fertilizers	$1,175,000	6/30/13
126	Water Conservation		*City of Laguna Woods - El Toro Road and Moulton Pkwy - West Median 2*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along West Median 2 - El Toro Road Landscape Retrofit	$116,150	7/1/13
127	Water Conservation		*City of Laguna Woods - El Toro Road and Moulton Pkwy - West Median 1*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along West Median 1 - El Toro Road Landscape Retrofit	$179,400	7/1/13
128	Water Conservation		*City of Laguna Woods - Moulton Pkwy - South Median 1*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along South Median 1 - Moulton Pkwy Median Improvements	$153,700	7/1/13
129	Water Conservation		*City of Laguna Woods - Moulton Pkwy - South Median 2*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along South Median 2 - Moulton Pkwy Median Improvements	$385,020	7/1/13

South Orange County WMA
Priority Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Construction
130	Water Conservation		*City of Laguna Woods - Moulton Pkwy - South Median 3*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along South Median 3 - Moulton Pkwy Median Improvements	$291,900	7/1/13
131	Water Conservation		*City of Laguna Woods - Moulton Pkwy - Median 1*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along Median 1 - Santa Maria Avenue Median Improvements	$152,610	7/1/13
132	Water Conservation		*City of Laguna Woods - Moulton Pkwy - Median 2*	Replacement of turf with low water use / drought tolerant landscaping to reduce water consumption and urban runoff along Median 2 - Santa Maria Avenue Median Improvements	$371,560	7/1/13
133	Water Conservation		*City of Laguna Niguel - Turfgrass Replacement in Crown Valley Community Park*	The project would remove 3.4 acres of turfgrass in Crown Valley Valley Community Park, replacing turf with 0.4 acres of permeable pavements, and 3 acres of drought tolerant plants and/or inert groundcoverings with associated low-precipitation-rate irrigation system changes. The change would reduce water use by 6.1 acre-feet per year.	$700,000	3/1/14
134	Habitat Restoration		*Audubon Starr Ranch Sanctuary*	Hedera helix, Olea europea, and Washingtonia robusta. The statewide-recognized, landscape scale (upland and riparian) Starr Ranch land management projects have been active since 1999. Riparian invasive control and restoration is done by two seasonal interns, Weed Warrior volunteers, and a crew of at risk young adults of the OC Conservation Corps. Staff biologists train volunteers to assist with wildlife and stream water quality monitoring for aquatic invertebrates and vertebrates, perennial pools, and songbirds. Land management research is integrated into education programs for kids and adults, including programs such as Stream Biosurvey, Stream Water Chemistry, and Ecology of Bell Creek. These programs offer a hands-on experience in wildlife and habitat research.	$275,000	
135	Water Quality	City of Dana Point	Microbial Source Tracking Study Investigations- San Juan Creek	Microbial Source Tracking & Research Study(ies) (Planning)	$400,000	2 months from funding
136	Water Supply	City of Aliso Viejo	Dairy Fork	Constructred wetland for improving quality of urban runoff for Dairy Fork Subwatershed	$716,500	6/15/14
137	Water Supply	City of Laguna Niguel	Flood Management and Habitat Improvement, Recycled-Water Conversion, and Turfgrass Replacement at Crown Valley Community Park	Correct creek flooding problems, enhance habitat, convert from potable to recycled waterm and replace turfgrass with low impact design in Crown Valley Community Park.	$1,200,000	
				Total New Projects	$770,818,687	

South Orange County WMA
Funded Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Funding
1	Habitat Restoration	Audubon Starr Ranch	Riparian Invasion Control, Restoration, Monitoring, and Education Project		$275,456.00	Prop 84, Round 2 application
1	Water Quality	City of Laguna Beach	Laguna Main Beach Ocean Protection Project	Rebuild oceanfront sewer lift station and aging sewer lines. Part of Laguna Beach Urban Runoff Diversion Program.	$ 2,400,000	Prop 84 ASBS/2010 Clean beaches initiative.
2	Water Quality	City of Laguna Beach	Rockledge Ocean Protection Project	Rebuild clifftop/oceanfront sewer lift station and aging sewer.	$ 900,000	Prop 84 Round 1
3	Water Quality	City of Laguna Beach	Heisler Park Marine Habitat Protection		$ 799,680	Prop 50, Implementation
4	Water Supply	City of San Clemente	Recycled Water Treatment and Distribution		$ 5,597,760	Prop 50, Implementation
5	Water Supply, Water Quality, Water Use Efficiency, Operational Flexibility, Stewardship of Land & Natural Resources	City of San Juan Capistrano	San Juan Capistrano Recycled Water Transmission System Improvements	Construction of recycled water transmission mains and recycled water reservoir to improve the City of San Juan Capistrano's recycled water system. The City currently has an existing system which serves Zones 425N and 350C and is supplied by Non-Domestic Wells. This project proposes improvements which will serve Zone 420S and Zone 250C, the largest and most demanding areas for recycled water in the City of San Juan Capistrano. The use of recycled and local non-domestic water will reduce demand on domestic water and reduce the overall cost of service to the City's customers.	$ 20,843,000	Prop 50, Implementation
6	Habitat Restoration	County of Orange	Aliso Creek Environmental Restoration		$ 1,704,860	Prop 50, Implementation
7	Water Supply	El Toro Water District	Recycled Water Distribution System Expansion		$ 4,410,000	Prop 50, Implementation
	Water Conservation	Irvine Ranch Water District	Baker Water Treatment Plant		$78,500,000.00	Prop 84 Round 2 application
	Water Conservation	Municipal Water District of Orange County	Comprehensive Landscape Water Use Efficiency Program		$1,660,817.00	Prop 84 Round 2 application
8	Water Conservation	Municipal Water District of Orange County	South Orange County Water Smart Landscape Project	The program will encourage the removal of 10.3 acres of non-functional turf replaced with California Friendly landscape; the upgrade of 1,500 antiquated irrigation timers to smart water application irrigation controllers (smart timers); and the conversion of 50,000 high-volume conventional spray irrigation heads to low-precipitation-rate irrigation equipment (rotating nozzles and drip).	$ 1,774,329	Prop 84 Round 1

South Orange County WMA
Funded Project List

Number	Water Management Strategy	Implementing Agency	Project Title	Project Description	Total Project Cost	Funding
9	Water Conservation	Municipal Water District of Orange County	Water Use Efficiency Program Expansion	The program will expand the removal of 10.3 acres of non-functional turf replaced with California Friendly landscape; the upgrade of 1,500 antiquated irrigation timers to smart water application irrigation controllers (smart timers); and the conversion of 50,000 high-volume conventional spray irrigation heads to low-precipitation-rate irrigation equipment (rotating nozzles and drip).	$ 1,274,000	Prop 50, Implementation
10	Flood Management	Orange County Flood Control District	San Juan Creek Channel (Facility No. L01) from 2100-ft upstream to 6100-ft upstream Stonehill Drive (left side) Phase 1		$ 5,000,000	Prop 84 Local Levee urgent Repair Grant (LLUR)
11	Water Supply	Santa Margarita Water District (SMWD) [Designated Project Lead between County of Orange, Rancho Mission Viejo, and SMWD]	Gobernadora Multi-Purpose Basin	The Project includes facilities for water quality, drainage peak flow retarding, Regional Riding and Hiking Trail, and non-potable water extraction/recycling and the ultimate size is a 35 acre basin.	$ 13,925,000	Prop 50 Round 1, & Prop 1E
12	Water Quality	SOCWA	Salt & Nutrient Management Planning Study	This project will develop a salt management for the groundwater in the South Orange County Wastewater Authority service area, a service area of about 550 sq miles including the San Juan & Aliso Creek Water Basins. Center of service approximately 3 34.771' -11 40.329'	$ 200,000	Prop 84
12	Water Conservation	South Coast Water District	Targeted Water Conservation Program		$ 613,000	Prop 84, Round 2 application
13	Water Supply	South Coast Water District	Aliso Creek Urban Runoff Recovery, Reuse, and Conservation		$ 490,000	Prop 50, Implementation
14	Water Quality	South Orange County Wastewater Authority	Coastal Treatment Plant Export Sludge System		$ 2,824,700	Prop 50, Implementation
15	Water Quality	Trabuco Canyon Water District	Shadow Rock Detention Basin Dry Season Runoff Capture and Collection System (Shadow Rock Detention Basin Urban Water Recovery Project)	Construct pump station and modify existing detention basin to capture dry season runoff for reuse	$ 603,400	Prop 84, Round 1

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OC Watersheds

Project Evaluation Summary

STAKEHOLDER VETTED SCORES

PROJECT TITLE	FM SCORE	WQ SCORE	WS SCORE	WC SCORE	NR SCORE	Implementing Agency	Grant Funding Request	TOTAL POINTS	Match %	$ per Acre/AF
Comprehensive Landscape Water Use Efficiency Program	54.40	191.25	242.09	105.82	158.07	MWDOC	$708,625	751.63	60%	$200.00
Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary	92.48	172.80	58.05	90.28	121.44	Audubon Starr Ranch Sanctuary	$229,500	535.05	17%	$2204/Acre
English Creek Aquatic Habitat Restoration Project	69.36	151.65	34.83	0.00	126.39	Mission Viejo	$2,126,870	382.23	25%	$53,506.00
San Juan Creek Storm Drain LO1SO2 BMPs	43.52	153.00	46.44	0.00	123.09	City of Dana Point	$385,000	366.05		
Conversion of Salt Creek Runoff to Recycled Water Facility-Construction	0.00	191.25	75.25	0.00	90.75	South Coast Water District/City of Dana Point	$3,000,000	357.25	50%	
Coastal Zone Effluent Utilization and Salinity Reduction Study	0.00	0.00	283.80	0.00	40.92	SOCWA	$50,000	324.72	50%	
Embankment Reconstruction Aliso and Sulphur Creek Confluence	104.72	92.25	0.00	0.00	107.25	SOCWA	$1,500,000	304.22	50%	
Conversion of Salt Creek Runoff to Recycled Water Facility-Planning	0.00	151.65	60.20	0.00	90.75	South Coast Water District/City of Dana Point	$500,000	302.60	50%	
Water Conservation, Implementation of Targeted Programs	0.00	59.40	0.00	161.69	70.29	South Coast Water District	$375,000	291.38	50%	
Rainbarrel Rebate Pilot Project	44.88	114.75	30.10	48.84	49.83	Laguna Niguel (recommend MWDOC)	$150,000	288.40	0%	$10,000/ac
Oso Creek Multi-Use Trails	46.24	76.50	26.66	36.26	97.35	City of Laguna Niguel	$1,200,000	283.01	60% of $2M	$226,415/acre
Replacement Lift Station No. 2 & Forcemains, Restore Adjacent Areas of Aliso Creek-Construction	36.72	79.20	0.00	0.00	166.65	South Coast Water District	$7,500,000	282.57	50%	
Replacement Lift Station No. 2 & Forcemains, Restore Adjacent Areas of Aliso Creek-Planning	36.72	79.20	0.00	0.00	166.65	South Coast Water District	$500,000	282.57	50%	
Aliso Creek Urban Runoff Capture and Reuse	82.96	131.85	0.00	0.00	60.06	City of Aliso Viejo	$3,375,000	274.87		
DRPP - Marguerite Parkway Runoff Prevention and Water Conservation Project	0.00	131.85	31.82	22.20	71.61	City of Mission Viejo	$1,875,000	257.48	25%	$75,000/acre
DRPP - Los Alisos Boulevard Runoff Prevention and Water Conservation Project	0.00	131.85	31.82	22.20	71.61	City of Mission Viejo	$881,250	257.48	25%	$301,282/acre
DRPP - Trabuco Road Runoff Prevention and Water Conservation Project	0.00	131.85	31.82	22.20	71.61	City of Mission Viejo	$401,250	257.48	25%	$89,166/acre
Chapparosa Park Wetland	32.64	114.75	0.00	22.20	76.89	City of Laguna Niguel	$175,000	246.48	0%	$3,365/acre

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Project Evaluation Summary

STAKEHOLDER VETTED SCORES

PROJECT TITLE	FM SCORE	WQ SCORE	WS SCORE	WC SCORE	NR SCORE	Implementing Agency	Grant Funding Request	TOTAL POINTS	Match %	$ per Acre/AF
Expand Recycled Water Distribution System-Construction	0.00	0.00	120.40	75.48	39.60	South Coast Water District	$2,800,000	235.48	50%	
Expand Recycled Water Distribution System-Planning	0.00	0.00	120.40	75.48	39.60	South Coast Water District	$200,000	235.48	50%	
Dairy Fork Constructed Wetland	36.72	191.25	0.00	0.00	0.00	Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	$125,000	227.97		
Tunnel Stabilization & Pipeline Replacement	0.00	92.25	0.00	0.00	117.15	South Coast Water District	$25,000,000	209.40	50%	
Street LID Improvements – Trabuco Road	0.00	151.65	0.00	44.40	10.23	City of Lake Forest	$28,210	206.28		
Street LID Improvements – Summerwood Way	0.00	151.65	0.00	44.40	10.23	City of Lake Forest	$26,082	206.28		
Baker Water Treatment Plant	0.00	76.50	79.55	33.67	10.23	Irvine Ranch Water District	$500,000	199.95		
Moulton Parkway South Median 2 Landscape Retrofit	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$192,510	191.25		
Santa Maria Median 2	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$185,780	191.25		
Moulton Parkway South Median 3 Landscape Retrofit	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$145,950	191.25		
El Toro Road - West Median 1 Landscape Retrofit	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$89,700	191.25		
Moulton Parkway South Median 1 Landscape Retrofit	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$76,850	191.25		
Santa Maria Median 1	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$76,305	191.25		
El Toro Road - West Median 2 Landscape Retrofit	0.00	151.65	0.00	0.00	39.60	City of Laguna Woods	$58,075	191.25		
Turf Replacement at Crown Valley Community Park	21.76	76.50	30.10	22.20	40.26	City of Laguna Niguel	$420,000	190.82	40%	$123,529/acre
Coastal Treatment Plant Export Sludge Rehabilitation	0.00	92.25	0.00	0.00	80.85	SOCWA		173.10		
Trabuco Creek Channel (L02) Phase 7, 300-feet upstream the Confluence with L01 to 300 feet upstream Del Obispo Street	93.84	0.00	75.25	0.00	0.00	Orange County Flood Control District	$6,875,000	169.09		
AV Ranch Landscape Improvement	0.00	92.25	75.25	0.00	0.00	City of Aliso Viejo		167.50		
Relocation of Joint Transmission Main (JTM) 30" Waterline-Construction	0.00	0.00	150.50	0.00	0.00	JRWSS	$5,139,500	150.50	50%	
Relocation of Joint Transmission Main (JTM) 30" Waterline-Construction	0.00	0.00	150.50	0.00	0.00	JRWSS	$2,750,000	150.50	50%	
Relocation of Joint Transmission Main (JTM) 30" Waterline-Planning	0.00	0.00	150.50	0.00	0.00	JRWSS	$1,752,000	150.50	50%	
Relocation of Joint Transmission Main (JTM) 36" Waterline-Construction	0.00	0.00	150.50	0.00	0.00	JRWSS	$812,000	150.50	50%	

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OC Watersheds

Project Evaluation Summary

STAKEHOLDER VETTED SCORES

PROJECT TITLE	FM SCORE	WQ SCORE	WS SCORE	WC SCORE	NR SCORE	Implementing Agency	Grant Funding Request	TOTAL POINTS	Match %	$ per Acre/AF
Relocation of Joint Transmission Main (JTM) 36" Waterline-Planning	0.00	0.00	150.50	0.00	0.00	JRWSS	$288,000	150.50	50%	
Relocation of Joint Transmission Main (JTM) 30" Waterline-Planning	0.00	0.00	150.50	0.00	0.00	JRWSS	$250,000	150.50	50%	
Sea Terrace Park Reservoir for Recycled Water	0.00	0.00	150.50	0.00	0.00	South Coast Water District/City of Dana Point	$1,250,000	150.50	50%	
Turfgrass Replacement & Irrigation Retrofits in Crown Valley Parkway Median	0.00	76.50	30.10	22.20	20.46	City of Laguna Niguel	$500,000	149.26	65%	$111,111/ac or $$71,423/ac-ft
OC Coastkeeper (No Name Provided)	0.00	114.75	0.00	0.00	30.69	OC Coastkeeper		145.44	none	$2,000.00
Street LID Impovements – Ridge Route Drive	0.00	76.50	0.00	22.20	20.46	City of Lake Forest	$637,500	119.16		
Street LID Improvements – Gowdy Drive	0.00	76.50	0.00	22.20	20.46	City of Lake Forest	$337,500	119.16		
Solar Energy Panels on District Property-Construction	0.00	0.00	58.05	0.00	51.15	South Coast Water District	$1,000,000	109.20	50%	
Solar Energy Panels on District Property-Planning	0.00	0.00	58.05	0.00	51.15	South Coast Water District	$100,000	109.20	50%	
LID Improvements – Rimgate Park Rehabilitation	12.24	92.25	0.00	0.00	0.00	City of Lake Forest	$127,500	104.49		
Salt Creek Habitat Restoration	46.24	0.00	0.00	0.00	29.70	City of Laguna Niguel	$1,600,000	75.94	0%	$1.6M/51.9 acres = $30,828
Groundwater Recovery Plant Expansion-Construction	0.00	0.00	58.05	0.00	0.00	South Coast Water District	$2,216,000	58.05	50%	
3rd Well - Groundwater Recovery Facility-Construction	0.00	0.00	58.05	0.00	0.00	South Coast Water District	$1,227,875	58.05	50%	
Groundwater Recovery Plant Expansion-Planning	0.00	0.00	58.05	0.00	0.00	South Coast Water District	$380,000	58.05	50%	
3rd Well - Groundwater Recovery Facility-Planning	0.00	0.00	58.05	0.00	0.00	South Coast Water District	$368,500	58.05	50%	
Sentry Well - Groundwater Recovery Facility	0.00	0.00	58.05	0.00	0.00	South Coast Water District	$203,000	58.05	50%	
Electrical Power Generator for Backup at Groundwater Recovery Facility	0.00	0.00	58.05	0.00	0.00	South Coast Water District	$250,000	58.05	50%	
Aeration/Cogeneration Upgrade	0.00	0.00	0.00	0.00	51.15	SOCWA		51.15		
Regional Treatment Plant Fats, Oils and Grease Waste To Energy Project	0.00	0.00	0.00	0.00	51.15	SOCWA		51.15		

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Evaluation Weighting

Goals	Objectives	Weight
Integrate Flood Management		3.4
	FR-1-Enhance Flood protection for public safety and property	3.6
	FR-2-Implement economically and technically feasible multiple uses for flood control facilities	3.2
Improve Water Quality		4.5
	WQ-1-Comply with Clean Water Act and Porter-Cologne	4.4
	WQ-2-Protect beneficial uses of receiving waters	4.1
Increase Water Supply and Reliability		4.3
	WS-1-Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	2.7
	WS-2-Develop and manage groundwater supplies inSouth Orange County10,800 AF by 2020	3.5
	WS-3-Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	3.5
	WS-4-Increase capture and utilization of urban runoff for irrigation purposes	3.5
	WS-5-Produce 15 MGD of ocean water desalination	3
	WS-6-Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	3.5
	WS-7-Manage and improve the supplies available to South Orange County for the collective benefit of the area	3.7
Promote Water Conservation		3.7
	WC-1 -Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	3
	WC-2-Reduce region wide landscape irrigation consumption to an ETAF	3.8
	WC-3-Maximize Efficiency of Utility Based Operations	3.1
	WC-4-Promote use of low impact design for new and existing developments	3.4
Protect Natural Resources		3.3
	NR-1-Enhance the functioning of regional aquatic ecosystems	3.1
	NR-2-Reduce impacts	4
	NR-3-Eradicate invasive species throughout the watershed	3
	NR-4-Minimize impacts to air, energy, land, materials and habitat resources	3.1
Management Goals		2.9
	MG-1-AddressStatewide Priorities	2.8
	MG-2-Develop Data Management System and Promote NecessaryResearch and Analysis	2.3
	MG-3-Comply with all regulatory requirements	3.5
	MG-4-Includes multiple partners and/or serves multiple beneficiaries	3.2
	MG-5-Develop and implement public education programs	2.6
	MG-6-ConsiderProject Readiness	3.1

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Project Evaluation Summary

PROJECT TITLE	FM SCORE	WQ SCORE	WS SCORE	WC SCORE	NR SCORE	Implementing Agency	Grant Funding Request	TOTAL POINTS	Match %	$ per Acre/AF
PROJECT TITLE	ORIGINAL SELF SCORES / RESULTS									
Comprehensive Landscape Water Use Efficiency Program	54.40	191.25	242.09	105.82	158.07	MWDOC	$708,625	751.63	60%	$200/AC
Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary	92.48	172.80	58.05	90.28	121.44	Audubon Starr Ranch Sanctuary	$229,500	535.05	17%	$2,204/AC
San Juan Creek Storm Drain LO1SO2 BMPs	43.52	153.00	46.44	0.00	123.09	City of Dana Point	$577,500	366.05	25%	$4,053/AF, $1,075/AC
Water Conservation, Implementation of Targeted Programs	0.00	59.40	0.00	161.69	70.29	South Coast Water District	$375,000	291.38	50%	$1,943/AF
Oso Creek Multi-Use Trails	46.24	76.50	26.66	36.26	97.35	City of Laguna Niguel	$1,200,000	283.01	40%	$226,415/AC
Dairy Fork Constructed Wetland	36.72	191.25	0.00	0.00	0.00	Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	$125,000	227.97	75%	$83/AC, $343/AF
Baker Water Treatment Plant	0.00	76.50	79.55	33.67	10.23	Irvine Ranch Water District	$500,000	199.95	99%	$16/AF
PROJECT TITLE	STAKEHOLDER UPDATED SCORES / RESULTS									
Comprehensive Landscape Water Use Efficiency Program	0.00	191.25	103.20	155.03	168.30	Municipal Water District of Orange County	$708,625	617.78	60%	$200/AC
Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary	80.92	171.45	120.40	45.88	174.24	Audubon Starr Ranch Sanctuary	$229,500	592.89	17%	$2,204/AC
Dairy Fork Constructed Wetland	24.48	191.25	45.15	14.06	136.95	Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	$125,000	411.89	75%	$83/AC, $343/AF
Baker Water Treatment Plant	0.00	38.25	288.10	28.12	40.92	Irvine Ranch Water District	$500,000	395.39	99%	$16/AF
Water Conservation, Implementation of Targeted Programs	0.00	76.50	0.00	149.11	70.29	South Coast Water District	$375,000	295.90	50%	$1,943/AF
San Juan Creek Storm Drain LO1SO2 BMPs	0.00	153.00	30.10	0.00	100.32	City of Dana Point	$577,500	283.42	25%	$4,053/AF, $1,075/AC
Oso Creek Multi-Use Trails	21.76	76.50	45.15	39.22	76.89	City of Laguna Niguel	$1,200,000	259.52	40%	$226,415/AC
PROJECT TITLE	AD-HOC UPDATED SCORES / RESULTS									
Comprehensive Landscape Water Use Efficiency Program	0.00	191.25	46.44	155.03	168.30	Municipal Water District of Orange County	$708,625	561.02	60%	$200/AC
Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary	62.56	171.45	15.05	45.88	174.24	Audubon Starr Ranch Sanctuary	$229,500	469.18	17%	$2,204/AC
Dairy Fork Constructed Wetland	24.48	191.25	45.15	7.03	136.95	Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	$125,000	404.86	75%	$343/AF, $83/AC
Baker Water Treatment Plant	0.00	38.25	288.10	7.03	40.92	Irvine Ranch Water District	$500,000	374.30	99%	$16/AF
San Juan Creek Storm Drain LO1SO2 BMPs	0.00	153.00	30.10	0.00	100.32	City of Dana Point	$385,000	283.42	25%	$4,053/AF, $1,075/AC
Water Conservation, Implementation of Targeted Programs	0.00	76.50	0.00	95.83	70.29	South Coast Water District	$375,000	242.62	50%	$1,943/AF
Oso Creek Multi-Use Trails	21.76	76.50	45.15	19.61	76.89	City of Laguna Niguel	$1,200,000	239.91	40%	$226,415/AC

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Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date	Latitude	Longitude
Comprehensive Landscape Water Use Efficiency Program	Municipal Water District of Orange County	Permits Anticipated By: CEQA Exempt	Throughout WMA	Throughout WMA

Grant Funding Request	Match Funds Secured?	Funding Source	CEQA	TOTAL POINTS
$708,625	☑ YES ☐ NO If "No", Explain:	MWDOC& Metropolitan	☐ YES ☑ NO If "No", When? Upon award	**561.02**

	Score	Value	Units
Integrate Flood Management	0.00		
FR-1 - Enhance Flood protection for public safety and property	0.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity			Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems			Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection			Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020			Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection			Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas			Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use			Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows			Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture			Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels	2	255	Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	0.00		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection			Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection	0	1019	Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection	0	1019	Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection	0	1019	Acres Enhancement Opportunity
Strategy: FR-2-S5-Convert hardened ditches and channels to soft bottoms (where feasible)			Acres of Soft Bottom Created
Improve Water Quality	191.25		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	5.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020	5	1019	Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030	5	1019	Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit	5	Yes	YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards	0	Yes	YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4			Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading			Acres Affected
Strategy: WQ-1-S9-Implement LID measures			Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading			Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow	5	1019	Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents			Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters			Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	5.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020	5	1019	Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030			YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020	0	4442	Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters	0	1019	Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development	5	1019	Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	5	1019	Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	5	1019	Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	0	4442	Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts			Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures			Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures			Acres Affected
Increase Water Supply and Reliability	46.44		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	4.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water	4	Yes	YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region	4	Yes	YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies	4	Yes	YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply	4	Yes	YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding	4	Yes	YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability	4	Yes	YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"			YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"	4	Yes	YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	0.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water			Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges			Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas			Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015			Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources	0	888	Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)			Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination			YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management			Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	0.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity			Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans			Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions			YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment			Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	0.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects			Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems	0	Yes	YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping			Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding			YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements			YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton			YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	0.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030	0	Yes	YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects			YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability			YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	0.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency			Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities			YES/NO
Promote Water Use Efficiency	155.03		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	0.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes			YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers			YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions			YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers			YES/NO
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	5.00		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	5	5883	Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	4	605	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	4	2445	Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	3	Yes	Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers	3	Yes	Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume			Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	3.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures			Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years			YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers	3		YES/NO
WC-4 - Promote use of low impact design for new and existing developments	4.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	4	102	Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020			Acres Impacted
Protect Natural Resources	168.30		
NR-1 - Enhance the functioning of regional aquatic ecosystems	5.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	5	1019	Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's	0	1019	Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems			Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns	0	1019	Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health			Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	5.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	5	4442	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows	0	4442	Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from	5	1019	Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible			Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030			YES/NO
NR-3 - Eradicate invasive species throughout the watershed	0.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030			Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible			Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use			Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	5.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible			Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies	5	Yes	YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030			YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair			YES/NO
Strategy: NR-4-S5-Reduce carbon footprint			Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation	5		YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
	$200/AC	60%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

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OC Watersheds

Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date		Latitude	Longitude
Riparian Invasive Control, Restoration, Monitoring, and Education at Audubon Starr Ranch Sanctuary	Audubon Starr Ranch Sanctuary	Permits Anticipated By:	N/A	33°37'	117°33'

Grant Funding Request	Match Funds Secured?		Funding Source	CEQA			TOTAL POINTS
$229,500	☑ YES ☐ NO	If "No", Explain:	So.CA Wetlands Restoration Project, Gimbel Fund	☐ YES ☐ NO	If "No", When?	N/A	**469.18**

	Score	Value	Units
Integrate Flood Management	62.56		
FR-1 - Enhance Flood protection for public safety and property	2.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity	0		Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems	0		Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection	0		Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020	0		Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection	2	125	Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas	2	125	Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use	0		Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows	0		Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture	0		Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels	0	125	Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	3.50		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection	0		Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection	0	125	Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection	0	125	Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection	3.5	125	Acres Enhancement Opportunity
Strategy: FR-2-S5-Convert hardened ditches and channels to soft bottoms (where feasible)	0		Acres of Soft Bottom Created
Improve Water Quality	171.45		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	4.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020	0		Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030	0		Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit	0		YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards	0		YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4	0		Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4	0		Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4	0		Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading	0		Acres Affected
Strategy: WQ-1-S9-Implement LID measures	0		Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading	4	125	Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow	4	125	Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents	4	125	Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4	0		Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters	0		Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	5.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020	0		Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030	0		YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020	0		Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters	0		Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development	0		Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	4	125	Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	4	125	Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	5		Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts	4	125	Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures	0		Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures	0		Acres Affected
Increase Water Supply and Reliability	15.05		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	0.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water	0		YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region	0		YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies	0		YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply	0		YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding	0		YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability	0		YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"	0		YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"	0		YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	1.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water	0		Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges	0		Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas	0		Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015	0		Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources	0		Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)	1	125	Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination	0		YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management	0		Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	0.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity	0		Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans	0		Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions	0		YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment	0		Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	0.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects	0		Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems	0	125	YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping	0		Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding	0		YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements	0		YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton	0		YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	0.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030	0		YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects	0		YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability	0		YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	0.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency	0		Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities	0		YES/NO
Promote Water Use Efficiency	45.88		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	0.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes	0		YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers	0		YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions	0		YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers	0		YES/NO
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	0.00		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	0		Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	0	125	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	0		Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	0		Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers	0		Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume	0		Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	4.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards	0		Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures	0		Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards	0		Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years	0		YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers	4	YES	YES/NO
WC-4 - Promote use of low impact design for new and existing developments	0.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	0		Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020	0		Acres Impacted
Protect Natural Resources	174.24		
NR-1 - Enhance the functioning of regional aquatic ecosystems	4.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	0		Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's	4	125	Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems	0		Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns	0		Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health	0		Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	4.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	0		Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows	0		Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from	4	125 +	Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible	0		Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030	0		YES/NO
NR-3 - Eradicate invasive species throughout the watershed	4.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030	4	125	Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible	4	125	Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use	4	125	Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	4.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible	0		Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies	4	YES	YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030	0		YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair	0		YES/NO
Strategy: NR-4-S5-Reduce carbon footprint	0	125	Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation	0		YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

4000 acre nature preserve in southeast Orange County in foothills of Santa Ana Mountains and east of Dove Canyon and Coto de Caza developments

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
	$2,204/AC	17%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

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OC Watersheds

Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date	Latitude	Longitude
Dairy Fork Constructed Wetland	Cities of Aliso Viejo, Lake Forest, Laguna Hill and Laguna Woods	Permits Anticipated By: 1/1/2013	33.58996	-117.71345

Grant Funding Request	Match Funds Secured?		Funding Source	CEQA			TOTAL POINTS
$125,000	☑ YES ☐ NO	If "No", Explain:	OCTA and General Fund	☐ YES	☑ NO	If "No", When? 1/1/2013	**404.86**

	Score	Value	Units
Integrate Flood Management	24.48		
FR-1 - Enhance Flood protection for public safety and property	2.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity	0		Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems	0		Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection	0		Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020	0		Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection	2		Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas	2		Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use	0		Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows	0		Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture	0		Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels	0		Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	0.00		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection	0		Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection	0		Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection	0		Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection	0		Acres Enhancement Opportunity
Strategy: FR-2-S5-Convert hardened ditches and channels to soft bottoms (where feasible)	0		Acres of Soft Bottom Created
Improve Water Quality	191.25		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	5.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020	5		Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030	0		Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit	5		YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards	5		YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4	0		Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4	0		Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4	0		Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading	0		Acres Affected
Strategy: WQ-1-S9-Implement LID measures	0		Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading	0		Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow	0		Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents	0		Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4	0		Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters	0		Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	5.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020	5		Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030	0		YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020	0		Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters	0		Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development	0		Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	0		Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	0		Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	0		Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts	0		Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures	0		Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures	0		Acres Affected
Increase Water Supply and Reliability	45.15		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	0.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water	0		YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region	0		YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies	0		YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply	0		YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding	0		YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability	0		YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"	0		YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"	0		YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	0.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water	0		Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges	0		Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas	0		Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015	0		Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources	0		Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)	0		Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination	0		YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management	0		Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	3.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity	0		Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans	3	<300	Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions	0		YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment	0		Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	0.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects	0		Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems	0		YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping	0		Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding	0		YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements	0		YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton	0		YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	0.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030			YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects			YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability			YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	0.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency	0		Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities	0		YES/NO
Promote Water Use Efficiency	7.03		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	0.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes	0		YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers	0		YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions	0		YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers	0		YES/NO
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	0.50		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	0.5	1.25	Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	0.5	1	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	0		Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	0		Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers	0		Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume	0		Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	0.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards	0		Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures	0		Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards	0		Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years	0		YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers			YES/NO
WC-4 - Promote use of low impact design for new and existing developments	0.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	0		Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020	0		Acres Impacted
Protect Natural Resources	136.95		
NR-1 - Enhance the functioning of regional aquatic ecosystems	5.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	5	1500	Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's	0		Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems	0		Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns	0		Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health	0		Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	5.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	5	1500	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows	0		Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from	0		Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible	0		Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030	0		YES/NO
NR-3 - Eradicate invasive species throughout the watershed	2.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030	0		Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible	2	1.5	Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use	0		Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	0.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible	0		Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies	0		YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030	0		YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair	0		YES/NO
Strategy: NR-4-S5-Reduce carbon footprint	0		Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation	0		YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
$343/AF	$83/AC	75%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

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OC Watersheds

Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date	Latitude	Longitude
Baker Water Treatment Plant	Irvine Ranch Water District	Permits Anticipated By:		

Grant Funding Request	Match Funds Secured?		Funding Source	CEQA		TOTAL POINTS
$500,000	☑ YES ☐ NO	If "No", Explain:	Partnerships	☑ YES ☐ NO	If "No", When?	**374.30**

	Score	Value	Units
Integrate Flood Management	0.00		
FR-1 - Enhance Flood protection for public safety and property	0.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity			Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems			Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection			Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020			Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection			Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas			Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use			Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows			Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture			Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels			Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	0.00		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection			Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection			Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection			Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection			Acres Enhancement Opportunity
Strategy: FR-2-S6-Convert hardened ditches and channels to soft bottoms (where feasible)			Acres of Soft Bottom Created
Improve Water Quality	38.25		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	1.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020			Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030			Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit		Yes	YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards		Yes	YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4	1	2	Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4	1	2	Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4	1	2	Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading			Acres Affected
Strategy: WQ-1-S9-Implement LID measures			Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading			Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow			Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents	1	2	Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4	1	2	Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters	1	2	Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	1.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020			Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030		No	YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020			Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters			Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development	1	2	Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	1	2	Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	1	2	Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	1	2	Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts			Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures			Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures			Acres Affected
Increase Water Supply and Reliability	288.10		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	5.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water	5	Yes	YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region		No	YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies	5	Yes	YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply		No	YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding		No	YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability	5	Yes	YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"	5	Yes	YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"	5	Yes	YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	0.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water			Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges			Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas			Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015			Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources			Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)			Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination		No	YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management			Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	0.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity			Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans			Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions		No	YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment			Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	5.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects	5	3000+	Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems		No	YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping			Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding		No	YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements		No	YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton		No	YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	5.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030	5	Yes	YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects		Yes	YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability		No	YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	5.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency	5	31366	Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities		No	YES/NO
Promote Water Use Efficiency	7.03		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	0.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes		Yes	YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers		No	YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions		No	YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers		No	YES/NO
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	0.50		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	0.5	<3	Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	0.5	1.5	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes			Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	0.5	1.5	Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers			Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume			Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	0.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures	0	<1	Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years		No	YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers		No	YES/NO
WC-4 - Promote use of low impact design for new and existing developments	0.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture			Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020			Acres Impacted
Protect Natural Resources	40.92		
NR-1 - Enhance the functioning of regional aquatic ecosystems	0.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems			Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's			Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems			Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns			Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health			Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	0.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	0	<1	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows			Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from			Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible			Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030		No	YES/NO
NR-3 - Eradicate invasive species throughout the watershed	0.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030			Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible			Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use			Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	4.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible			Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies		No	YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030		No	YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair		No	YES/NO
Strategy: NR-4-S5-Reduce carbon footprint	4	2100 AF	Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation		No	YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
$16/AF		99%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

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OC Watersheds

Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date	Latitude	Longitude
Water Conservation, Implementation of Targeted Programs	South Coast Water District	Permits Anticipated By: N/A	Various	Various

Grant Funding Request	Match Funds Secured?	Funding Source	CEQA	TOTAL POINTS
$375,000	☑ YES ☐ NO If "No", Explain:	District Reserves	☐ YES ☐ NO If "No", When? exempt	**242.62**

	Score	Value	Units
Integrate Flood Management	0.00		
FR-1 - Enhance Flood protection for public safety and property	0.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity			Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems			Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection			Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020			Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection			Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas			Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use			Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows			Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture			Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels	1		Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	0.00		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection			Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection			Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection			Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection			Acres Enhancement Opportunity
Strategy: FR-2-S5-Convert hardened ditches and channels to soft bottoms (where feasible)			Acres of Soft Bottom Created
Improve Water Quality	76.50		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	2.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020			Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030			Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit			YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards			YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4			Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading			Acres Affected
Strategy: WQ-1-S9-Implement LID measures			Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading			Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow	2	20	Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents			Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters			Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	2.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020			Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030			YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020			Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters	0	20	Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development	2	20	Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems			Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems			Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030			Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts			Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures			Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures			Acres Affected
Increase Water Supply and Reliability	0.00		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	0.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water			YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region			YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies			YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply			YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding			YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability			YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"			YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"			YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	0.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water			Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges			Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas			Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015			Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources			Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)			Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination			YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management			Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	0.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity			Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans			Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions			YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment			Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	0.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects			Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems			YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping			Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding			YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements			YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton			YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	0.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030			YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects			YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability			YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	0.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency			Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities			YES/NO
Promote Water Use Efficiency	95.83		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	3.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes	0		YES
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers			YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions			YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers	3		YES
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	2.00		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	2	10	Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	2	20	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	2	20	Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements	2	20	Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers	2	20	Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume	2	20	Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	3.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards	0.5	3	Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures			Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years			YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers	3	x	YES
WC-4 - Promote use of low impact design for new and existing developments	0.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	0	20	Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020			Acres Impacted
Protect Natural Resources	70.29		
NR-1 - Enhance the functioning of regional aquatic ecosystems	3.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	3	20	Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's			Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems			Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns	0	0	Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health			Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	3.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	1	3	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows			Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from	3	20	Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible			Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030			YES/NO
NR-3 - Eradicate invasive species throughout the watershed	0.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030			Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible			Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use			Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	0.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible			Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies			YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030			YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair			YES/NO
Strategy: NR-4-S5-Reduce carbon footprint			Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation			YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

Various locations throughout SCWD service area, South Laguna Beach, City of Dana Point, parts of San Juan Capistrano & San Clemente, CA

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
$1,943/AF		50%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

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OC Watersheds

Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date	Latitude	Longitude
San Juan Creek Storm Drain LO1SO2 BMPs	City of Dana Point	Permits Anticipated By: 6/1/2014	N 33.46549	W 117.68212

Grant Funding Request	Match Funds Secured?	Funding Source	CEQA	TOTAL POINTS
$385,000	☐ YES ☑ NO If "No", Explain: Pending OCTA Teir 2 Grant Award	Prop 84 Stormwater 2013	☑ YES ☐ NO If "No", When? 8/31/2012	**283.42**

	Score	Value	Units
Integrate Flood Management	0.00		
FR-1 - Enhance Flood protection for public safety and property	0.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity			Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems			Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection			Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020			Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection			Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas			Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use			Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows			Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture			Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels			Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	0.00		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection	0	62	Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection			Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection	0	358	Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection			Acres Enhancement Opportunity
Strategy: FR-2-S5-Convert hardened ditches and channels to soft bottoms (where feasible)			Acres of Soft Bottom Created
Improve Water Quality	153.00		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	4.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020			Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030			Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit	4	YES	YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards			YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4			Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4	2	10	Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4	4	358	Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading	4	358	Acres Affected
Strategy: WQ-1-S9-Implement LID measures			Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading	2	10	Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow			Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents			Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4			Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters			Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	4.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020	4	358	Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030			YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020	3	95	Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters	4	358	Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development			Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	4	358	Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	4	358	Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	3	95	Acre-Feet
Strategy: WQ-S-SX- Implement measures to reduce health risk/rate of illness in recreational waters.	4	358	Acres of subwatershed area with decrease
Strategy: WQ-2-S10-Implement storm volume reduction measures			Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures			Acres Affected
Increase Water Supply and Reliability	30.10		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	0.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water			YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region			YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies			YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply			YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding			YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability			YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"			YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"			YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	2.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water			Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges			Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas			Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015			Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources	1	1600	Acre-feet/year
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)	2	2	Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination			YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management			Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	0.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity			Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans			Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions			YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment			Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	0.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects			Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems			YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping			Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding			YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements			YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton			YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	0.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030			YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects			YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability			YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	0.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency			Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities			YES/NO
Promote Water Use Efficiency	0.00		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	0.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes			YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers			YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions			YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers			YES/NO
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	0.00		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes			Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes			Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes			Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements			Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers			Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume			Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	0.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures			Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years			YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers			YES/NO
WC-4 - Promote use of low impact design for new and existing developments	0.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture			Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020			Acres Impacted
Protect Natural Resources	100.32		
NR-1 - Enhance the functioning of regional aquatic ecosystems	4.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	4	358	Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's			Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems			Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns			Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health	3	95	Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	3.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	3	95	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows			Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from			Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible	3	95	Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030	3	YES	YES/NO
NR-3 - Eradicate invasive species throughout the watershed	2.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030	2	2	Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible			Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use			Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	0.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible			Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies			YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030			YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair			YES/NO
Strategy: NR-4-S5-Reduce carbon footprint			Acres Reduced
Strategy: NR-4-S6-Reduce solid waste generation			YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

On east side of San Juan Creek , immediately north of Pacific Coast Highway bridge. County designation: LO1SO2.
GIS: N 33.46549, W 117.68212. AutoCAD file attached. 358 acre watershed.

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
$4,053/AF	$1,075/AC	25%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

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OC Watersheds

Project Evaluation Worksheet

PROJECT TITLE	Implementing Agency	Permitting Date	Latitude	Longitude
Oso Creek Multi-Use Trails	City of Laguna Niguel	Permits Anticipated By: 3/1/2014	33.33270	-117.40320

Grant Funding Request	Match Funds Secured?		Funding Source	CEQA		TOTAL POINTS
$1,200,000	☐ YES ☑ NO	If "No", Explain: pending Tier 2 Nov2012	OCTA & General Fund	☑ YES ☐ NO	If "No", When?	**239.91**

	Score	Value	Units
Integrate Flood Management	21.76		
FR-1 - Enhance Flood protection for public safety and property	0.00		
Strategy: FR-1-S1-Stabilize streambeds to improve flood capacity			Acres of Streambed
Strategy: FR-1-S2-Improve flood conveyance systems			Acres Protected
Strategy: FR-1-S3-Improve infrastructure to enhance flood control protection	0	5.3	Acres Protected
Strategy: FR-1-S4-Remove as many properties as possible from FEMA designated floodplains by 2020	0	5.3	Acres Removed from Floodplain
Strategy: FR-1-S5-Remove invasive species from stream channels to improve capacity and flood control protection			Acres Removed from Channel
Strategy: FR-1-S6-Preserve floodplains in open space areas			Acres Preserved
Strategy: FR-1-S7-Increase stormwater and urban runoff capture for re-use	0	1.6	Acre-Feet Re-Used, Net Annual
Strategy: FR-1-S8-Retrofit hydromodification controls on existing development to reduce storm flows	0	2.8	Acres Retrofitted
Strategy: FR-1-S9-increase stormwater on-site capture	0	0.12	Acre-Feet Captured, per 85% Storm
Strategy: FR-1-S10-Utilize LID principles to store and infiltrate runoff from existing development projects to lessen flows in flood control channels	1	2.5	Acres Where LID Applied
FR-2 - Implement economically and technically feasible multiple uses for flood control facilities	2.00		
Strategy: FR-2-S1-Increase recreational opportunities while maintaining or improving flood control protection	2	2.5	Acres of Recreational Area
Strategy: FR-2-S2-Increase water conservation opportunities while maintaining or improving flood control protection			Acres of Conservation Area
Strategy: FR-2-S3-Increase water quality improvement opportunities while maintaining or improving flood control protection	0	5.3	Acres of Water Quality Area
Strategy: FR-2-S4-Increase environmental enhancement opportunities while maintaining or improving flood control protection	0	0.3	Acres Enhancement Opportunity
Strategy: FR-2-S5-Convert hardened ditches and channels to soft bottoms (where feasible)			Acres of Soft Bottom Created
Improve Water Quality	76.50		
WQ-1 - Comply with Clean Water Act and Porter-Cologne	2.00		
Strategy: WQ-1-S1-Utilize region-wide, non-structural BMPs to prevent pollutants from entering storm drain system by 2020			Acres Affected
Strategy: WQ-1-S2-Install source control including litter devices on high priority drain inlets by 2030	2	2.8	Acres Affected
Strategy: WQ-1-S3-Implement programs and projects to comply with TMDLs and NPDES Permits timelines set by the RWQCB permit		yes	YES/NO
Strategy: WQ-1-S4-Seek regional consistency in NPDES permit standards			YES/NO
Strategy: WQ-1-S5-Implement pollution prevention measures to reduce pollutant discharge to MS4	1	0.3	Acres Affected
Strategy: WQ-1-S6-Implement stormwater treatment control measures to reduce pollutant discharge from MS4	2	5.3	Acres Affected
Strategy: WQ-1-S7-Implement dry weather treatment control measures to reduce pollutant discharge from MS4	1	0.3	Acres Affected
Strategy: WQ-1-S8-Implement dry weather flow volume reduction measures to reduce pollutant loading	1	0.3	Acres Affected
Strategy: WQ-1-S9-Implement LID measures	2	5.3	Acres Affected
Strategy: WQ-1-S10-Implement storm flow volume reduction measures to reduce pollutant loading	2	5.3	Acres Affected
Strategy: WQ-1-S11-Implement pollution prevention/source control measures to reduce dry weather urban runoff flow			Acres Affected
Strategy: WQ-1-S12-Implement pollution prevention/source control measures for pollutant constituents			Acres Affected
Strategy: WQ-1-S13-Implement wet weather treatment control measures to reduce pollutant discharge from MS4	2	5.3	Acres Affected
Strategy: WQ-1-S14-Implement wet weather treatment control measures to reduce pollutant discharge to receiving waters	2	5.3	Acres Affected

WQ-2 - Protect beneficial uses of receiving waters	2.00		
Strategy: WQ-2-S1-Develop programs to reduce pathogen levels to increase Beneficial Uses by 2020	2	5.3	Acres Improved
Strategy: WQ-2-S2-Implement grease control measures at 100 % of food services facilities to reduce overflows and spills by 2030			YES/NO
Strategy: WQ-2-S3-Implement nuisance water diversions when determined to be the most effective solution by 2020			Acre-Feet Diverted
Strategy: WQ-2-S4-Promote the implementation of effective pathogen control measures for high use waters			Acres Improved
Strategy: WQ-2-S5-Improve sediment & erosion control for existing development			Acres Improved
Strategy: WQ-2-S6-Promote the effective nutrients control measures to protect downstream aquatic ecosystems	2	5.3	Acres Improved
Strategy: WQ-2-S7-Promote the implementation of effective toxics control measures to protect downstream aquatic ecosystems	2	5.3	Acres Improved
Strategy: WQ-2-S8-Improve the quality of the water that may reach the aquifers by 2030	1	1.6	Acre-Feet
Strategy: WQ-2-S9-Implement hydromodification control measures to reduce downstream channel erosive impacts	2	2.8	Acres with Hydromod Retrofits
Strategy: WQ-2-S10-Implement storm volume reduction measures	1	0.12	Acre-Feet Reduced per 85% Storm
Strategy: WQ-S-S11-Implement LID measures	2	2.5	Acres Affected
Increase Water Supply and Reliability	45.15		
WS-1 - Improve planning and awareness of water supply reliability issues related to imported water into South Orange County	0.00		
Strategy: WS-1-S1-Identify and quantify risks and/or threats to the delivery of imported water			YES/NO
Strategy: WS-1-S2-Participate in MET Integrated Resources Planning and examine Bay-Delta and Colorado river supplies to the region			YES/NO
Strategy: WS-1-S3-Outreach to parties on the economic need for dependable water supplies			YES/NO
Strategy: WS-1-S4-Advocate that MET place priority on reliability of supply			YES/NO
Strategy: WS-1-S5-Access MET project funding to local projects and gain MET support for other funds such as federal project funding			YES/NO
Strategy: WS-1-S6-Support participant agency projects that improve supply reliability			YES/NO
Strategy: WS-1-S7-Develop an understanding of regional storage interconnectivity and "emergency interconnections"			YES/NO
Strategy: WS-1-S8-Measure and quantify supply reliability improvements and support improvements to individual agency "days of storage"			YES/NO
WS-2 - Develop and manage groundwater supplies in South Orange County 10,800 AF by 2020	1.00		
Strategy: WS-2-S1-Investigate groundwater recharge options for imported, urban runoff and recycled water	1	1.6	Acre-Feet
Strategy: WS-2-S2-Support SJBA in developing SJB Groundwater Management Plan and solutions to pumping challenges			Acre-Feet
Strategy: WS-2-S3-Investigate opportunities to develop supply projects in the San Mateo Basin and other areas			Acre-Feet
Strategy: WS-2-S4-Increase use of groundwater for potable supply by 2015	1	1.6	Acre-Feet
Strategy: WS-2-S5-Protect aquifers from saltwater intrusion and contamination from natural or man-made sources			Acre-Feet Protected
Strategy: WS-2-S6-Eliminate negative impacts to groundwater recharge from non-native plants (Arundo)			Acres Non-Native Plants Removed
Strategy: WS-2-S7-Identify and cap abandoned wells where groundwater supply is susceptible to contamination			YES/NO
Strategy: WS-2-S8-Efficient groundwater basin management			Acre-Feet Improvement
WS-3 - Increase efficient use of recycled water from municipal wastewater sources by 20,000 AFY by 2020	0.00		
Strategy: WS-3-S1-Increase recycled water production and distribution capacity			Acre-Feet
Strategy: WS-3-S2-Support improvements in the quality of recycled water and development of Salinity Management Plans			Acre-Feet Improved
Strategy: WS-3-S3-Seek technical and financial resources to assist customer with recommended conversions			YES/NO
Strategy: WS-3-S4-Reduce recycled irrigation water applied to environment			Acre-Feet
WS-4 - Increase capture and utilization of urban runoff for irrigation purposes	2.00		
Strategy: WS-4-S1-Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects	2	4.15	Acre-Feet Captured
Strategy: WS-4-S2-Investigate options for regional standards and promote use of rain water capture systems			YES/NO
Strategy: WS-4-S3-Reduce recycled water application to landscaping			Acre-Feet Reduced
WS-5 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020	0.00		
Strategy: WS-5-S1-Pursue SOCCOD Project through feasibility studies and exploration of funding			YES/NO
Strategy: WS-5-S2-Pursue Huntington Beach Project through agreements			YES/NO
Strategy: WS-5-S3-Examine opportunities for ocean desalination at Camp Pendleton			YES/NO
WS-6 - Improve System Reliability to protect against out of the region earthquakes and floods as well as earthquakes in Orange County that would cause interruptions of supplies	0.00		
Strategy: WS-6-S1-Improve system reliability through various methods by 2030			YES/NO
Strategy: WS-6-S2-Develop a methodology to account for the reliability improvements from supply projects			YES/NO
Strategy: WS-6-S3-Examine pipeline conditions and earthquake vulnerability			YES/NO

WS-7 - Manage and improve the supplies available to South Orange County for the collective benefit of the area	0.00		
Strategy: WS-7-S4-Develop an institutional and financial framework for sharing water resources in an emergency			Acre-Feet Made Available
Strategy: WS-7-S1-Evaluate feasibility of water transfers for Cadiz, Strand Ranch, or other opportunities			YES/NO
Promote Water Use Efficiency	19.61		
WC-1 - Compliance with "20 x 2020" and with MWD's IRP Goals by 2020	0.00		
Strategy: WC-1-S1-Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes			YES/NO
Strategy: WC-1-S2-Provide technical assistance and financial incentives for water efficiency to industrial manufacturers			YES/NO
Strategy: WC-1-S3-Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions			YES/NO
Strategy: WC-1-S4-Provide technical assistance to single- and multi-family residential consumers			YES/NO
WC-2 - Reduce region wide landscape irrigation consumption to an ETAF of < 0.7 by 2020	0.50		
Strategy: WC-2-S1-Promote the use/retrofitting of smart timers in urban landscapes	0	0.96	Acre-Feet Conserved
Strategy: WC-2-S2-Promote use of native and non-native California Friendly plants in urban landscapes	0.5	0.64	Acres of Friendly Plants Installed
Strategy: WC-2-S3-Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes	0	0.96	Acre-Feet Conserved
Strategy: WC-2-S4-Promote use/retrofitting of irrigation system distribution uniformity improvements			Acre-Feet Conserved
Strategy: WC-2-S5-Provide landscape water efficiency education to landscape owners and managers			Acre-Feet Conserved
Strategy: WC-2-S6: Reduce annual irrigation consumption volume			Acre-Feet Conserved
WC-3 - Maximize Efficiency of Utility Based Operations	0.00		
Strategy: WC-3-S1-Implement Distribution System Audit Leak and Detection Repair programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S2-Implement conservation based rate structures			Acre-Feet Conserved
Strategy: WC-3-S3-Implement meter repair and replacement programs following AWWA Standards			Acre-Feet Conserved
Strategy: WC-3-S4-Update water waste prevention regulations every 5 years			YES/NO
Strategy: WC-3-S5-Implement school education and public information programs to consumers			YES/NO
WC-4 - Promote use of low impact design for new and existing developments	1.00		
Strategy: WC-4-S1-Promote use of alternative landscape design features that maximize stormwater capture	1	2.5	Acres Impacted
Strategy: WC-4-S2-Achieve permit compliance by 2020			Acres Impacted
Protect Natural Resources	76.89		
NR-1 - Enhance the functioning of regional aquatic ecosystems	2.00		
Strategy: NR-1-S1-Manage developed areas to minimize impacts on downstream aquatic ecosystems	2	5.3	Acres Impacted
Strategy: NR-1-S2-Eliminate anthropogenic impacts to marine ASBS's			Acres Impacted
Strategy: NR-1-S3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems			Acres Constructed
Strategy: NR-1-S4-Promote the judicial incorporation or retrofitting of stormflow attenuation processes, devices and/or permeable surfacing into new and existing developments that disrupt natural hydrologic patterns	2	5.3	Acres Impacted
Strategy: NR-1-S5-Treat stream flows to improve water quality and protect public health			Acre-Feet Treated
NR-2 - Reduce impacts from urban runoff	2.00		
Strategy: NR-2-S1-Promote the utilization of structural BMPs to eliminate nuisance runoff and reduce the discharge of pollutants from MS4 system into downstream aquatic ecosystems, during both wet and dry weather	2	4.5	Acre-Feet Treated Annually
Strategy: NR-2-S2-Design new infrastructure to minimize hydraulic impacts to storm flows	2	3.85	Acre-Feet Intercepted Annually
Strategy: NR-2-S3-Promote the utilization of non-structural BMPs, appropriate to land use type, to eliminate nuisance runoff and prevent potential pollutants from			Acres Impacted
Strategy: NR-2-S4-Utilize nuisance water diversions where feasible			Acre-Feet Diverted
Strategy: NR-2-S5-Promote recovery and recycling of 75% of solid waste materials collected from streets or surface drainage by 2030			YES/NO
NR-3 - Eradicate invasive species throughout the watershed	2.00		
Strategy: NR-3-S1-Eradicate Arundo donax and other highly invasive plant species by 2030			Acres Removed
Strategy: NR-3-S2-Re-establish native communities along stream courses where feasible	1	0.64	Acres Established
Strategy: NR-3-S3-Provide opportunities for controlled recreational access and enjoyment of aquatic ecosystem areas to minimize the environmental impacts of uncontrolled use	2	2.5	Acres Provided

NR-4 - Minimize impacts to air, energy, land, materials and habitat resources	1.00		
Strategy: NR-4-S1-Stabilize streambeds utilizing bioengineering techniques wherever possible			Acres of Stabilized Streambed
Strategy: NR-4-S2-Promote scientific research, technology development and investigative studies			YES/NO
Strategy: NR-4-S3-Promote sewage biosolids by 90% reuse for soil fertilization by 2030			YES/NO
Strategy: NR-4-S4-Keep sanitary sewer systems in good repair			YES/NO
Strategy: NR-4-S5-Reduce carbon footprint	1	150	C02 tons reduced annually
Strategy: NR-4-S6-Reduce solid waste generation			YES/NO

ADDITIONAL PROJECT INFORMATION

Describe Project's Geographic Location and Extent (or provide a shapefile)

Along Forbes Road west of I-5/Crown Valley interchange. Project replaces 2.8 acres of impervious road pavement with pervious trails and landscape, restoring direct infiltration into water supply aquifer system estimated as 1.6 A-F annually based on annual average precipitation. Also constructs bioretention facilities treating on-and off-site road and landscape stormwater runoff from total 5.3 acres.

Cost in $ per Acre-Foot	Cost in $ per Acre	Match Percent Committed	
	$226,415/AC	40%	

Score	Value (Benefitting Acres)	Value (Acre-Feet)
0	**0**	**0**
1	**< 1**	**< 3**
2	**< 10**	**< 30**
3	**< 100**	**< 300**
4	**< 1,000**	**< 3,000**
5	**> 1,000**	**> 3,000**

APPENDIX G

Salt and Nutrient Management Plan

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The Salt and Nutrient Management Plan (SNMP) is currently undergoing the final review, endorsement and inclusion process which will include:

1. San Diego Regional Water Quality Control Board review and comments
2. State Water Resources Control Board review and comments
3. Third party “Academic” review and comments
4. Endorsement by South Orange County Wastewater Authority
5. Addition of SNMP as Appendix G to the Integrated Regional Watershed Management Plan.

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APPENDIX H

Flood Management Plan

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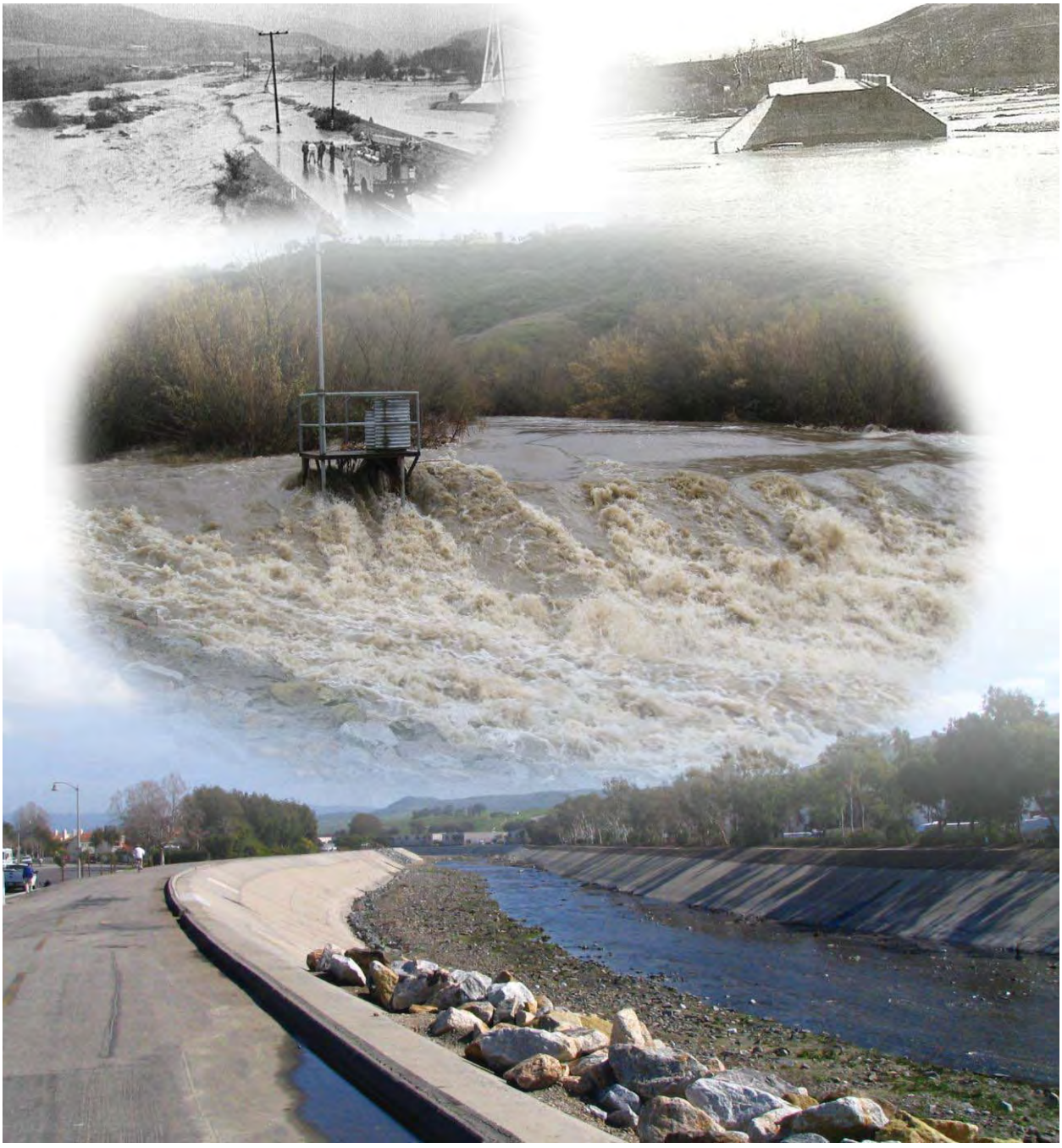
Flood Plan for the South Orange County Integrated Regional Watershed Management Plan

June 2013



COVER PHOTO CREDITS: San Juan Creek 1969; County of Orange. Camino Capistrano Bridge 1938; County of Orange. Aliso ACWHEP Jan 2010; Tetra Tech. San Juan Creek Channel; Wikimedia Commons.

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1.0 Executive Summary

The South Orange County Watershed Management Area (SOCWMA) lies within the southern portion of Orange County. It is made up of 6 watersheds. The terrain of these watersheds ranges from the high elevations of the Cleveland National Forest in the San Juan Creek Watershed and Aliso Creek Watershed and the coastal hills of the Laguna Coastal Streams, Dana Point Coastal Stream, San Clemente Coastal Streams, and San Mateo watersheds to the coastal floodplain at the ocean outlet of each of these watersheds.

The flood management of the area relies on a series of regional flood control facilities, local flood control facilities (can include open channels and underground systems), and natural streams. The regional flood control facilities are largely owned and operated by Orange County Flood Control District (OCFCD). These systems currently have the greatest impact to flooding in the area. Privately owned lands with the potential of development equally have an impact to flooding in these watershed areas.

The emergency response to large flood events is managed through the Orange County Operational Area Emergency Operations Center (EOC) which is associated with the Orange County Sheriff's Department Emergency Management Division (EMD). The EOC Manager coordinates the efforts for responses to all significant disasters, including flood disasters. Additionally, the Water Emergency Response Organization (WEROC) works with the EOC to assist water and wastewater utilities with their response and resources. Participants in the response to a flood event include OCFCD, Orange County Public Works, the Cities, and the Water Districts.

The EMD is responsible for the development and update to the County Emergency Operations Plan (EOP). The EOP documents updates in the processes that lead to better emergency preparedness and response. The EMD actively pursues improvements to the County EOP. These improvements include activities such as the training of cross-discipline teams to respond to all types of disasters.

On a regional scale, the improvement of flood protection is the responsibility of OCFCD. This agency performs ongoing facility assessments and maintains a 7-year Capital Improvement Plan that identifies the top priority regional projects to improve the flood protection throughout Orange County, including within the SOCWMA. Local improvements to the flood protection of the area are carried out by the cities within SOCWMA. In addition, the local water districts construct improvements in localized areas to improve the flood protection to their facilities and pipelines.

OCFCD continues its efforts to raise the level of protection in Orange County to the 100-year level. The 100-year level of protection would provide protection for storms up to the 100-year storm which is defined as the event having a 1-percent change of being equaled or exceeded in any given year. It is currently estimated that over $2.5 billion of capital project expenditures are required for completion of all flood control improvements with $0.5 billion needed for improvements in the SOCWMA. Without assistance from the state and federal government, it would take over 90 years to provide necessary protection to all watersheds in Orange County. Funding opportunities are pursued by OCFCD to leverage funds to implement projects to obtain this level of protection sooner.

2.0 Regional Setting

The Mediterranean climate in South Orange County is characterized by brief, intense storms between November and March. It is not unusual for a majority of the annual precipitation to fall during a few storms in close proximity to each other. The higher elevation portions of the watershed (the headwater areas) typically receive significantly greater precipitation, due to orographic effects. Rainfall, brief intense storms, and extreme temporal variability in rainfall result in "flashy" systems where stream discharge can vary by several orders of magnitude over very short periods of time.

As shown in Figure 2-1, the SOCWMA is comprised of six major watersheds: 1) Laguna Coastal Streams, 2) Aliso Creek, 3) Dana Point Coastal Streams (Salt Creek), 4) San Juan Creek, 5) San Clemente Coastal Streams, and 6) San Mateo Creek. These watersheds overlap with a number of local cities, as shown in Figure 2-2, including Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano.

2.1 Laguna Coastal Streams Watershed

The Laguna Coastal Streams Watershed is approximately 13 square miles and includes portions of the cities of Aliso Viejo, Laguna Beach, and Laguna Woods. It consists of the Laguna Canyon Creek watershed which runs north to south, directly through the middle of this watershed, and discharges into the Pacific Ocean in Laguna Beach. Several other smaller watersheds, including Boat Canyon, Blue Bird Canyon, Rim Rock Canyon, and Hobo Canyon, also drain portions of these cities. This watershed is bound on the west by Emerald Canyon and on the east by the Aliso Creek watershed. The remaining undeveloped areas are largely within the Laguna Coast Wilderness Park and the Aliso and Wood Canyons Regional Park. Laguna Canyon Creek runs parallel to Laguna Canyon Road, underneath the San Joaquin Hills Transportation Corridor, through the city of Laguna Beach, and underneath the Pacific Coast Highway, before emptying into the Pacific Ocean.

The Laguna Coastal Streams Watershed falls under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.12). In addition to Laguna Canyon Creek, the Basin Plan lists Boat Canyon, Laguna Canyon, Blue Bird Canyon, Rim Rock Canyon, and Hobo Canyon as receiving waters discharging to the Pacific Ocean.

The major flood control facility in this watershed is Laguna Canyon Channel (I02)

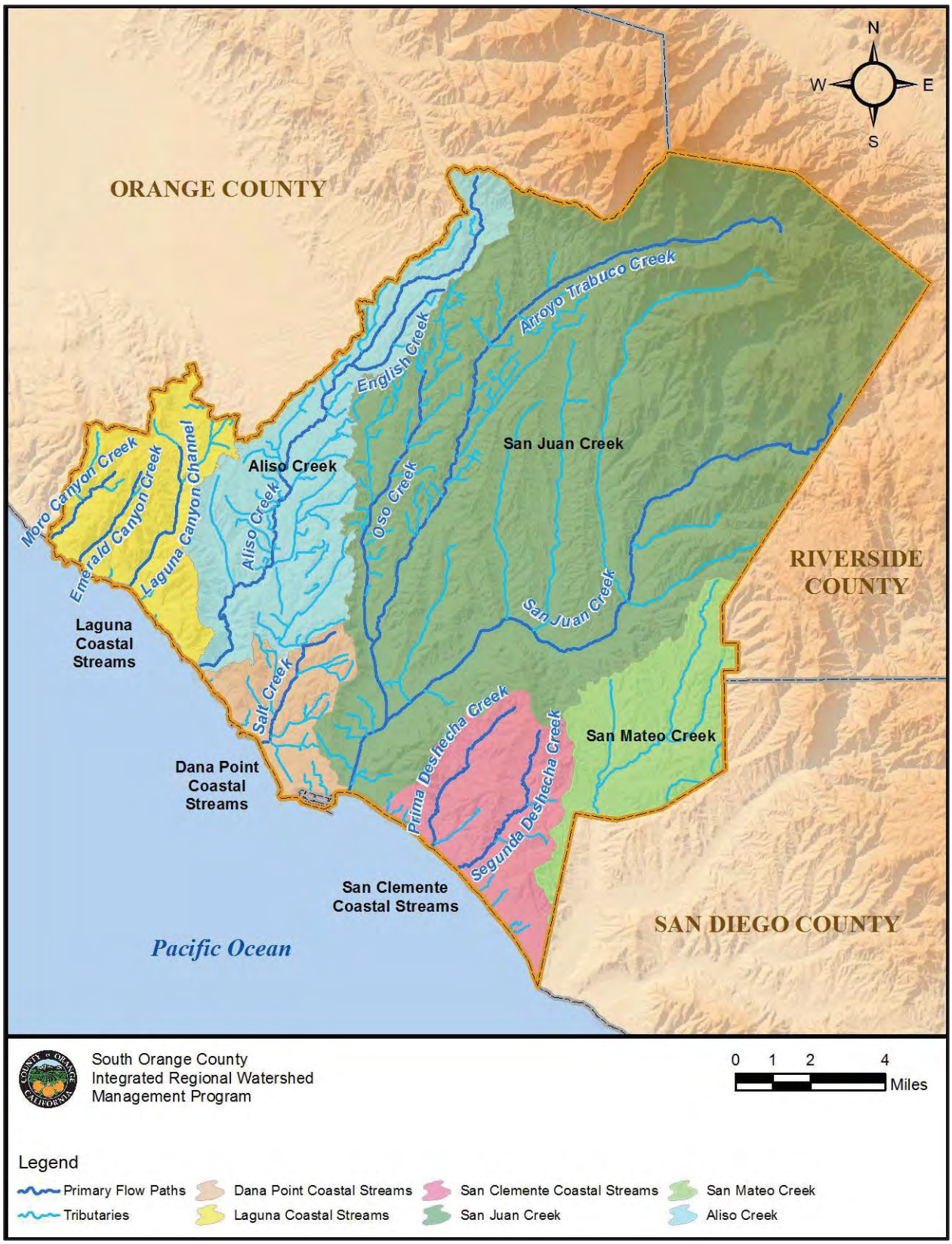

Figure 2-1: SOCWMA Watersheds

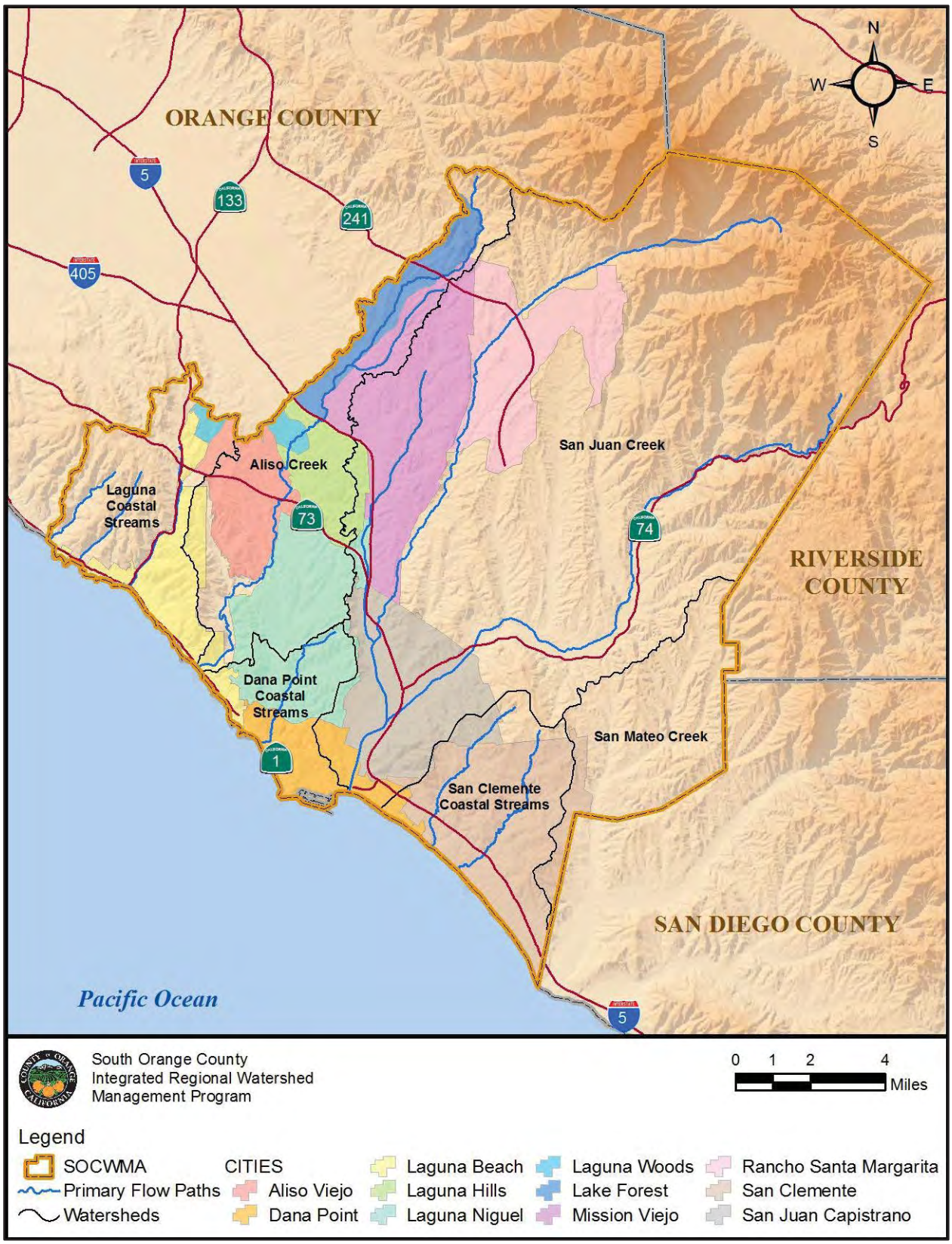

Figure 2-2: SOCWMA Cities

2.2 Aliso Creek Watershed

The Aliso Creek Watershed drains a long, narrow coastal canyon of approximately 35 square miles, with headwaters in the Cleveland National Forest. The creek ultimately discharges into the Pacific Ocean at Aliso Beach. The north to south watershed includes portions of the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo. Major transportation arteries through the watershed include the San Joaquin Hills Transportation Corridor and Interstate 5.

The Aliso Creek Watershed is largely developed, with the exception of the Cleveland National Forest in the upper watershed and the Aliso Wood Canyon Regional Park in the lower watershed.

The Aliso Creek Watershed falls under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.13). The Basin Plan lists the English Canyon, Sulphur Creek, and Wood Canyon tributaries to Aliso Creek as receiving waters.

Major flood control facilities in this watershed include Aliso Creek Channel (J01), Sulphur Creek Channel (J03), Narco Channel (J04), Aliso Hills Channel (J05), Dairy Fork Channel (J06), and English Canyon Channel (J07).

2.3 Dana Point Coastal Streams Watershed

The Dana Point Coastal Streams Watershed drains 10 square miles. The main tributary of the watershed is Salt Creek, which ultimately drains into the Pacific Ocean. The watershed is almost fully developed and includes portions of the cities of Dana Point and Laguna Niguel, and a very small area of San Juan Capistrano. Remaining undeveloped areas include open space within the Aliso and Wood Canyons Regional Park in the upper watershed and the Salt Creek Corridor Regional Park in the eastern part of the watershed. A few small, unnamed drainages and larger tributaries (Arroyo Salado Creek and San Juan Canyon Creek) join Salt Creek as it makes its way through the watershed. The creek originates in the city of Laguna Niguel and flows underneath Marina Hills Drive, Niguel Road, Pacific Island Drive, and lastly, Pacific Coast Highway, before discharging into the Pacific Ocean at Salt Creek Beach.

The Dana Point Coastal Streams Watershed falls under the Laguna subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.14). In addition to the primary Salt Creek, the Basin Plan lists San Juan Canyon and Arroyo Salado as receiving waters.

The major flood control facility in this watershed is Salt Creek Channel (K01).

2.4 San Juan Creek Watershed

The San Juan Creek Watershed drains approximately 160 square miles and is the largest watershed in the SOCWMA. San Juan Creek drains a broad, fan-shaped, fairly steep watershed with much of its headwaters in the Cleveland National Forest and other public lands. The Creek ultimately discharges into the Pacific Ocean at Doheny Beach. The watershed includes portions of the cities of Dana Point, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, and San Juan Capistrano. Major transportation arteries through the watershed include the San Joaquin Hills Transportation Corridor and

Interstate 5. The San Juan Creek Watershed is approximately 40 percent developed, with ongoing future development of most remaining privately held land.

The San Juan Creek Watershed falls under the Mission Viejo subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.21-1.28). The Basin Plan lists Bell Canyon Creek, Cañada Gobernadora, Arroyo Trabuco (Trabuco Creek), and Oso Creek tributaries to San Juan Creek as receiving waters.

Major flood control facilities in this watershed include San Juan Creek Channel (L01), Trabuco Creek Channel (L02), Oso Creek Channel (L03), La Paz Channel (L04), Horno Creek Channel (L05), Canada Chiquita Channel (L06), Canada Gobernadora (L07), and Tijeras Canyon Channel (L11).

2.5 San Clemente Coastal Streams Watershed

The San Clemente Coastal Streams Watershed is approximately 19 square miles and includes portions of the cities of San Clemente, San Juan Capistrano and Dana Point, draining a fairly steep set of coastal ridges. Prima Deshecha Cañada is one of two main streams that flow through the City of San Clemente, ultimately discharging into the Pacific Ocean at Poche Beach. Several small, unnamed drainages, as well as a few larger tributaries, join Prima Deshecha as it makes its way through the watershed. The Segunda Deshecha Canada, the second main stream draining the watershed, flows through the Talega development, along Avenido Pico, under the San Diego Freeway (Interstate 5) and N. El Camino Real, before discharging into the Pacific Ocean at North Beach. The watershed is almost fully developed.

The San Clemente Coastal Streams Watershed falls under the San Clemente subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.31 and 1.32). The Basin Plan lists Prima Deshecha Cañada and Segunda Deshecha Cañada as receiving waters.

Major flood control facilities in this watershed include Prima Deshecha Canada Channel (M01), and Segunda Deshecha Canada Channel (M02).

2.6 San Mateo Creek Watershed

Most of San Mateo Creek and its outlet to the Pacific Ocean, at San Onofre State Beach, are actually located in San Diego County. This watershed includes approximately 20 square miles of southeastern Orange County including portions of the City of San Clemente in its downstream-most area. The portion of San Mateo Creek within Orange County flows through unincorporated Orange County before entering the City of San Clemente. It then re-enters San Diego County, ultimately discharging into the Pacific Ocean at San Onofre State Beach. The San Mateo Creek tributaries include Gabino Canyon, Paz Canyon, and Blind Canyon, which combine and flow into Cristianitos Creek. The Paz Canyon tributary flows into Gabino Canyon before combining with the Blind Canyon tributary. This tributary then flows through the area proposed for the Foothill Transportation Corridor and flows into Cristianitos Creek, which ultimately discharges into San Mateo Creek within San Diego County. The tributaries are also joined by several small, unnamed drainages as they make their way through the watershed.

The San Mateo Creek Watershed falls under the San Mateo Canyon subunit of the San Juan Hydrologic Basin (designated Hydrologic Sub Area 1.40). The Basin Plan lists San Mateo Creek and its mouth as receiving waters.

There are no flood control facilities in this watershed.

2.7 Flood history

Much of the flood history from the late 19th and early 20th century focuses on reports along the Santa Ana River where the population resided. While the Santa Ana River is outside of the South Orange County WMA, its proximity is a likely indictor of floods that would also impact South Orange County and is included in the discussions below.

Great Flood of 1862 - The storm and flood of January 1862, called the Noachian deluge of California, were unusual in two ways: 1) the storm occurred during the very severe drought of 1856-1864 and 2) the flooding was extremely long, lasting 20 days. Under normal circumstances, major floods last no longer than a few days. The only structure left standing along the Santa Ana River was a chapel called Aqua Mansa on high ground above the river. The priest rang the chapel bell and the settlers fled the rising waters. Small villages along the Santa Ana River were completely destroyed. This flood event affected the West Coast from Oregon to San Diego.

Great Flood of 1916 – The flood on January 27, 1916 inundated a large area in Santa Ana, flooding Main Street with water 3 feet deep. The farming area, today known as City of Westminster, was also flooded. A total of six bridges, three traffic bridges and three railroad bridges washed away and four people drowned.

Great Flood of 1938 – The flood of 1938, considered the most devastating of all County floods in the 20th Century, affected all of Southern California. The storm began on February 27 lasting until March 3. In the Santa Ana Basin, 34 people died and 182,300 acres were flooded. All buildings in Anaheim were damaged or destroyed. Two major railroad bridges, seven traffic bridges, and the little town of Atwood were completely destroyed. As the Santa Ana River inundated the northwestern portion of Orange County, train service to and from Santa Ana was cancelled and communication with the outside world was essentially nonexistent. Damage exceeded $50 million.

Great Flood of 1969 – The floods of January and February were the most destructive on record in Orange County. Previous floods had greater potential for destruction, but the County was then relatively undeveloped. The intensity of the 1938 flood was greater, however, of shorter duration. A drought that began in 1945 was relieved by only two wet years until the floods in 1969. An annual overdraft of 100,000 acre-feet brought the average groundwater level to 15 feet below sea level, and ocean water moved into the aquifers. Some wells along the coast began producing brackish water and had to be abandoned. http://www.ocwd.com/html/history.htm Rainfall was continuous from January 18-25 resulting in widespread flooding January 25-26. Orange County was declared a national disaster area on February 5. A storm on February 21-25 once again brought rain to the already saturated ground, culminating in a disastrous flood on February 25. The largest peak outflow from Santiago Reservoir since

its inception in 1933 occurred in February. On February 25, the reservoir at Villa Park Dam reached its capacity. This was the first time since its construction in 1963 with a maximum outlet inflow of 11,000 cfs. Even though the outlet conduit was discharging up to 4,000 cfs, spillway overflow occurred at 1:30 p.m. on February 25 and continued 36 hours. The maximum peak outflow from the dam reached 6,000 cfs. The safety of the dam was never threatened. However, the outflow caused serious erosion downstream in Orange and Santa Ana and in portions of parks and golf courses. Trees and debris inundated the streambed. Houses, apartments, gardens, swimming pools, and bridges eroded away. Numerous residents and volunteers, worked around the clock to remove debris, sandbag eroding embankments, cordon off danger zones, issue warnings, and make temporary repairs. U.S. Marine Corps helicopters dropped junked cars along the banks of the creek below Bristol Street in an effort to prevent further undermining of homes. A Southern Pacific Railroad bridge, water and sewer lines, a pedestrian over crossing, and three roads washed out. Approximately 2,000 Orange and Santa Ana residents were evacuated from houses bordering Santiago Creek.

Great Flood of 1983 – The presence of an El Nino weather pattern spawned the flood of 1983. The intense downpour concentrated in a local area and the highest waves to crest on shore in 10 years. Meanwhile, the Santa Ana River crested at the mouth of the ocean; creating a disaster for the low-lying areas of Huntington Beach with floodwaters three to five feet deep. In addition, the pounding surf destroyed a section of the Huntington Beach Pier, resulting in a complete renovation of the pier.

Great Floods of 1993 – In 1993, El Niño spawned a storm and flood. This storm was concentrated in the Laguna Canyon Channel area from Lake Forest to downtown Laguna Beach. In spite of a valiant effort to save downtown merchants by sandbagging, the stores were flooded. Laguna Canyon Road was damaged extensively as well as homes and small businesses in the Laguna Canyon Channel. There were no fatalities reported.

El Niño Storm Season of 1997/1998 - Flooding during the 1997/1998 El Niño Storm Season affected Orange County. Extensive storm damage to private property and public infrastructure (County and Cities) reached approximately $50 million. Storm conditions caused numerous countywide mudslides, road closures, and channel erosion. Hillside erosion and mudslides forced continual clearing of County roads of fallen trees and debris. Protective measures, such as stabilizing hillside road slopes with rock or K-rail at the toe of slopes, were taken to keep the normal flow of transportation on the County's road system. County harbors, beaches, parks, and trails also sustained substantial storm damage.

High ocean waves and storm activity forced the closure of Aliso Beach Pier when it was declared unsafe to the public and as a result, eventually required demolition. The high ocean waves also severely damaged the Laguna Beach boardwalk. Flooding occurred in the city, causing injuries and two deaths as a result of water and mudflow. Lateral erosion occurred to the natural banks of Serrano Creek and Aliso Creek. Storm flows destroyed portions of San Juan Creek and Trabuco Creek levees and channel linings. The U.S. Army Corps of Engineers assumed responsibility for the channel restoration following initial emergency response repairs made by the County. Substantial silt and sedimentation deposits at Santa Ana-Delhi and San Diego Creek Channels contributed to severe dredging problems at the Upper Newport Bay Regional Park, with costs estimated in excess of $2 million. Major landslides in Laguna

Niguel caused millions of dollars in damage. Deterioration and collapse of a culvert 25 feet beneath the asphalt forced closure of Santiago Canyon Road for three weeks.

Assistance from resources such as the U.S. Army Corps of Engineers (USACE) and the Federal Highway Administration minimized the overall reimbursement from FEMA (P.L. 93-288, Stafford Act for Public Assistance). Still, the FEMA/NDAA reimbursement to the County unincorporated area alone still reached approximately $4 million.

Although the 1997/1998 floods resulted in substantial damage to Orange County, it was not unprecedented. In January 1995, a disaster was declared in the County as extremely heavy and intense rains quickly exceeded the storm runoff capacity of local drainage systems in many Orange County cities and regional Flood Control District systems. As a result, widespread flooding of homes and businesses occurred throughout these cities. There were approximately 1000 people evacuated and extensive damage sustained to both private and public property. Unincorporated areas of the county received $12.5 million in reimbursement through Public Assistance programs.

2005 Pineapple Express storms - A series of Pineapple Express storms battered Southern California in January and February 2005. These storms were the biggest to hit Southern California since the El Niño of 1998 and caused mud slides and flooding throughout Orange County. Both state proclamations and federal declarations of disaster were made for these storms. A Pineapple Express is non-technical term for meteorological events characterized by strong and persistent flows of atmospheric moisture. It typically brings heavy precipitation from the tropics around Hawaii, to the west coast of North America.

2.8 Demographics

The U.S. Census Bureau's 2010 decennial census indicates that the population within the SOCWMA was approximately 550,000. The total population within Orange County is 3,010,000. The population in South Orange County is somewhat older with approximately 14% aged 65 or older, compared to 11.9% for Orange County as a whole, and 11.7% for the entire state of California. The population within SOCWMA is 68% white, 18% Hispanic/Latino, 8.6% Asian, and 1.2% black.

2.9 Land Use

To determine land use patterns within the SOCWMA, a GIS analysis of 2008 Southern California Association of Governments (SCAG) land use data was performed along with an aerial review to highlight patterns and trends. SCAG data can be requested on the website "http://www.scag.ca.gov/". The SOCWMA includes 157,166 acres of South Orange County, totaling approximately 31% of Orange County. The SOCWMA consists of primarily vacant undeveloped land, which comprises 52% of the total area, mostly in the hills and rugged mountains in the east. A further 17% has been set aside as Open Space and/or Recreation. The single largest urban land use is by far residential which occupies 19% of the area. Commercial type properties, general office, retail, and education facilities occupy 5%, with the remaining 7% a mix of various land uses, most of which is transportation, communications, and utilities (2.8%). Some of the larger existing commercial centers, much of it retail businesses, reside along Oso Creek, Lower San Juan Creek, and along Narco Channel. There is very little industrial land use in South Orange County, comprising only 1.6% of the SOCWMA. Future land developments are expected to

expand in a similar pattern of ratios with expected future developments including Baker Ranch in Lake Forest, and Rancho Mission Viejo along Ortega Highway. Figure 2-3 shows land use patterns in the SOCWMA area.

Within the local cities, population density ranges from approximately 2,500 to 6,400 people per square mile. An aerial review shows that those cities with almost entirely urban landscapes and little undeveloped incorporated land, tend toward 5,000-6,000 people per square mile. Figure 2-4 shows the population density of 2010 census tracts.

Early urbanization of the area began in low lying valleys and floodplains, or other flat terrain, in San Juan Capistrano, Laguna Beach, and some areas of Dana Point and San Clemente. These areas are the most susceptible to flooding in South Orange County. As urbanization has continued, most development moved to the local hills, ridges, and some smaller valleys in the hills. The majority of the urbanized landscape is now located in these local hills, ridges, and smaller valleys where flooding tends to be more local and short lived.

Figure 2-3: Land Use

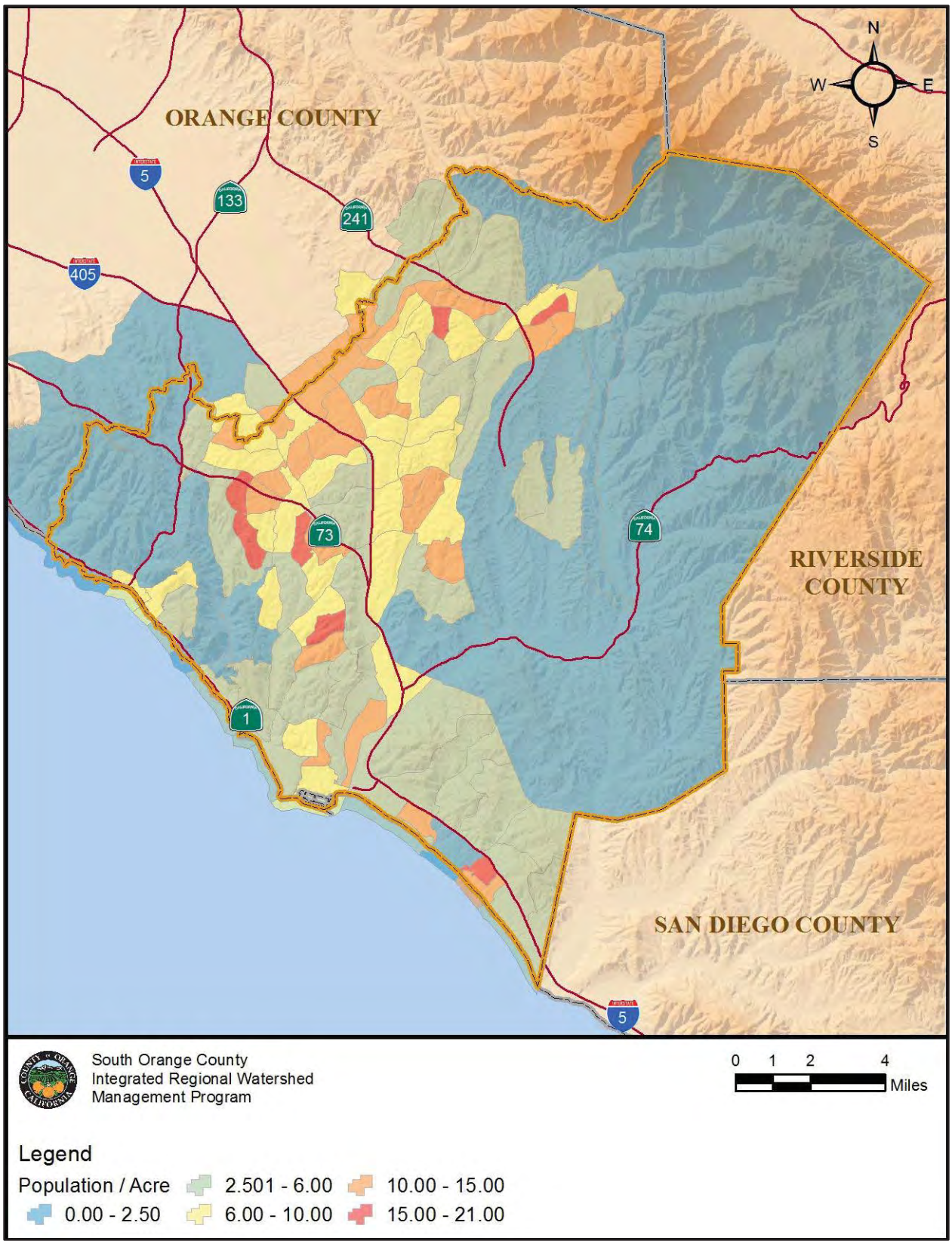

Figure 2-4: Population Density by Census Tract

2.10 Economy

This region of South Orange County is primarily a suburb community with residents commuting to employment concentration centers, particularly in and around Irvine where there is a heavy concentration of corporate and regional headquarters for many major companies. Commuters also travel to central and north Orange County, Los Angeles County, Riverside County, San Bernardino County, and San Diego County. The local economy is primarily service and consumer driven with many local shopping centers. Potential disruption by flooding may have its largest disruptions in transportation. Only interstate 5 transits the lower part of the SOCWMA before branching off to the 73 toll road, and only a single rail line passes through. Flooding of local roadways and possible disruption to major transit arteries that often follow local valleys can cause further impediments to commuters attempting to exit, enter, or move throughout the region.

2.11 Regional partners and their respective jurisdictions, roles and responsibilities

In South Orange County, flood management is led by OCFCD. The cities, water districts, and local emergency responders also have flood management responsibility. The following table identifies the flood management partners, their jurisdictions, and responsibilities.

Table 2-1: Flood Management Partners in South Orange County

Agency	Jurisdiction within Orange County	Responsibilities
County / City partners		
Orange County Flood Control District	Includes all of South Orange County	Inspection, maintenance, storm patrol, emergency response, and recovery for all regional facilities owned or contracted out to OCFCD.
City of Aliso Viejo	7.5 square mile area with a population of approximately 47,800	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Dana Point	6.5 square miles area with a population of approximately 33,300	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Laguna Beach	8.8 square mile area with a population of approximately 24,900	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Laguna Hills	6.7 square mile area with a population of approximately 30,300	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Laguna Niguel	14.8 square mile area with a population of approximately 63,000	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Laguna Woods	3.1 square mile area with a population of approximately 16,200	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Lake Forest	17.8 square mile area with a population of approximately 77,300	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Mission Viejo	17.7 square mile area with a population of approximately 93,300	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of Rancho Santa Margarita	13.0 square mile area with a population of approximately 47,900	Inspection, maintenance, storm patrol, emergency response, and recovery for all local

Agency	Jurisdiction within Orange County	Responsibilities
		facilities.
City of San Clemente	18.7 square mile area with a population of approximately 63,500	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
City of San Juan Capistrano	14.1 square mile area with a population of approximately 34,600	Inspection, maintenance, storm patrol, emergency response, and recovery for all local facilities.
Water District partners		
El Toro Water District	Provides water service to approximately 52,170 residents situated on 8.5 square miles. Serviced communities include Aliso Viejo, Lake Forest, Laguna Hills, Laguna Woods, and portions of Mission Viejo.	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Irvine Ranch Water District	Provides water services to 330,000 residents in Central Orange County over nearly 181 square miles. IRWD serves the city of Irvine and portions of Tustin, Newport Beach, Costa Mesa, Orange, and Lake Forest, Santa Ana, and unincorporated Orange County.	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Laguna Beach County Water District	Provides water services to 25,000 people within an 8.5 square mile area of Southern Orange County, including portions of the city of Laguna Beach, a portion of Crystal Cove State Park, and the unincorporated community of Emerald Bay.	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Moulton Niguel Water District	Serves approximately 166,964 residents in an area of 36.5 square miles and includes the City of Laguna Niguel and portions of the cities of Laguna Hills, Mission Viejo, Dana Point, and Aliso Viejo.	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Municipal Water District of Orange County	Provides imported water to more than two million Orange County residents through 27 cities, water districts, and two private water	Support of member agencies through the WEROC program.

Agency	Jurisdiction within Orange County	Responsibilities
	companies. MWDOC's service area is a total of a 600 square miles	
San Clemente Utilities Division	Service area of 14.2 square miles within the City of San Clemente. With a population of approximately 59,000	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
City of San Juan Capistrano Water Services	Services an area of approximately 14.4 square miles with a population is 37,233 in the City of San Juan Capistrano.	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Santa Margarita Water District	Serves a population of 150,000 over 62,000 acres. Communities serviced include Rancho Santa Margarita, Los Flores, Coto de Caza, Mission Viejo, Ladera Ranch and Talega	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
South Coast Water District	Serves approximately 45,000 residents including Dana Point and portions of Laguna Beach	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
South Orange County Wastewater Authority	Serves approximately 520,000 residents in a 220 square mile service area which is roughly co-terminus with the area of the IRWM Plan. SOCWA operates four regional wastewater treatment plants and two ocean outfalls. SOCWA is a Joint Powers Authority with 10 member agencies.	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Trabuco Canyon Water District	It serves an estimated population of 13,665 over 9,100 acres in the City of Rancho Santa Margarita and unincorporated area of the County	Inspection, storm patrol, emergency response, and recovery of water district facilities impacted by floodwaters.
Emergency Responder partners		
Orange County Sheriff Department	Includes all of South Orange County	Leads the Emergency Operations Center (EOC) which is activated in all significant events
Orange County Fire Authority	Includes all of South Orange County	Part of the response team supporting the EOC
Water Emergency Response Organization of Orange County (WEROC)	Includes all of South Orange County	Coordinates water district responses including sharing of equipment

3.0 Assessments of Flood Hazards

Orange County is located on a semi-arid coastal plain and normally receives approximately 12 inches of rainfall annually. Eighty percent (80%) of this typically occurs between December and March. The infrequency of very large floods tends to obscure the County's flood hazard. Storms labeled “severe” have occurred in less than 10 of the past 175 years. In particularly disastrous storms, a false sense of security prevailed following long periods of mild semi-arid years.

The County’s rapid growth and transformation from an agricultural community to an urban community has changed flood control of large flows from mountains and hills to include control of additional runoff produced by development of the plains. Although there is a countywide system of flood control facilities, some of these facilities are inadequate for conveying runoff from major storms, such as the Standard Project Flood or the 100-year flood.

3.1 Assets

Figure 3-1 identifies the regional flood control channel facilities that are located within the SOCWMA. This figure also shows the ownership along reaches of each flood control facility. Appendix A includes more detailed maps of the SOCWMA facilities and ownership.

Subsequent updates to this Flood Plan will identify the agency with maintenance responsibility for each reach of facility. While the ownership and maintenance responsibility often lies with the same agency, there are exceptions to this.

In addition to the flood control channel facilities, 11 dams are located in the SOCWMA that contribute to the flood protection. Inundation areas related to a dam break have been identified and incorporated into the County Emergency Response Plan. These dams are show in Appendix A.

Figure 3-1: SOCWMA Facilities and Ownership

3.2 Flood Hazard Analysis

As part of this Integrated Regional Water Management Plan (IRWMP) Flood Plan, an analysis of the risk to human life and property were analyzed based on the 100-year and 500-year floodplains shown on the National Flood Insurance Rate Maps (FEMA, 2012), and HAZUS (Hazards-United States) economic data. The FEMA maps can be accessed via the following website: https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView

GIS spatial analysis was conducted using these two datasets to determine both the average population densities and average structure values, per mile of stream channel, within the floodplain boundaries in the SOCWMA. The FEMA maps show the extent of expected flooding due to 100-yr and 500-year flood events (areas protected by levees were omitted), while the HAZUS is a census track level economic database used for earthquake, hurricane, and flood damage modeling by FEMA. The spatial analysis consisted of overlaying the population and value of census tracks over the FEMA mapped floodplains. The average population and property structure value for each river reach was extracted through the GIS analysis.

The following table shows the results of this HAZUS GIS analysis. Figure 3-2 indicates the location of the sites/streams in the results table. Appendix B includes a series of maps that depicts these results.

Table 3-1: HAZUS GIS Analysis

ID	STREAM NAME (River Reach Area)	REACH LENGTH (mi)	VALUE PER MILE (Thousand $)	POPULATION PER MILE	CITY
1	Segunda Deshecha (Upper) (M02)	0.41	$1,633	7	San Clemente
2	Segunda Deshecha (Middle) (M02)	0.61	$10,510	12	San Clemente
3	Segunda Deshecha (Lower) (M02)	0.14	$2,084	5	San Clemente
4	Prima Deshecha (Lower) (M01)	0.42	$7,468	31	San Clemente
5	Prima Deshecha (Upper) (M01)	1.33	$39,586	272	San Clemente
6	Arroyo Salada (J03P01)	0.17	$936	6	Laguna Niguel
7	Rim Rock Canyon (I02)	0.97	$375	2	Laguna Beach
8	Aliso Creek (Lower 2) (J01)	0.28	$214	2	Laguna Beach
9	Bluebird Canyon (I00P03)	0.12	$936	6	Laguna Beach
10	Aliso Creek (Lower 1) (J01)	0.64	$0	0	Laguna Beach
11	Laguna Canyon (Middle-Upper) (I02)	3.76	$43,537	189	Laguna Beach, Unincorporated
12	Laguna Canyon (Lower) (I02)	0.36	$50,755	71	Laguna Beach
13	Narco Channel (Middle) (J04)	0.33	$20,261	163	Laguna Niguel
14	Narco Channel (Lower) (J04)	0.94	$39,642	51	Laguna Niguel
15	Aliso Creek (Middle) (J01)	0.37	$8,522	65	Lake Forest, Mission Viejo, Laguna Woods

ID	STREAM NAME (River Reach Area)	REACH LENGTH (mi)	VALUE PER MILE (Thousand $)	POPULATION PER MILE	CITY
16	Oso Creek (Upper Trib) (L03)	1.44	$17,849	0	Mission Viejo
17	Oso Creek (Lower) (L03)	1.62	$342,177	9	Laguna Niguel, Mission Viejo
18	Hickey Canyon (n/a)	1.03	$2,488	13	Unincorporated
19	Horno Creek (n/a)	0.83	$24,823	124	San Juan Capistrano
20	San Juan Creek (Middle) (L01)	1.52	$238,602	1330	San Juan Capistrano
21	San Juan Creek (Lower) (L01)	1.38	$148,905	1440	Dana Point, San Juan Capistrano
22	Camino Las Ramblas Channel (L01S02)	0.47	$36,063	42	San Juan Capistrano
23	San Juan Creek (Upper) (L01)	0.26	$2,622	19	San Juan Capistrano
24	Aliso Creek (Upper 2) (J01)	0.23	$5,014	57	Lake Forest
25	Aliso Creek (Upper 1) (J01)	0.35	$6,840	17	Mission Viejo
26	Narco Channel (Upper) (J04)	0.18	$585	0	Aliso Viejo, Laguna Hills

By far, the greatest population and value at risk are those adjacent to San Juan Creek (Lower (#21) and Middle (#20)), with Oso Creek (Lower) also having a high value at risk. Other high risk areas include Upper Prima Deshecha (#5), Upper and Middle Laguna Canyon (#11), and Horno Creek (#19). These facilities are discussed specifically in Section 3.4 – Regional Flood Hazard Risk. Note that the results of these analyses are based on existing FEMA flood area delineations and census data. Improvements to flood control not currently accounted for by FEMA, or expected future changes based on future improvements, or other changes such as in zoning, are not accounted for in this analysis.

Figure 3-2: Flood Hazard Analysis Sites

3.3 Deficiency Analysis

OCFCD has performed analyses (i.e. Deficiency Studies) to identify the adequacy of specific reaches of flood control facilities, largely focused on those reaches operated and maintained by OCFCD. In many cases the analysis was approximate in nature and intended to guide the internal process for prioritizing additional study needs. The results of those Deficiency Studies were reviewed and facility reaches were assigned one of the following categories:

- Adequate – Reaches in which the facility's existing capacity is 100% or greater of the facility's ultimate condition 100-year flow capacity (ultimate design discharge), and a determination has been made that adequate freeboard is provided by the system.
- Marginally Adequate – Reaches in which the facility's existing capacity is between 90% and 100% of the ultimate design discharge.
- Deficient – Reaches in which the facility's existing capacity of the system is less than 90% of the ultimate design discharge.

The following summary table was generated based on the information in the Deficiency Studies. This information is intended to provide a big picture perspective of the adequacy or deficiencies of general reaches of the regional facilities. In situations where a small reach had a different conveyance capacity (e.g. at a bridge crossing), that small reach was simply incorporated into the adjacent reach and not called out with a changed capacity. This is consistent with the purpose of this table which is to provide general, approximate information on the adequacy of a given reach. Again, it is stressed that this is for overall planning purposes and any future improvement considerations should begin with a more detailed assessment of the adequacy of the target reach.

This table is not intended to characterize the capacity of natural watercourses. No analysis was done in those reaches to assess the capacity.

Table 3-2: Conveyance Capacity Category

Facility Reach (length)	**Category**
Emerald Bay Channel – Facility H05	
Pacific Ocean to Culvert (90')	Adequate
Laguna Canyon Channel – Facility - I02	
Pacific Ocean to Dog Park Basin (12,600'[1,2])	Deficient
Aliso Creek – Facility J01	
Aliso Creek Road to Pacific Park Drive (1,000')	Marginally Adequate
Moulton Parkway to 48" RCP approximately 1,400 feet upstream of San Diego Freeway (5,000'[1])	Adequate
48" RCP approximately 1,400' upstream of San Diego Freeway to Los Alisos Blvd (1,800')	Deficient
Los Alisos Blvd to Muirlands Blvd Bridge (1,800')	Marginally Adequate
AT&SF RR to 2nd Street Bridge (1,900')	Adequate
El Toro Road Crossing to approximately 500' upstream of Portola Parkway (7,000'[1])	Adequate

Facility Reach (length)	**Category**
Sulphur Creek –Facility J03	
Downstream of Sulphur Creek Reservoir to 1,475 feet upstream (1,475')	Marginally Adequate
Central Park Drive to Greenfield Drive (12,200')	Deficient
Narco Channel – Facility J04	
Alicia Parkway to San Joaquin Hills Transportation Corridor (9,700')	Deficient
Aliso Hills Channel – Facility J05	
1,100 downstream Moulton Parkway to Moulton Parkway (1,100'[1])	Marginally Adequate
Dairy Fork Channel – Facility J06	
500' downstream of Aliso Viejo Parkway to Aliso Viejo Parkway (500')	Deficient
English Canyon Channel – Facility J07	
Aliso Creek confluence to Entidad (4,300'[1])	Deficient
Salt Creek Channel – Facility K01	
Pacific Ocean to Camino del Avion (5,300')	Deficient
San Juan Creek Channel – Facility L01	
Pacific Coast Highway to I-5 (13,000')	Deficient
La Novia to 1,000' upstream of Antonio Parkway (12,700')	Adequate
Channel reach above Caspers Park (2,900')	Adequate
Trabuco Creek Channel – Facility L02	
San Juan Creek confluence to 2,400' upstream of Rancho Viejo Road (17,800')	Marginally Adequate
Foothill Transportation Corridor to Trabuco Canyon Road (5,800')	Deficient
Oso Creek Channel – Facility L03	
Confluence with Trabuco Creek to 1,300' downstream of San Joaquin Hills Transportation Corridor (2,800')	Adequate
1,300' downstream of San Joaquin Hills Transportation Corridor to 1,500' upstream of Paseo de la Colinas (3,300')	Marginally Adequate
1,500' upstream of Paseo de la Colinas to San Diego Freeway (5,200'[1])	Adequate
San Diego Freeway to Jeronimo Road (13,900')	Deficient
Jeronimo Road to La Barca (4,600'[1])	Adequate
La Barca to 1,000' upstream of La Barca (1,000')	Marginally Adequate
1,000' upstream of La Barca to 1,500' upstream of La Barca (500')	Deficient
1,500' upstream to 1,800' upstream of La Barca (300')	Marginally Adequate
La Paz Channel – Facility L04	
Oso Creek confluence to 500' upstream of Montilla Lane (7,800'[1])	Deficient
Horno Creek Channel – Facility L05	
San Juan Creek confluence to Covenant Hills Drive (3,600'[1])	Adequate
Canada Chiquita Channel – Facility L06	
Tesoro Creek Road to Oso Parkway (1,900'[1])	Adequate
Canada Gobernadora – Facility L07	
No deficiency study available	Not available
Tijeras Canyon Channel	
Avenida Empressa to Plano Trabuco Road (7,400')	Deficient
Prima Deshecha Channel – Facility M01	
Pacific Coast Highway to Diamante (8,100'[1])	Deficient
Segunda Deshecha Channel – Facility M02	

Facility Reach (length)	Category
Pacific Ocean to El Camino Real (500')	Adequate
El Camino Real to San Diego Freeway (4,300')	Marginally Adequate
Avenida Pico to Avenida La Pata (5,400'[1])	Adequate

Note 1 - reach includes natural watercourse length for which no analysis was done to assign a category. That length is NOT included in the total length provided.

Note 2 - In the winter of 2012, the City of Laguna Beach experienced flooding in its downtown area along Laguna Canyon Channel. The 1985 Project Report for Laguna Canyon Channel, in coordination with the U.S. Army Corps of Engineers and Caltrans proposed a triple box culvert along Broadway and a double box along Ocean Avenue. The cost of this project was estimated at $31 million in 1985 dollars.

The reaches within SOCWMA where a deficiency in the system exists along the longest length are Laguna Canyon Channel (I02), Sulphur Creek Channel (J03), Narco Channel (J04), and Oso Creek Channel (L03). These reaches are further discussed in Section 3.4.

3.4 Regional Flood Hazard Risk

While there is some agreement in the conclusions from the Flood Hazard Analysis (Section 3.2) and the Deficiency Analysis (Section 3.3), these two analyses do not provide the exact same conclusions. The Flood Hazard Analysis shows high levels of risk in relatively fewer locations than the deficiency analysis. This is largely attributed to the fact that the flows considered in the Flood Hazard Analysis and in the Deficiency Analysis are from two separate sources. The Flood Hazard Analysis uses flows adopted by FEMA while the Deficiency Analysis uses flows adopted by OCFCD. In general, the OCFCD flows are higher than the FEMA flows.

3.4.1 San Juan Creek and Trabuco Creek Channels

The greatest flood risk reflected in the Flood Hazard Analysis is along San Juan Creek within the Cities of San Juan Capistrano and Dana Point. The population at risk is significantly higher than that along any other flood control facility in the SOCWMA. The reach of San Juan Creek from the ocean to I-5 was identified as deficient in the Deficiency Analysis.

The OCFCD is the local sponsor for the San Juan Creek Watershed Study currently being prepared by the USACE. The study encompasses the area from the Pacific Ocean to the I-5 Freeway including the Trabuco Creek Channel confluence to upstream of Del Obispo Street addressing issues related to sedimentation transport, ultimate design for the conveyance of the 100-year storm, and environmental habitat. However, implementation of this study might take many years.

Over the years San Juan Creek Channel sustained numerous damages caused by heavy storms, with the most recent damages occurring a few days apart in January 2005. During the 2010 storm events Trabuco Creek from Del Obispo and the confluence with San Juan Creek suffered damages. The damaged portions of the creek's levees (both San Juan and Trabuco) were promptly repaired following the storms. However, despite these repairs, significant portions of the levees remain vulnerable to failure during major storm events while the creek's capacity remains deficient to convey the 100-year storm. OCFCD focused its resources on a levee fortification program providing immediate protection against catastrophic levee failure. The levee reinforcement program includes the creek segment from Stonehill

Drive to the I-5 Freeway and from Trabuco Creek Channel from its confluence with San Juan Creek Channel to 1,600 feet upstream of Del Obispo Bridge. The project has been divided into eight (8) project segments within both San Juan Creek and Trabuco Creek Channels. The program was initially scheduled to be completed over the next five years; however, OCFCD is awaiting completion of the feasibility study currently being prepared by the USACE. The study focuses on flood risk management and potential ecosystem restoration opportunities on the lower reaches of the San Juan Creek Watershed (including San Juan Creek, Trabuco Creek and Oso Creek). This study is a "spin-off" study of the comprehensive San Juan Creek Watershed Feasibility F5 Study prepared by the Corps in August 2002.

The phases that include installation of the steel sheet pile wall on both sides of the levee from 1,700 feet upstream of Stonehill Drive to upstream of the confluence with Trabuco Creek Channel and have the highest priority for completion. Construction began in December 15, 2008. The remaining segments, to be constructed in the next few years, have been prioritized based on the District's funding allocation. Following these improvements, a second phase will begin which includes additional construction needed to raise the level of protection to the desired 100-year level and certify the levee and remove adjacent areas out of the Federal Emergency Management Agency's (FEMA) floodplain designation.

3.4.2 Prima Deshecha Channel

The high risk along this channel in the City of San Clemente is reflected in both the Flood Hazard Analysis and the Deficiency Analysis. Future actions will be identified to further analyze the consequences of the risk in this reach and the potential improvements to mitigate the risk. There is currently no specific project identified in the OCFCD 7-year plan along this channel. (NEED CITY input if there is any plans).

3.4.3 Laguna Canyon Channel

The high risk along this channel in the City of Laguna Beach and unincorporated areas of Orange County is reflected in both the Flood Hazard Analysis and the Deficiency Analysis. A future OCFCD project (included as a Qualified Future Project on the Capital Improvement Plan) will further analyze the consequences of the risk in this reach and the potential improvements to mitigate the risk.

3.4.4 Horno Creek

This channel was identified as a high risk area in the Flood Hazard Analysis; the Deficiency Analysis indicates this reach is adequate. This reach is owned by private parties and by the Capistrano Unified School District. This reach experienced flooding in the 2010 storm events. Future actions will be identified to further analyze the consequences of the risk in this reach and the potential improvements to mitigate the risk. There is currently no specific project identified in the OCFCD 7-year plan along this channel.

3.4.5 Narco Channel

The high risk along this channel within the City of Laguna Niguel is reflected in both the Flood Hazard Analysis and the Deficiency Analysis. Future actions will be identified to further analyze the consequences of the risk in this reach and the potential improvements to mitigate the risk. There is currently no specific project identified in the OCFCD 7-year plan along this channel

3.4.6 Sulphur Creek Channel and Oso Creek Channel

These channels within the Cities of Laguna Niguel, San Juan Capistrano, and Mission Viejo were identified as having a high risk as part of the Deficiency Study but not in the Flood Hazard Analysis. As explained previously, the difference in discharge used in the two analyses is likely the cause of the discrepancy. Future actions will be identified to further analyze the consequences of the risk in this reach and the potential improvements to mitigate the risk. There is currently no specific project identified in the OCFCD 7-year plan along either of these channels.

4.0 Proposed Regional Improvements

Regional improvements can broadly be divided into management actions and proposed projects. The following sections discuss both types of improvements.

4.1 Management Actions

Management Actions used throughout the SOCWMA focus on mitigating the risk. Two significant ways this is done is via the purchase of flood insurance and Hazard Mitigation Planning including constructing the ultimate channel improvement to convey the 100-year storm flow, and for the local jurisdictions to preserve or purchase land within the influence of the FEMA Special Flood Hazard Area as open space prohibiting development in perpetuity.

4.1.1 Flood Insurance

All of SOCWMA participates in the FEMA National Flood Insurance Program (NFIP). As part of this program each community adopts floodplain ordinances that govern management of the floodplain. Participation in this program makes the purchase of flood insurance available for purchase throughout the community. Additionally FEMA has a Community Rating System (CRS). Participation in this program allows for reductions in the flood insurance premium throughout the community. Premium reductions are based on the CRS class which ranges from 1 to 10 with a Class of 1 being the best. The following table identifies the CRS rating for each community within SOCWMA. "N/A" indicates that the community is not participating in the CRS and no insurance premium reductions are offered.

Table 4-1: CRS Status

Community	CRS Class	Premium Reduction
City of Aliso Viejo	N/A	N/A
City of Dana Point	N/A	N/A
City of Laguna Beach	N/A	N/A
City of Laguna Hills	N/A	N/A
City of Laguna Niguel	N/A	N/A
City of Laguna Woods	N/A	N/A
City of Lake Forest	N/A	N/A
City of Mission Viejo	8	10%
City of Rancho Santa Margarita	N/A	N/A

Community	CRS Class	Premium Reduction
City of San Clemente	N/A	N/A
City of San Juan Capistrano	9	5%
Unincorporated Orange County	6	20%

4.1.2 Hazard Mitigation Plans

Development of Hazard Mitigation Plans is another management action aimed at mitigating risk in the planning area. These plans generally focus on various types of hazardous risk that are likely in the planning area. These natural hazards include flood/storm, wildland/urban fires, earthquake, dam failure, landslide/mudslide, tsunami, and drought. Participation in a HMP also allows the participating agencies to pursue grant funding through FEMA (discussed further in Section 8.0).

Table 4-2: Hazard Mitigation Plan Status

Participating Jurisdiction	Date	Status
City of Laguna Woods	10/29/12 (draft)	Updating
City of Mission Viejo	02/02/2007	Updating
City of San Clemente	09/03/2004	Expired
City of San Juan Capistrano	07/20/2007	Expired
ETWD, IRWD, MNWD, MWDOC, SMWD, SCWD, SOCWA	02/2012	Submitted
Unincorporated areas of Orange County, Orange County Sheriff Department*	11/2010	Active

*Plan includes County owned and maintained facilities.

4.2 Projects

Specific structural improvement projects have been identified within SOCWMA that will support flood risk reduction throughout the SOCWMA. The following table summarizes those projects.

Table 4-3: Flood Risk Reduction Projects in SOCWMA

Project Name	Lead Agency	Notes
City of Laguna Beach Animal Shelter Laguna Canyon Creek Erosion Protection	City of Laguna Beach	This project will investigate suitable erosion control systems and provide for design and construction of the improvements. Cost: $400,000; Schedule: 1/1/2014
Laguna Channel Capacity Improvements Preliminary Design	City of Laguna Beach	The portion of Laguna Canyon Channel under Coast Highway is a choke point that can be enlarged by 30% to match the capacity of the upstream portion between Coast Hwy and Beach Street. This project is a preliminary design that

Project Name	Lead Agency	Notes
		will include preliminary geotechnical evaluation, utility location, a traffic management plan for construction, a project study report, environmental documentation and permitting. Cost: $300,000; Schedule: 1/1/2014
Laguna Canyon Channel Hydraulic Improvement and Diversion Unit at Beach Street	City of Laguna Beach	Laguna Channel frequently overflows at Beach Street causing extensive flooding in the Downtown area. This study would develop options for diverting and containing the overflow of surface water down Broadway Street. The preliminary design would include environmental documentation and a Coastal Development permit. Cost: $15,000; Schedule: 1/1/2014
Laguna Canyon Road Dewitt Property Wetlands	City of Laguna Beach	This project will expand and enhance the wetland area northerly of Phillips Road to 20062 Laguna Canyon Road for flooding and water quality improvements. This project provides funding for conceptual design and entitlements. Cost: $25,000; Schedule: 1/1/2014
Laguna Canyon Creek Habitat Restoration Project	City of Laguna Beach	The City of Laguna Beach has completed an initial study of the Laguna Creek and a conceptual plan of restoration opportunities. The study Hydrogeomorphic Method (HGM) assessment determined that the creek is now functioning at about 50 percent of its overall habitat, biological, and hydrological functional capacity. The proposed project will build on the initial study results to prepare the necessary watershed assessment, technical studies, permits, environmental documents and final design plans and specifications for construction of the multi-beneficial restoration work. Cost: $450,000
San Juan Creek Channel	OCFCD	See Section (3.4.1) for additional details
Trabuco Creek Channel	OCFCD	See Section (3.4.1) for additional details

Project Name	Lead Agency	Notes
Aliso Creek through Aliso Creek golf course	SOCWA	Protection for the land outfall line
Aliso Creek through the Aliso Wood Canyon Wilderness Park	SOCWA	2 high risk erosion areas at the confluence with Sulphur Creek and downstream of the ACWHEP structure
Aliso Creek and Moulton and Alicia Parkway	SOCWA	2 locations of exposed pipe encasements
Narco Channel	SOCWA	Erosion near 73 Toll Road
Groundwater Facility Protection San Juan Creek	SCWD	Protection for Groundwater Recovery Facility at Stone Hill and San Juan Creek
Recycled Water Facilities Protection Aliso Creek	SCWD	Protection of Pipelines and Pump Station along and adjacent to the mouth of Aliso Creek at PCH
North Coast Interceptor Force Main Protection Project	City of Laguna Beach	Protection of NCI sewer force main located within Aliso Creek
Maintenance Facility, Road, Interceptor Sewer, Lift Station and Force Main Protection Project	SCWD	Protection for sewer lift station, maintenance facility, pipelines, force main, and road immediately adjacent to and facilities within Aliso Creek between Aliso Beach and the Coastal Treatment Plant
San Juan Creek Property	SCWD	Protection for District Road, access right of way and Property owned adjacent to San Juan Creek between Stone Hill Road and PCH in Dana Point
San Juan Creek Parks, Bridge, Trails and Highways	City of Dana Point	Protection of PCH bridge crossing of San Juan Creek, adjacent pedestrian bridges and trails at south access to City of Dana Point

5.0 Regional Priorities

It is anticipated that further development of this Flood Plan will lead to the identification of additional Regional Improvements, both Management Actions and Proposed Projects. As this strategy develops further, the improvements will be prioritized.

6.0 Operations & Maintenance

Operation and Maintenance (O&M) activities are performed by the OCPW O&M staff on regional facilities owned by OCFCD or contracted by local jurisdictions. OCFCD O&M inspectors are very familiar with their assigned areas and can respond quickly to any issues related to OCFCD facilities. City staff and contracted support provide O&M activities for local facilities. O&M is performed on a regular basis. Subsequent updates to this Floodplain Plan will provide details on the scheduling of maintenance activities, the maintenance responsibility, and typical practices that are in place.

7.0 Emergency Response

The County of Orange Operational Area Emergency Operations Plan (EOP, May 2009) provides the county-wide plan for coordinating responses and recovery operations within Orange County. It is based on the Incident Command System (ICS) and National Incident Management Systems (NIMS). The Emergency Operations Center (EOC) is the central point in managing all county responses to major disasters. In response to a flooding disaster, the EOC (within the Emergency Management Division (EMD) of the Sheriff's Department) is activated when the Orange County Public Works (OCPW) Storm Operation Center (SOC) requests activation through the EMD.

To provide quantitative information for flood warning and detection, the County of Orange began installing its ALERT (Automated Local Evaluation in Real Time) system in 1983. Operated by the County's Environmental Monitoring Section of OCPW in cooperation with the National Weather Service, ALERT uses remote sensors located in rivers, channels and creeks to transmit environmental data to a central computer in real time. Sensors have been installed along the Santa Ana River, San Juan Creek, Arroyo Trabuco Creek, Oso Creek and Aliso Creek, as well as other flood control channels and basins. The field sensors transmit hydrologic and other data (e.g., precipitation data, water levels, temperature, wind speed, etc.) to base station computers for display and analysis. In addition, six pump stations (Huntington Beach, Cypress, Seal Beach, Los Alamitos, Harbor-Edinger, and South Park [none of which are in the SOCWMA area]) regulating storm water discharge to flood control channels are also instrumented. Their monitoring system includes automated call-out of operations personnel in the event of a problem.

The Storm Operation Center is activated when heavy rainfall occurs or is predicted, and/or when storm run-off conditions indicate probable flood damage. The Storm Center monitors the situation on a 24-hour basis, and response may include patrols of regional flood control channels, and deployment of equipment and personnel to reinforce facilities if needed. Storm Center activation and various emergency response actions are based on the following Emergency Readiness Stages:

Stage One: Mild rainfall occurs. OCPW O&M personnel monitor the situation.

Stage Two: Heavy rainfall or potential heavy rainfall. The SOC at Glassell is activated by O&M who is in control of the SOC. O&M notifies OC Public Works Director and OC Sheriff EMD of facility status. River/Creek Patrols area activated for all OC Public Works facilities.

Stage Three: Heavy rain continues or deterioration of OC Public Works facilities. OC Public Works contacts EMD at their discretion to recommend activation of EOC. When EOC is active, EOC is in command. WEROC is notified and activated when water utilities are impacted.

Stage Four: Local Emergency. Likely extensive damage to public facilities or localized flooding may occur. Manager of EMD coordinates the Local Emergency Proclamation. EOC coordinates response activities. WEROC works with the water utilities to coordinate response and share resources.

Stage Five: State Emergency. Governor proclaims "State of Emergency" when additional provisions are needed.

Stage Six: Federal Disaster. The President declares a federal disaster which allows for federal assistance (normally financial reimbursement).

Local flood facilities are managed by the Cities during flood events. In some Cities, this is done via private contracts or contracting through the OCPW-FCD. Cities can also partner with the local water districts for support in responding to storm related action.

8.0 Regional Financial Plan

As discussed in Section 5.0 Regional Priorities, it is expected that the strategy for a flood safe region will continue to develop through the identification of appropriate management actions and proposed projects. It is expected that the projects identified and those that will be identified in the future will be funded through a combination of local revenues and grant funding from both State and Federal agencies. Grant funding programs that have been considered within SOCWMA or are appropriate for consideration include the following.

OCFCD continues its efforts to raise the level of protection in Orange County to the 100-year level. It is currently estimated that over $2.5 billion of capital project expenditures are required for completion of all regional Flood Control improvements within the County. Of the total expenditures required, $0.5 billion would fund projects within the SOCWMA. OCFCD continues to work with the US Army Corps of Engineers on the San Juan Creek Watershed to determine Federal interest in funding up to 65 percent of construction costs. Absent this assistance, it would take over 25 years to provide necessary protection to this watershed.

OCFCD works with other counties and flood management entities to monitor potential State and Federal efforts to raise the flood protection levels to as high as a 500-year storm frequency level. Even increasing the level of protection to a 200-year level could place over 18 cities countywide in a newly defined floodplain. If adopted by FEMA, this would require additional residents, businesses and property owners to purchase flood insurance.

8.1 Bond Programs

The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84) authorizes $5.388 billion in general obligation bonds to fund safe drinking water, water quality and supply, flood control, waterway and natural resource protection, water pollution and contamination control, state and local park improvements, public access to natural resources, and water conservation efforts.

The Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E) authorizes $4.09 billion in general obligation bonds to rebuild and repair California's most vulnerable flood control structures to protect homes and prevent loss of life from flood-related disasters, including levee failures, flash floods, and mudslides and to protect California's drinking water supply system by rebuilding delta levees that are vulnerable to earthquakes and storms. Proposition 84 enhances these efforts with an additional $800 million for flood control projects.

The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (Proposition 50) implements Chapter 6 (a) of Proposition 50 (Water Code Section 79545 (a) and provided $3.44 billion general obligation bonds to fund a variety of water projects, including: Specified CALFED Bay-Delta Program projects including urban and agricultural water use efficiency projects; Grants and loans to reduce Colorado River water use; Purchasing, protecting and restoring coastal wetlands near urban areas; Competitive grants for water management and quality improvement projects; Development of river parkways; Improved security for state, local and regional water systems; and Grants for desalination and drinking water disinfection.

The Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act of 2000 (Proposition 13)authorized $1.97 billion to provide funds for a safe drinking water, water quality, flood protection, and water reliability program.

8.2 Funding Programs

Implementation Integrated Regional Water Management Program (Proposition 84) This program funds projects ready for or nearly ready to proceed to implementation, engaged in the IRWM Planning process with the South Orange County WMA, Urban and agricultural water conservation projects necessary to meet a 20% reduction in per capita water use by the year 2020, projects that address critical water supply or water quality needs for Disadvantaged Communities (DACs), where feasible. In 2011, the South Orange County WMA was awarded a Proposition 84 IRWM Round 1 Implementation Grant for $2,316,780 for the following three projects: South Orange County Water Smart Landscape (WSL) Project, Rockledge Ocean Protection Project – City of Laguna Beach, Shadow Rock Detention Basin Project – Trabuco Canyon Water District. In 2013, a grant request for Round 2 Implementation Grants of $1.7 million was submitted for the following four projects: Municipal Water District of Orange County's Comprehensive Landscape Water Use Efficiency Program; Audubon Starr Ranch Sanctuary's Riparian

Invasion Control, Restoration, Monitoring, and Education Project; Irvine Ranch Water District's Baker Water Treatment Plant; and South Coast Water District's Targeted Water Conservation Program.

Flood Protection Corridor Program (Proposition 84 & 1E) - This program funds nonstructural flood management projects that include wildlife habitat enhancement and/or agricultural land preservation. $5 million of funding per eligible project is available with $29 million total funds available. The next solicitation is expected in Fall 2013.

Stormwater Grant Program (Proposition 84) – Proposition 84 Storm Water Grant Program provides matching grants to local public agencies for the reduction and prevention of storm water contamination of rivers, lakes, and streams. In addition, Proposition 84 provides planning funds be used to finance planning and monitoring necessary for the successful design, selection, and implementation of the SWGP projects. $9M was allocated in 2012 for Planning, $42M was allocated in 2013 for Implementation Round 1 and $31M is allocated for Implementation Round 2. The City of Laguna Niguel was awarded $1,436,512 under Round 1 for the Oso Creek Multi-Use Trail Project. Round 2 concept proposals application period is anticipated for Summer 2013, and Round 2 full proposals application period is anticipated for Spring 2014.

Urban Streams Restoration Program (Proposition 84 & 13). This program provides grants to local communities for projects to reduce flooding and erosion and associated property damages; restore, enhance, or protect the natural ecological values of streams; and promote community involvement, education, and stewardship. The projects have included stream cleanups, bank stabilization projects, revegetation efforts, recontouring of channels to improve floodplain function and occasional acquisition of strategic floodplain properties or easements. Grants range from $1,000 to $1 million. The next round of grant funding which is expected to total approximately $9 million from remaining allocations will be released in Spring of 2013.

Local Levee Assistance Program (LLAP - Proposition 84) – This program funds projects to immediately repair and improve critically-damaged local levees, evaluate levee stability and levee seepage and under seepage, and to perform design or alternatives analysis. Local levees are levees throughout the State that are not part of the State Plan of Flood Control for the Central Valley and are not located within the Sacramento-San Joaquin Delta. The LLAP has two components: (1) the Local Levee Critical Repair (LLCR) Program which provides for design and repairs of critically-damaged levees and (2) the Local Levee Evaluation (LOLE) Program which provides funds for feasibility studies and geotechnical evaluation of levees. The Trabuco Creek Channel (L02) Levee Protection Project Phase 7 is expected to receive $5 million in funding through the LLAP. Both programs require a 50% base cost share. $13.1 million is expected to be available for release in 2013/2014.

Integrated Regional Water Management Implementation Grant (Proposition 50). In 2005 this program awarded the SOCWMA $25,000,000 for the following seven projects: Water Use Efficiency Program Expansion - MWDOC on behalf of 13 cities and 12 special districts in South Orange County; Canada Gobernadora Multipurpose Basin - Santa Margarita Water District; Heisler Park Marine Habitat Protection - City of Laguna Beach; J.B. Latham Treatment Plant – Advanced Water Treatment - South

Orange County Wastewater Authority, in cooperation with the City of San Juan Capistrano, Moulton Niguel Water District, and South Coast Water District; Recycled Water Transmission System Improvements - City of San Juan Capistrano; Recycled Water Treatment and Distribution - City of San Clemente; Aliso Creek Environmental Restoration Project - County of Orange, South Orange County Wastewater Authority (SOCWA), and Moulton Niguel Water District (MNWD). No additional funding is expected to be available through this program.

Stormwater Flood Management Program (Proposition 1E). The program funds projects consistent with the adopted IRWM Plan, designed to manage stormwater runoff to reduce flood damages, and yield multiple benefits (must have more than one), such as: Groundwater recharge, Water quality improvement, Ecosystem restoration and benefits, Reduction of instream erosion and sedimentation. Examples of Regional Projects: Santa Margarita Water District was awarded $5 million in funding for the Gobernadora Multi-use Basin Project in 2012. South Orange County Wastewater Authority applied for the Aliso and Sulphur Creek Bank Stabilization Project in 2013. No additional funding is expected to be available through the Proposition 1E Stormwater Flood Management program.

Hazard Mitigation Grant Program (Federal Emergency Management Agency (FEMA)). The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

Appendix A

Facility Ownership

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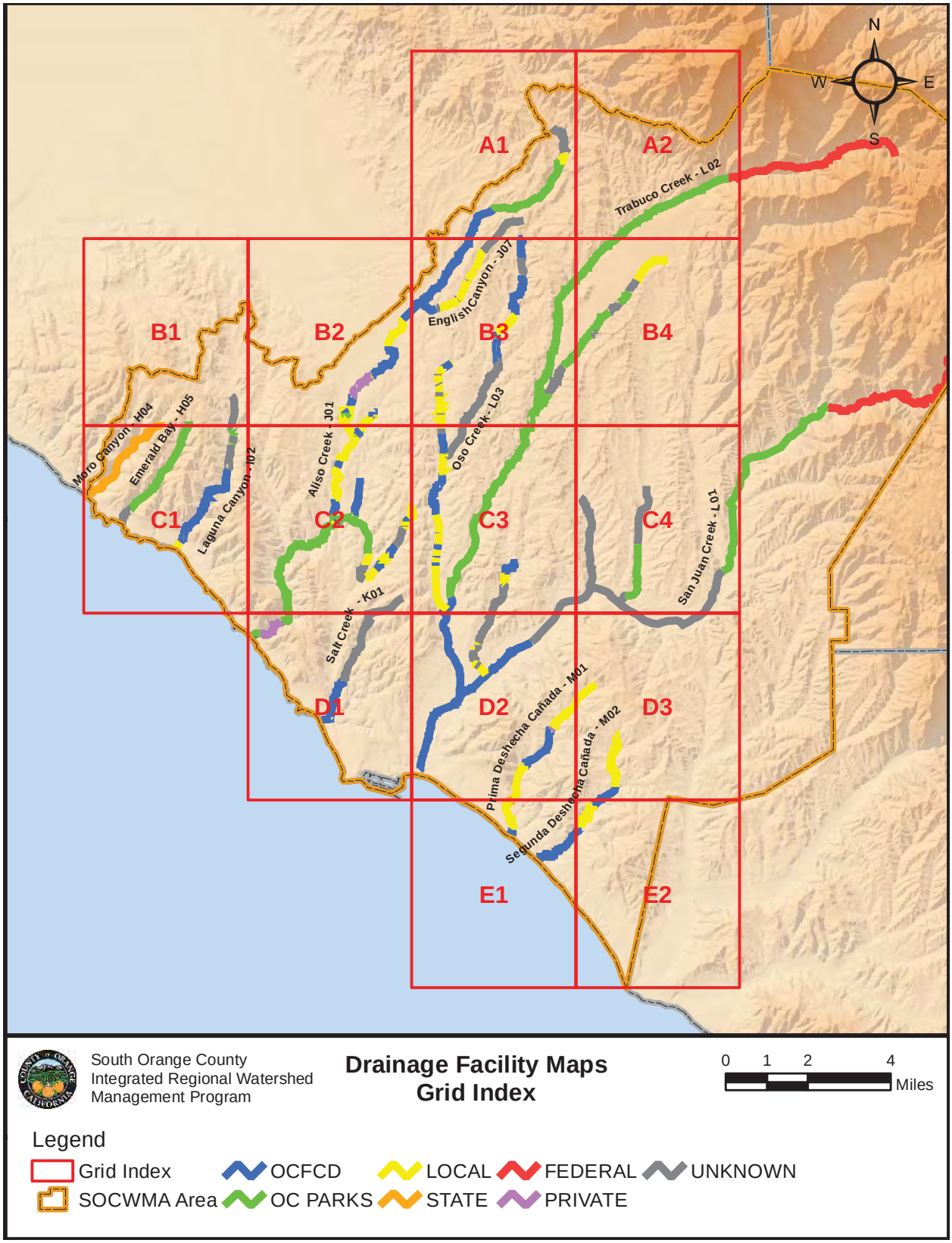
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C3
C4
D1
D2
D3
E1
E2
Trabuco Creek - L02
English Canyon - J07
Moro Canyon - H04
Emerald Bay - H05
Laguna Canyon - I02
Aliso Creek - J01
Oso Creek - L03
San Juan Creek - L01
Salt Creek - K01
Prima Deshecha Cañada - M01
Segunda Deshecha Cañada - M02
South Orange County
Integrated Regional Watershed
Management Program
Drainage Facility Maps
Grid Index
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Grid Index
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FEDERAL
PRIVATE
UNKNOWN

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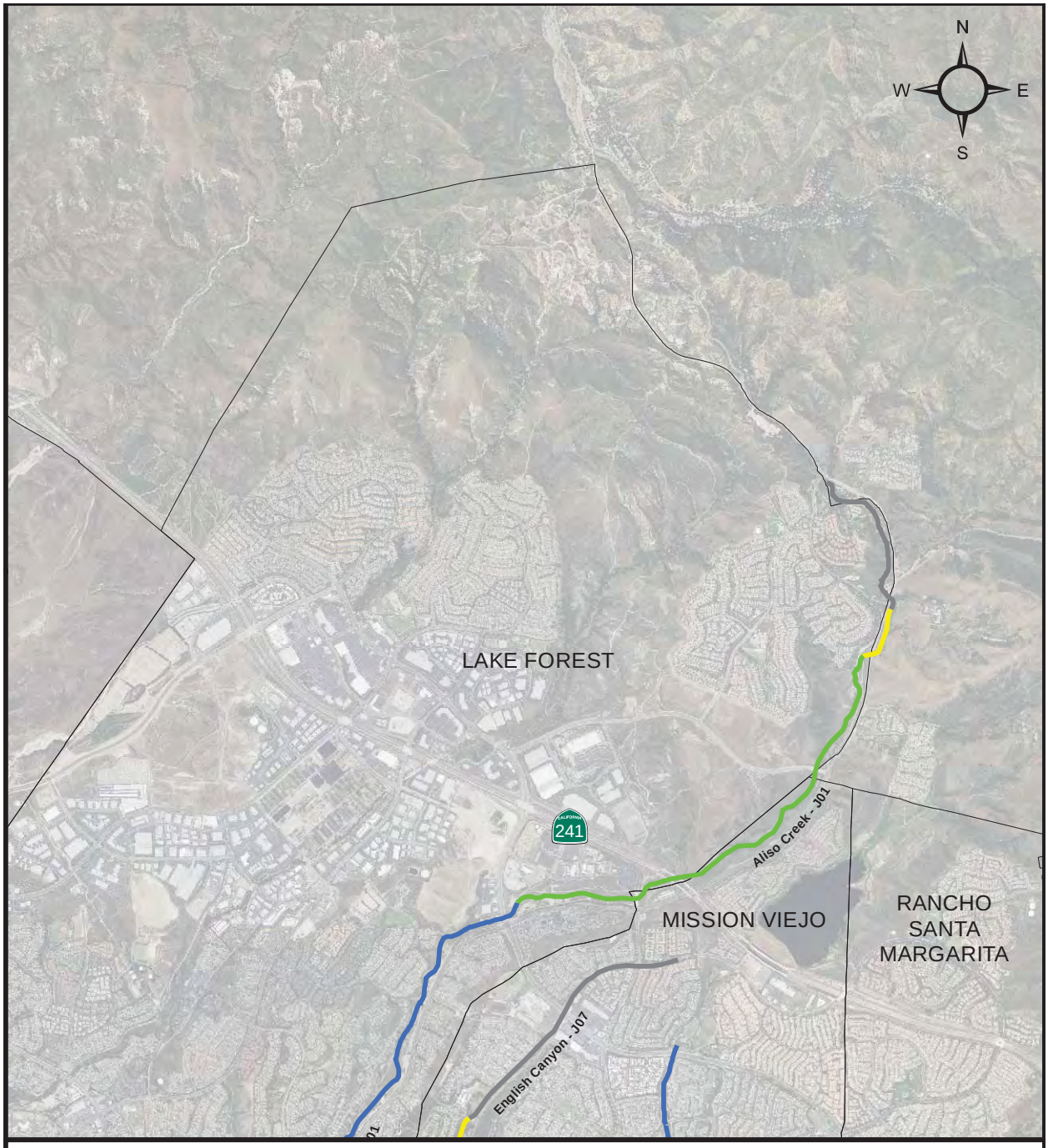


South Orange County
Integrated Regional Watershed
Management Program

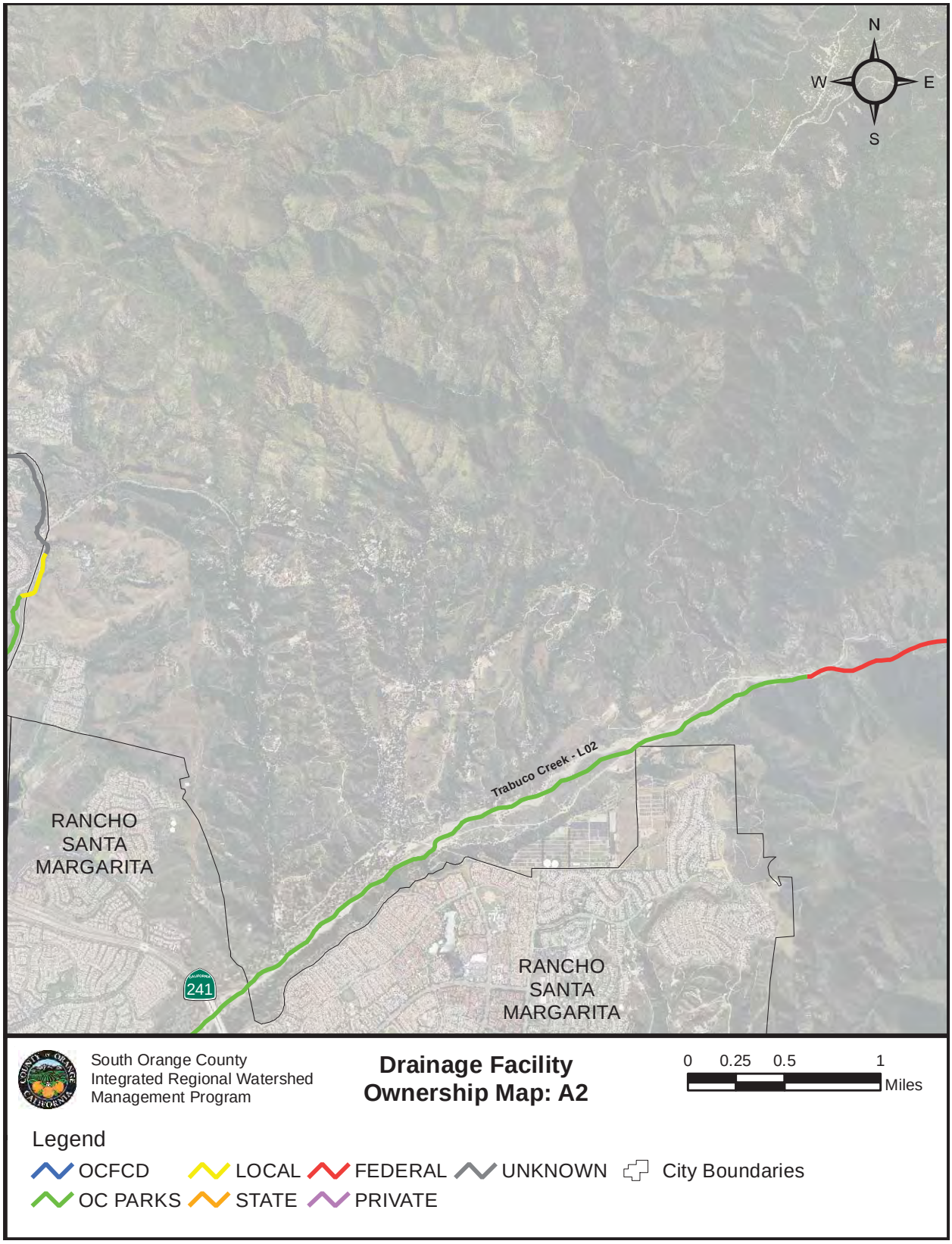
Drainage Facility Ownership Map: A1

0 0.25 0.5 1 Miles

Legend

OCFCD LOCAL FEDERAL UNKNOWN City Boundaries

OC PARKS STATE PRIVATE



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: A2

0 0.25 0.5 1
Miles

Legend

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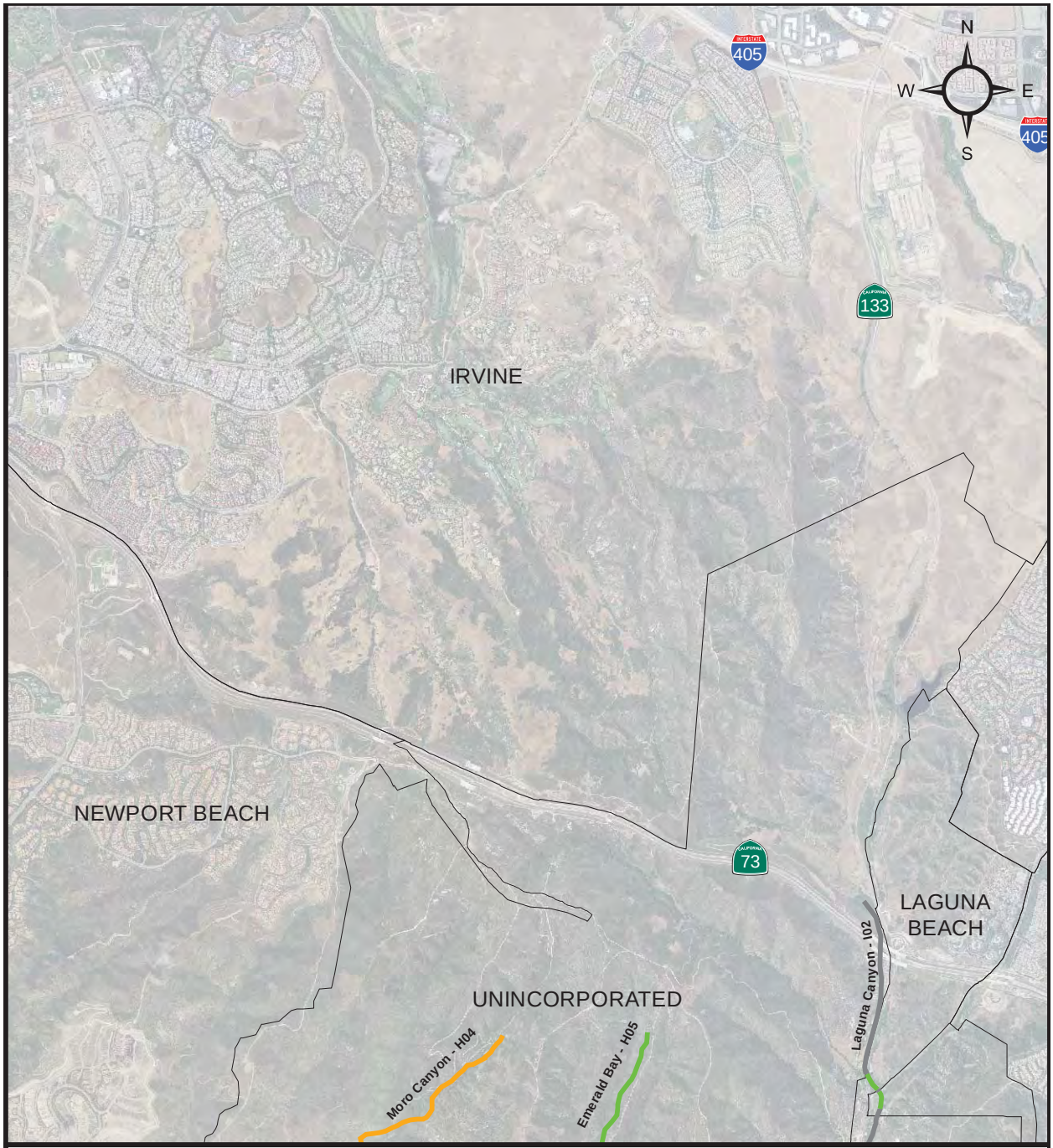
OC PARKS STATE PRIVATE



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: B1

0 0.25 0.5 1
Miles

Legend

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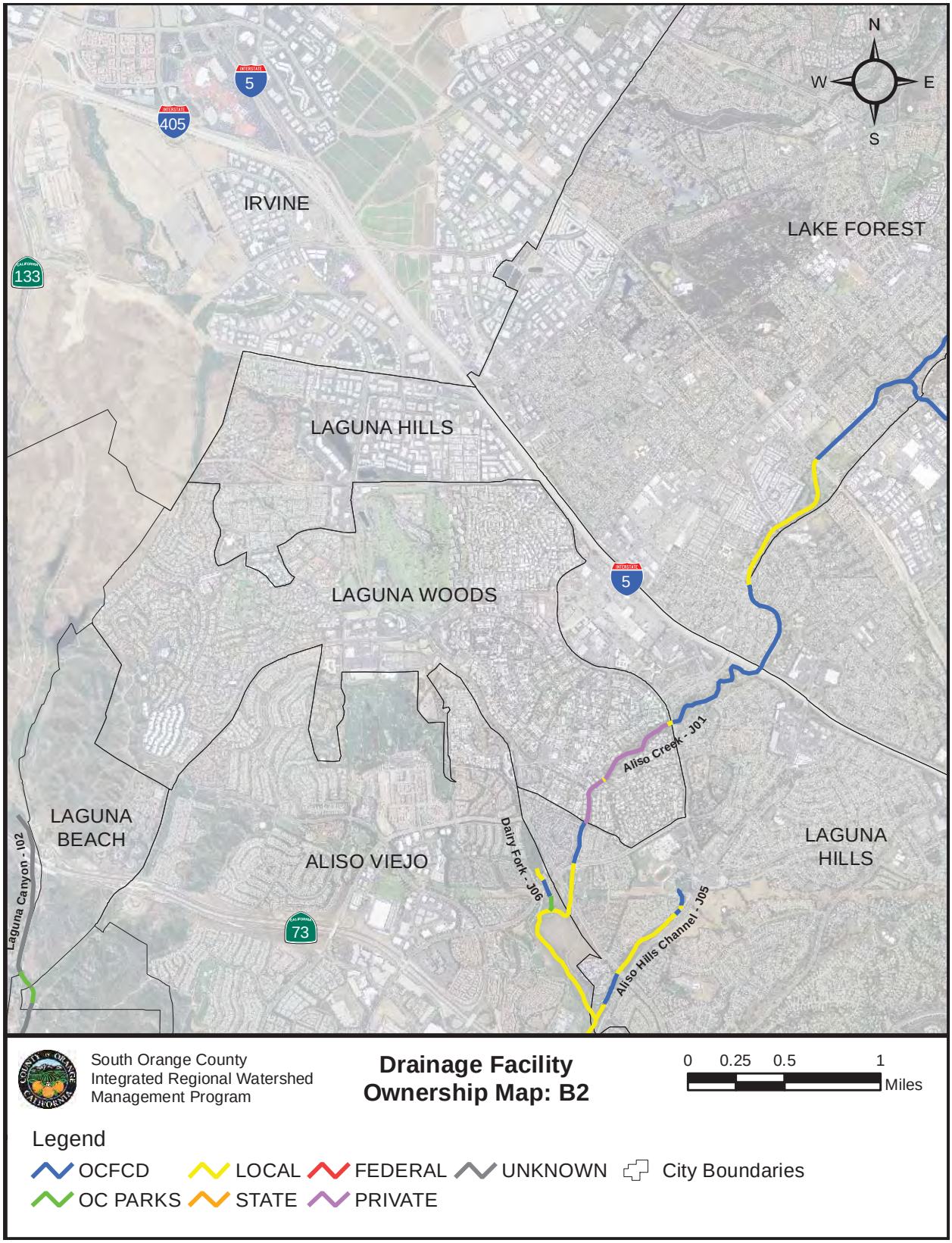
OC PARKS STATE PRIVATE



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: B2

0 0.25 0.5 1 Miles

Legend

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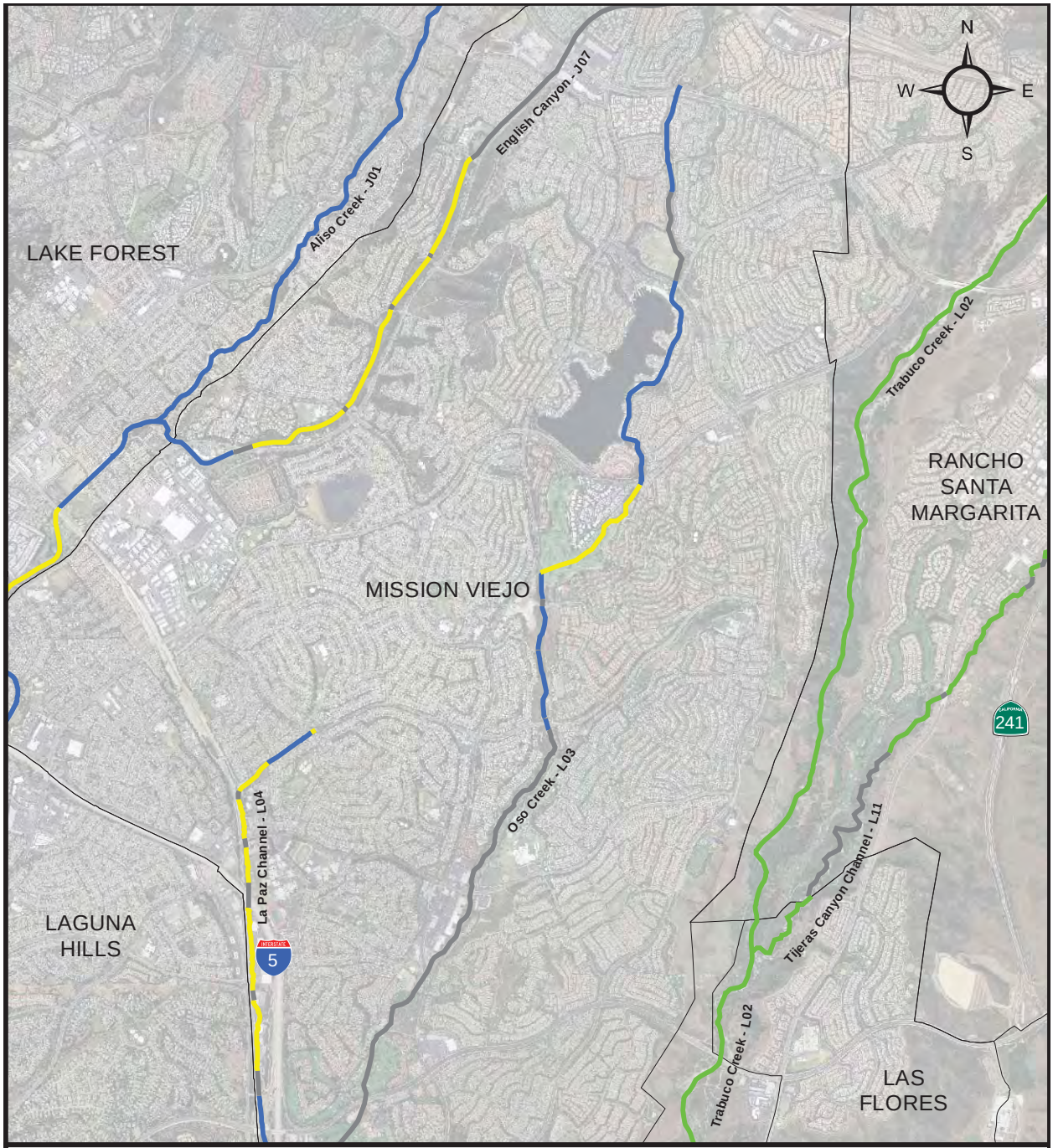
OC PARKS STATE PRIVATE



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: B3

0 0.25 0.5 1 Miles

Legend

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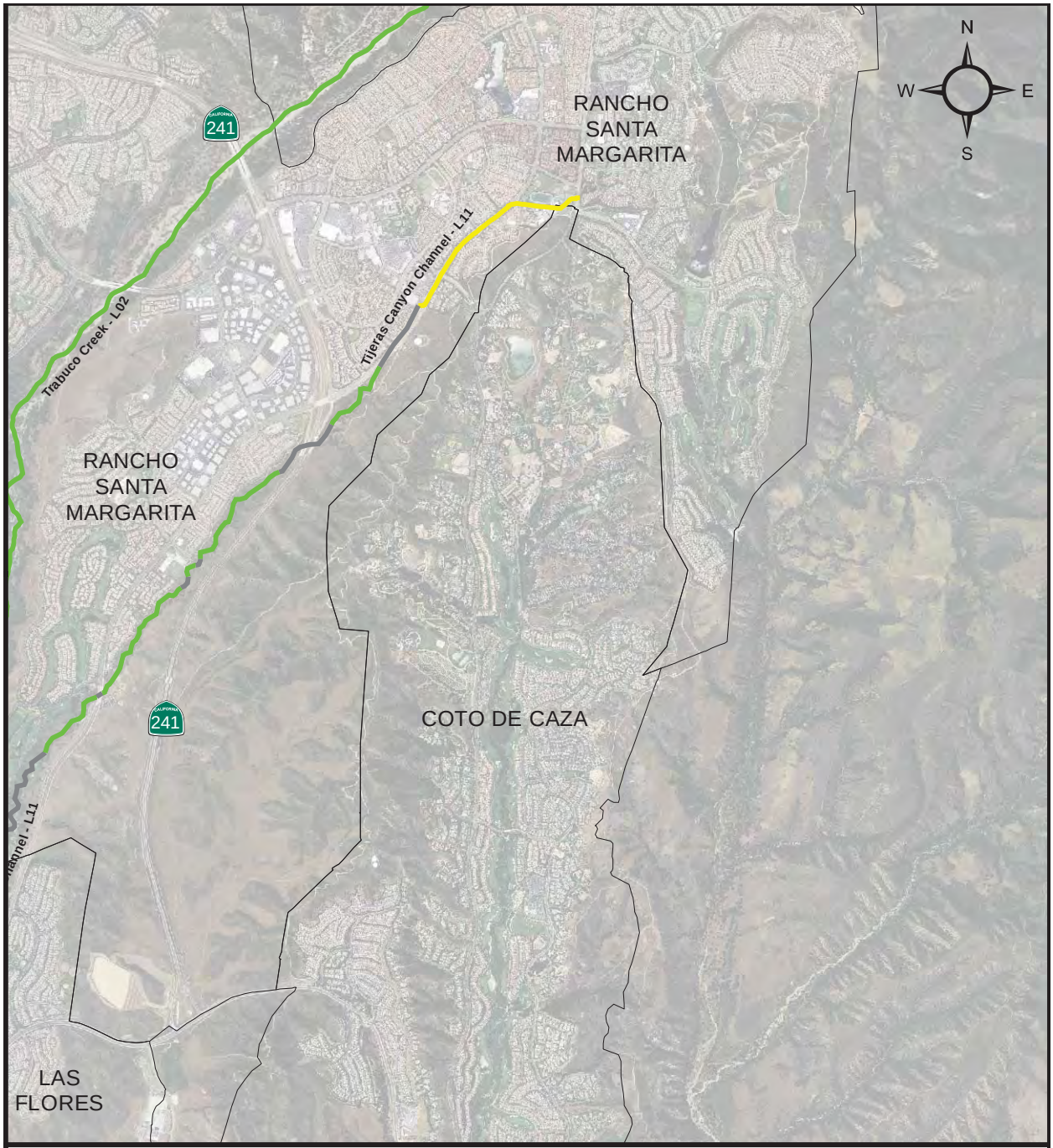
OC PARKS STATE PRIVATE



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: B4

0 0.25 0.5 1
Miles

Legend

OCFCD
LOCAL
FEDERAL
UNKNOWN
City Boundaries
OC PARKS
STATE
PRIVATE

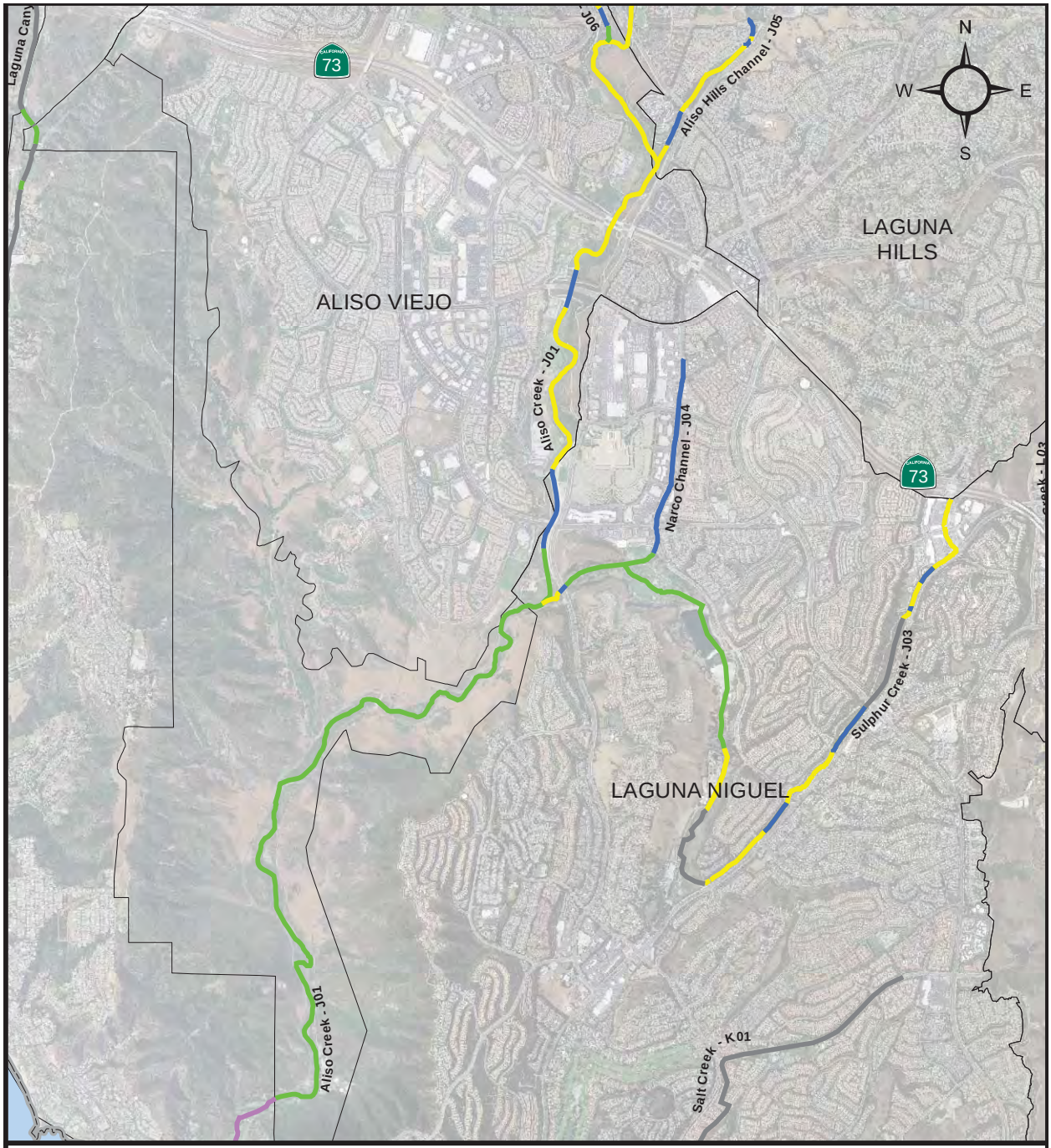
South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: C1

0 0.25 0.5 1 Miles

Legend

OCFCD
OC PARKS
LOCAL
STATE
FEDERAL
PRIVATE
UNKNOWN
City Boundaries



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: C2

0 0.25 0.5 1 Miles

Legend

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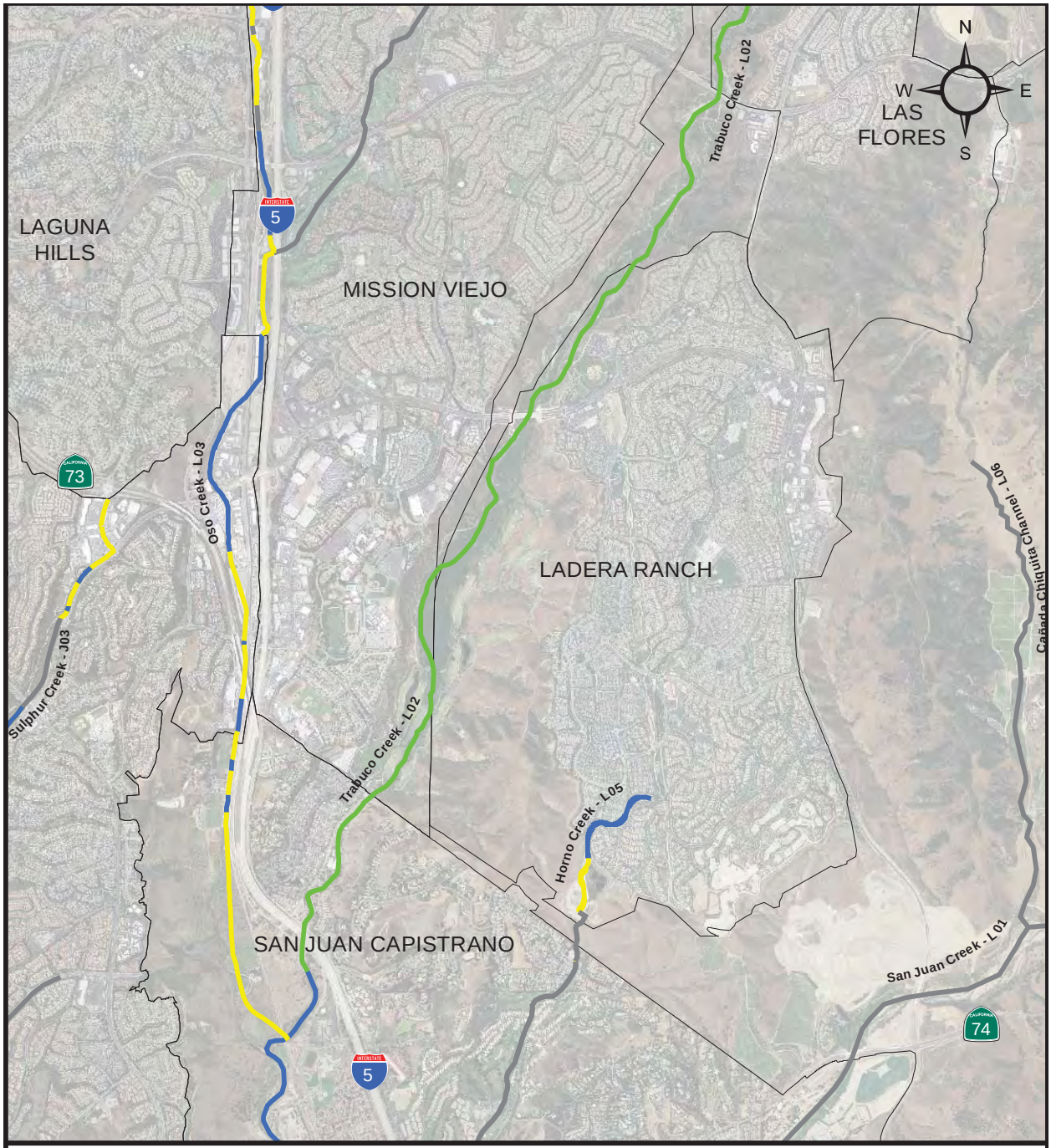
OC PARKS STATE PRIVATE



South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: C3

0 0.25 0.5 1 Miles

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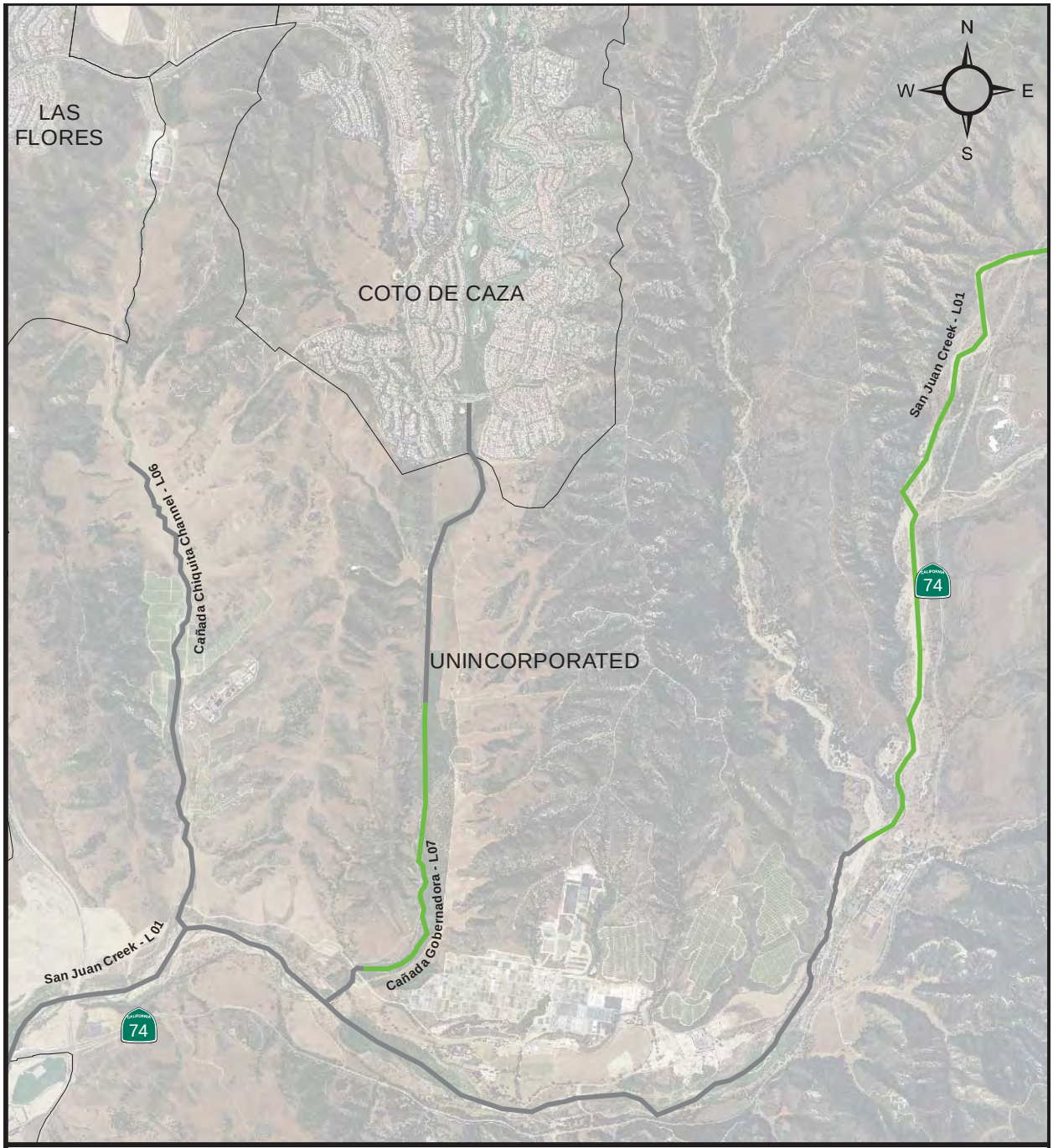

South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: C4

0 0.25 0.5 1 Miles

Legend

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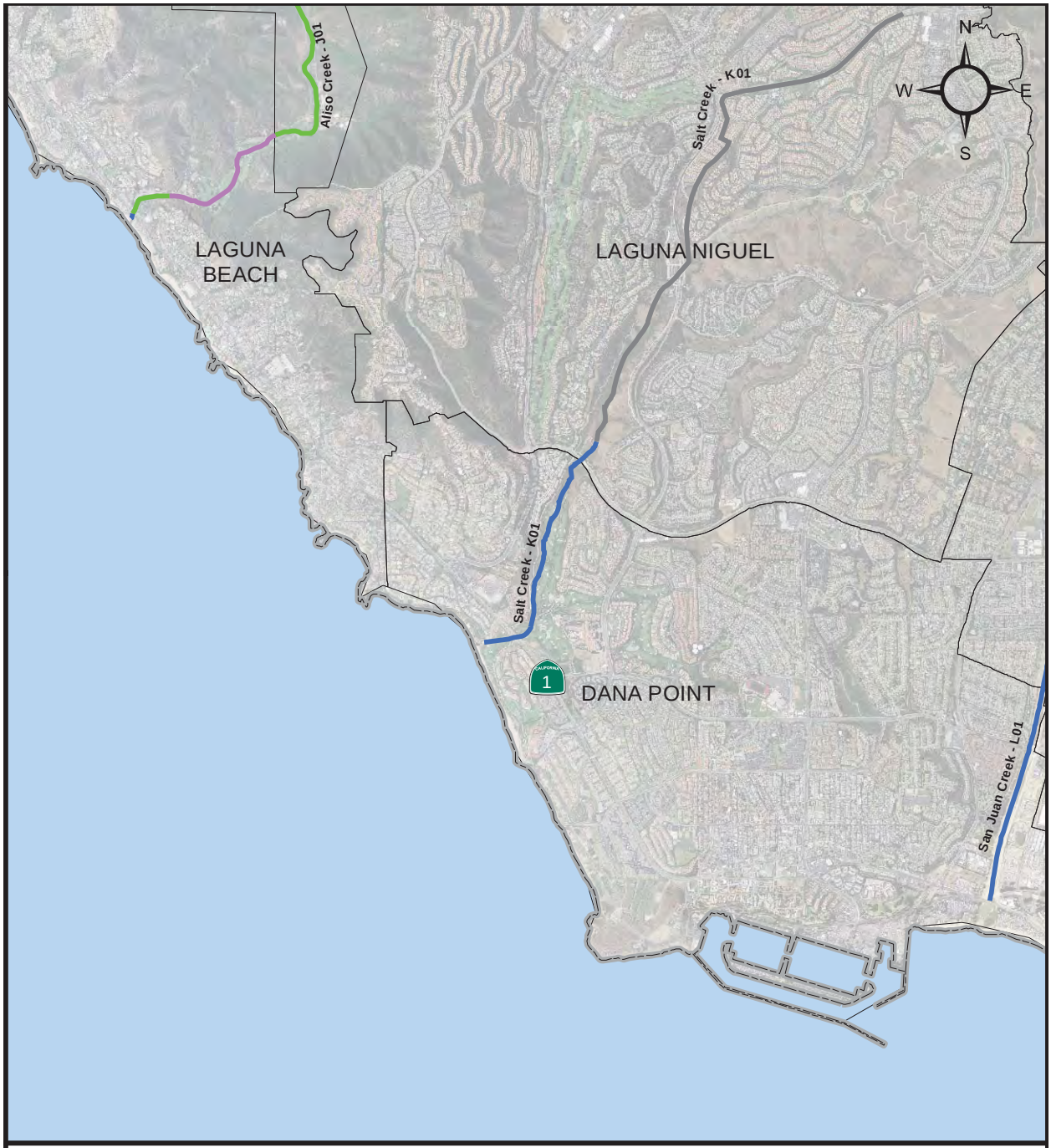

South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: D1

0 0.25 0.5 1
Miles

Legend

OCFCD
LOCAL
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City Boundaries
OC PARKS
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South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: D2

0 0.25 0.5 1
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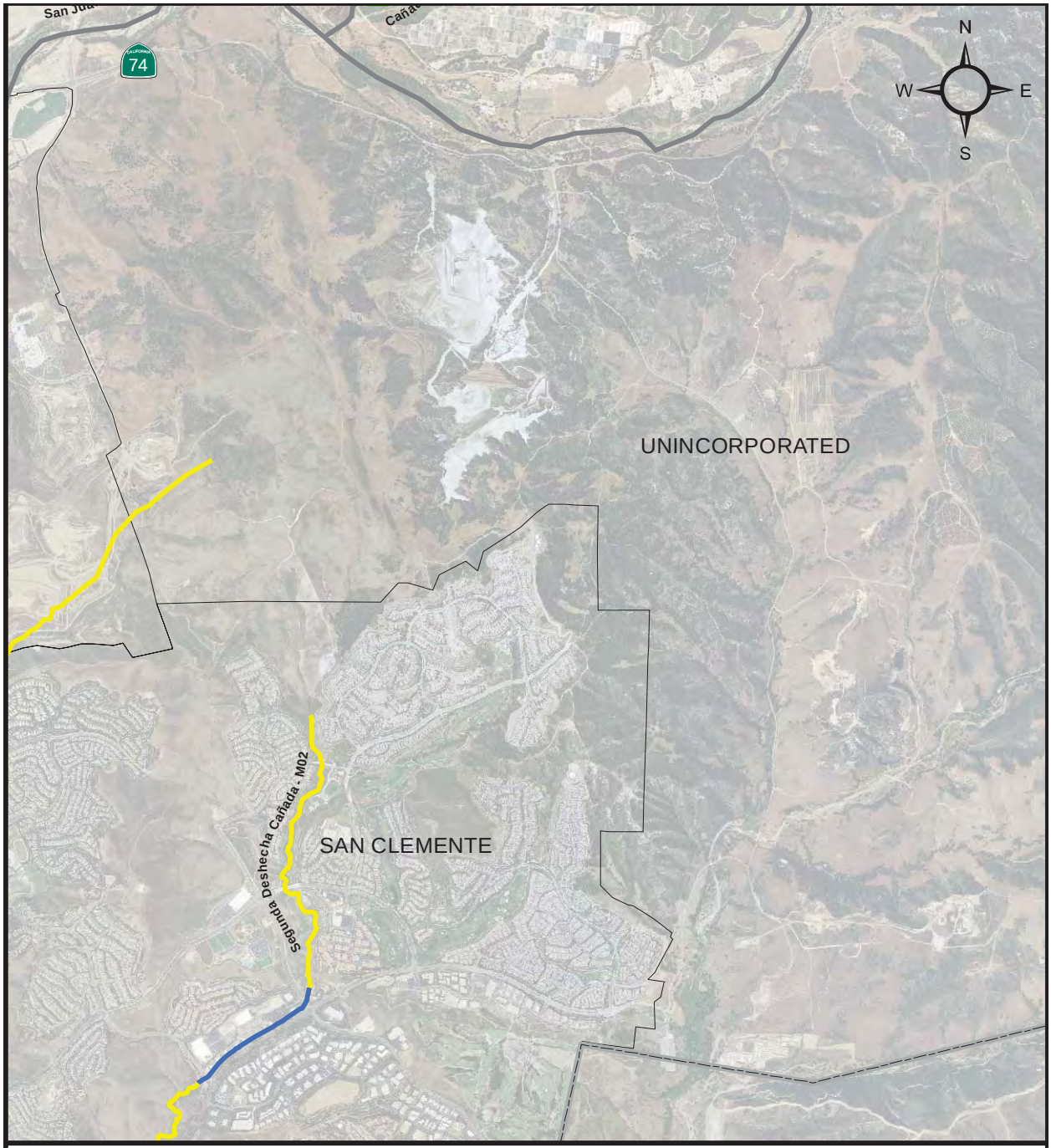

South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: D3

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Miles

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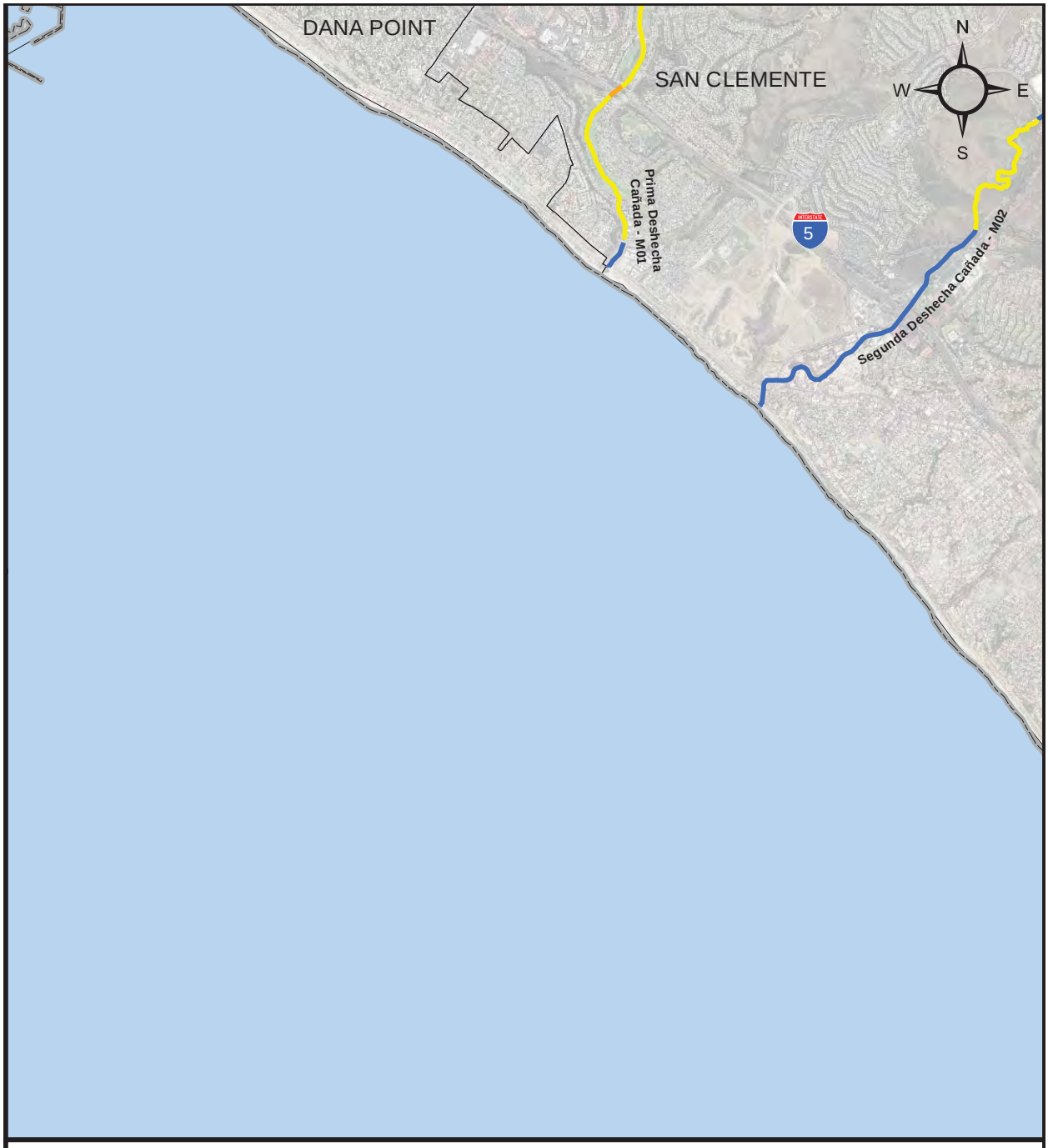

South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: E1

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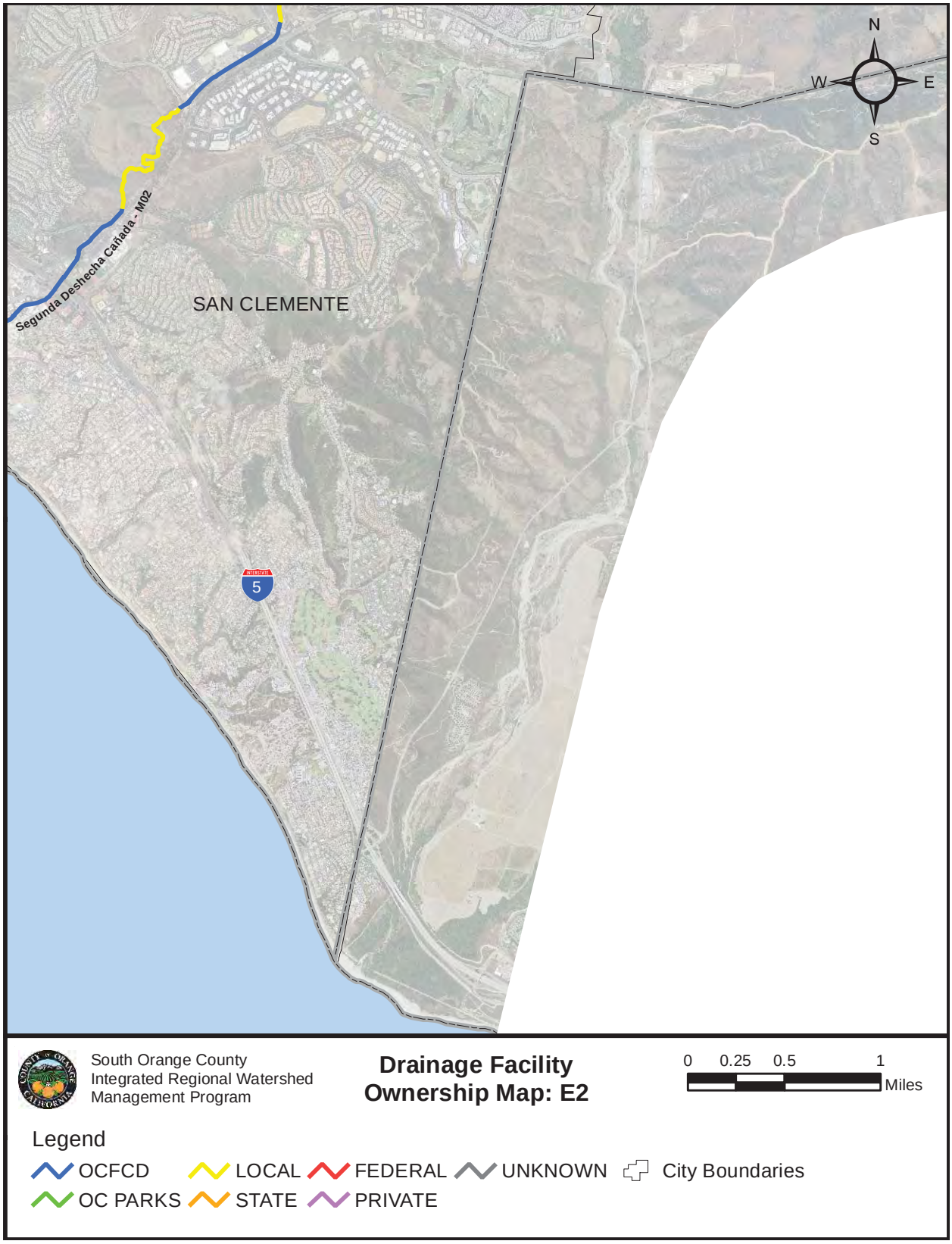

South Orange County
Integrated Regional Watershed
Management Program

Drainage Facility Ownership Map: E2

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Appendix B

Flood Hazard Analysis

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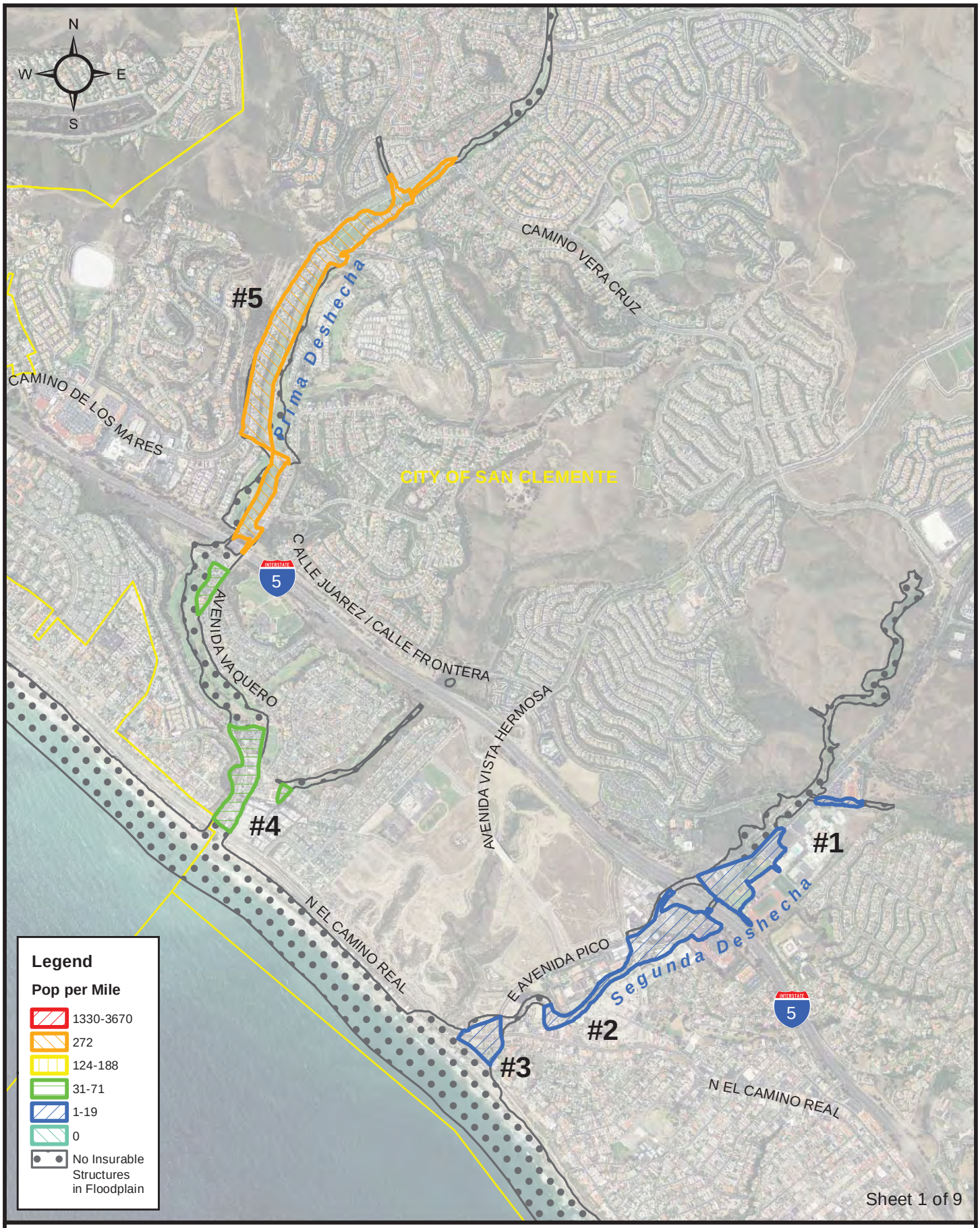
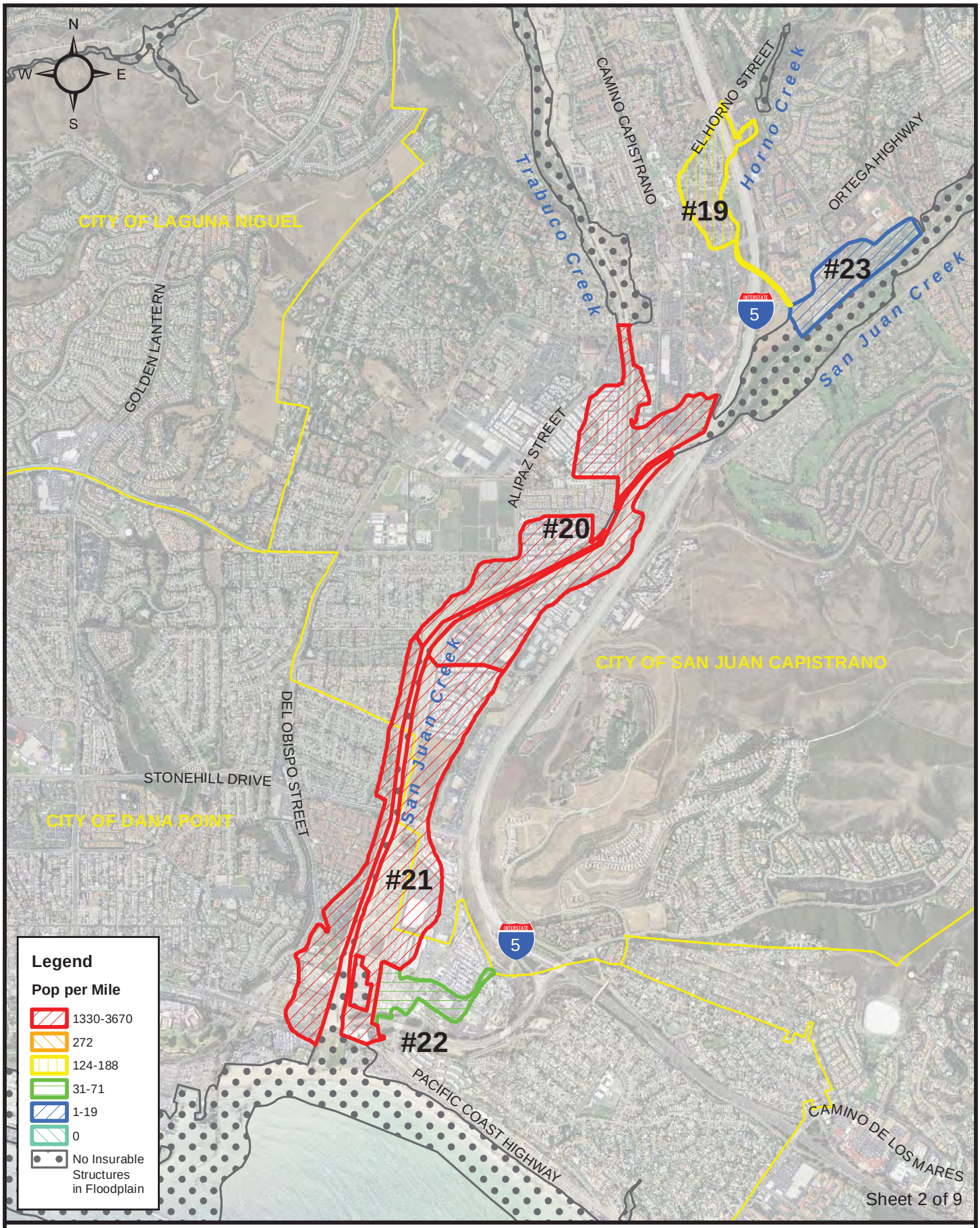


Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Population in the Floodplain

0 900 1,800 3,600 Feet



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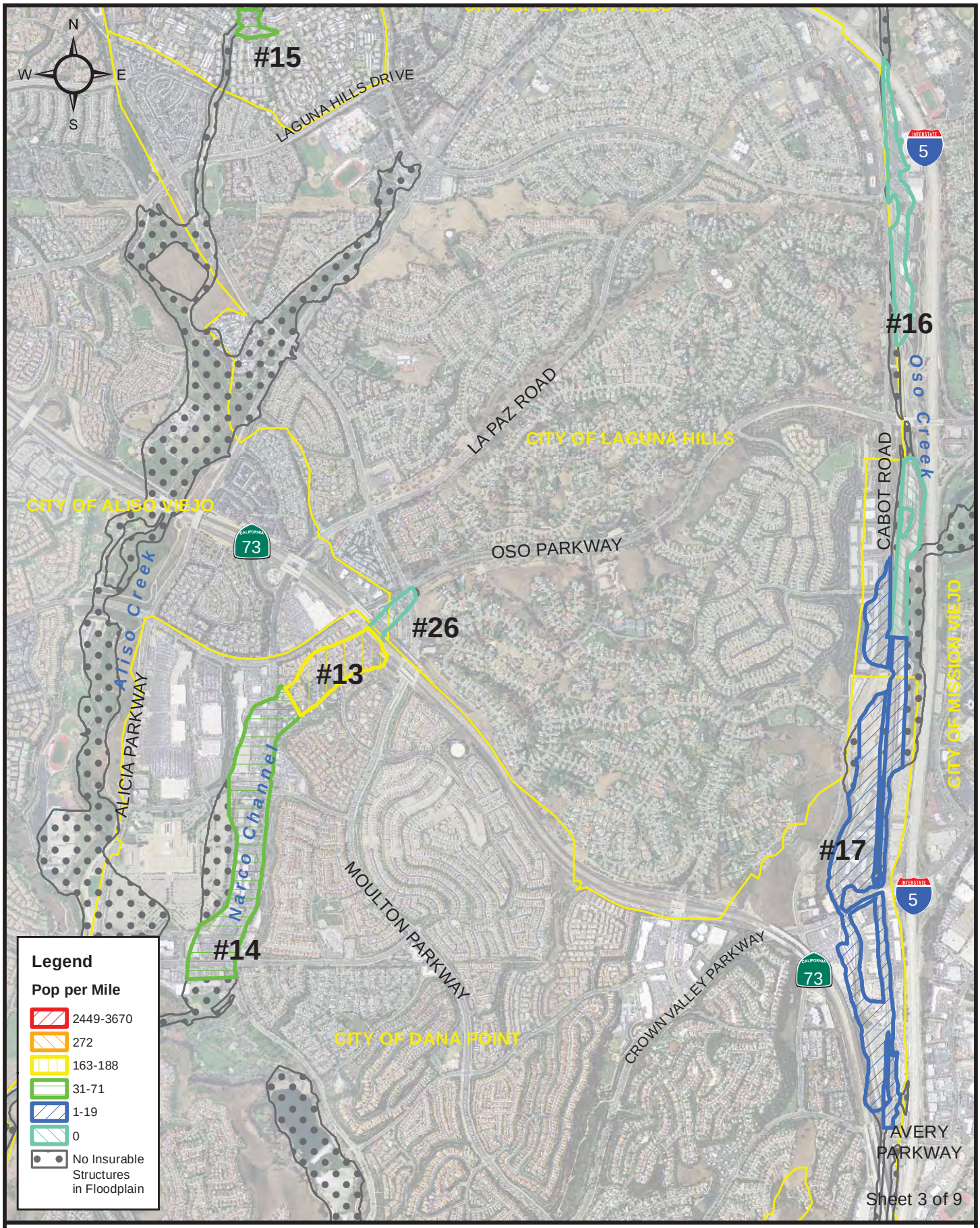
Population in the Floodplain

0 1,100 2,200 4,400 Feet



Sheet 3 of 9

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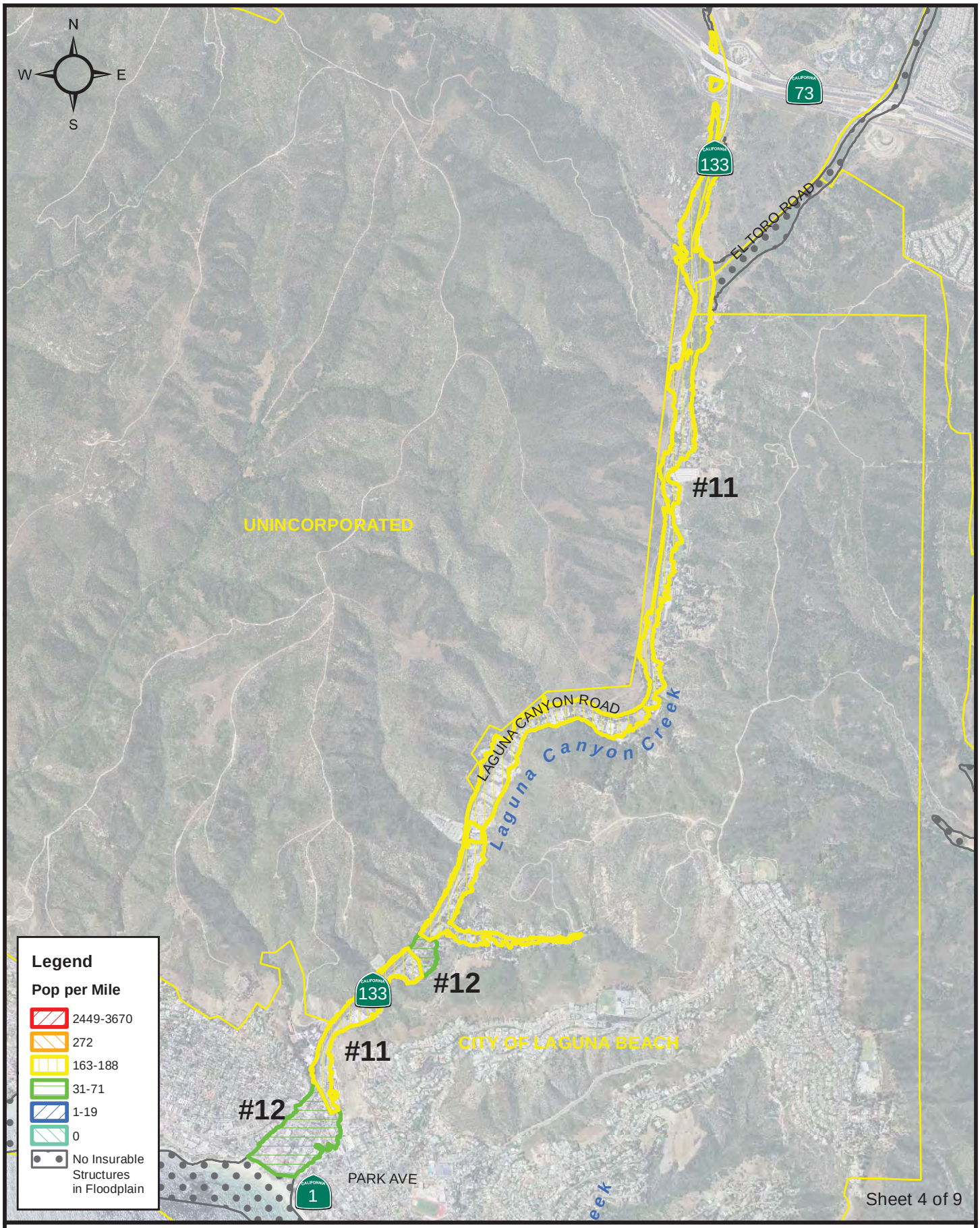
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Population in the Floodplain

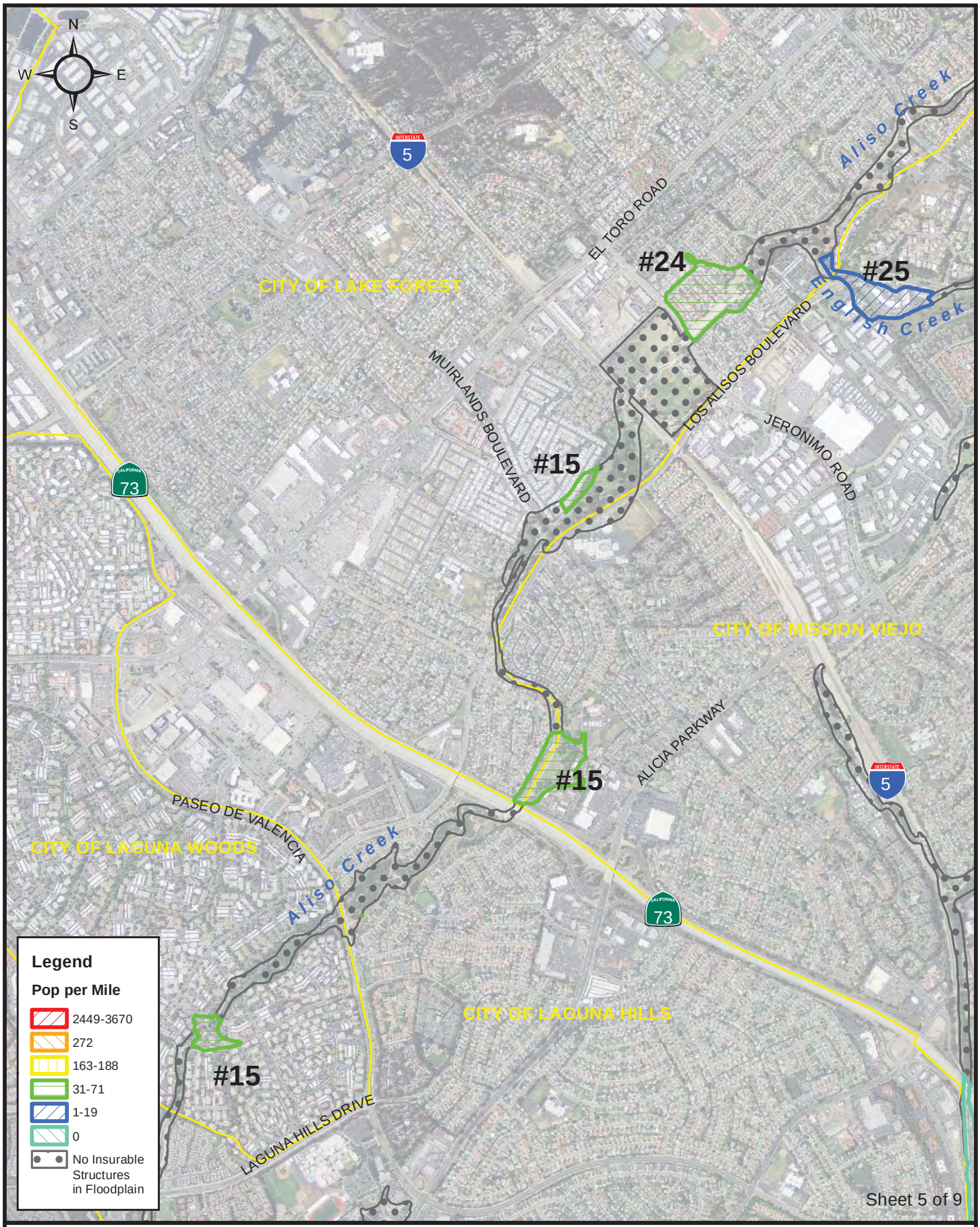
0 1,000 2,000 4,000 Feet



Data Source: FEMA Hazus 2012, FEMA DFIRM 2012
Aerial Source: NAIP 2012

Population in the Floodplain

0 1,000 2,000 4,000 Feet



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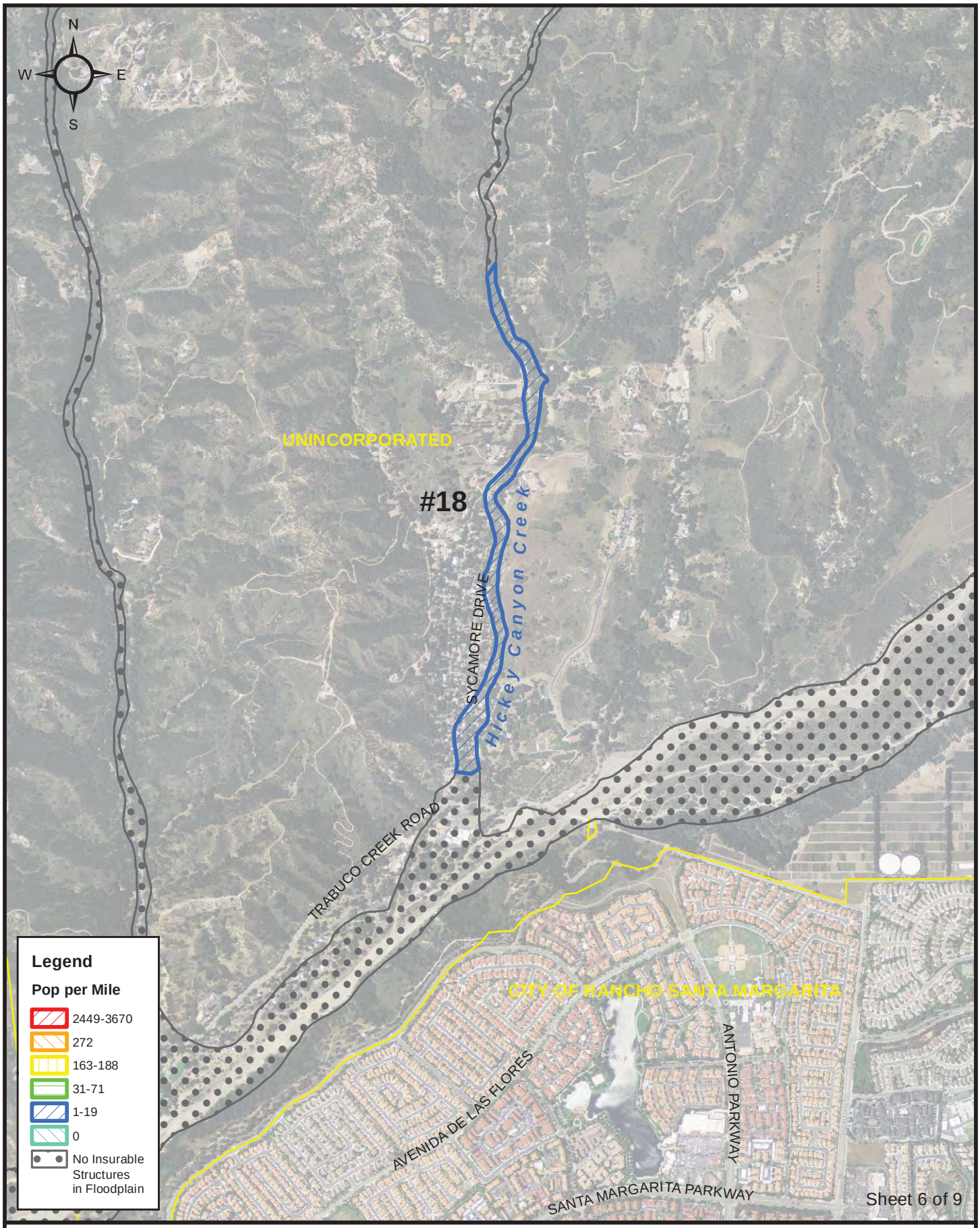
Aerial Source: NAIP 2012

Population in the Floodplain

0 850 1,700 3,400 Feet



Sheet 6 of 9

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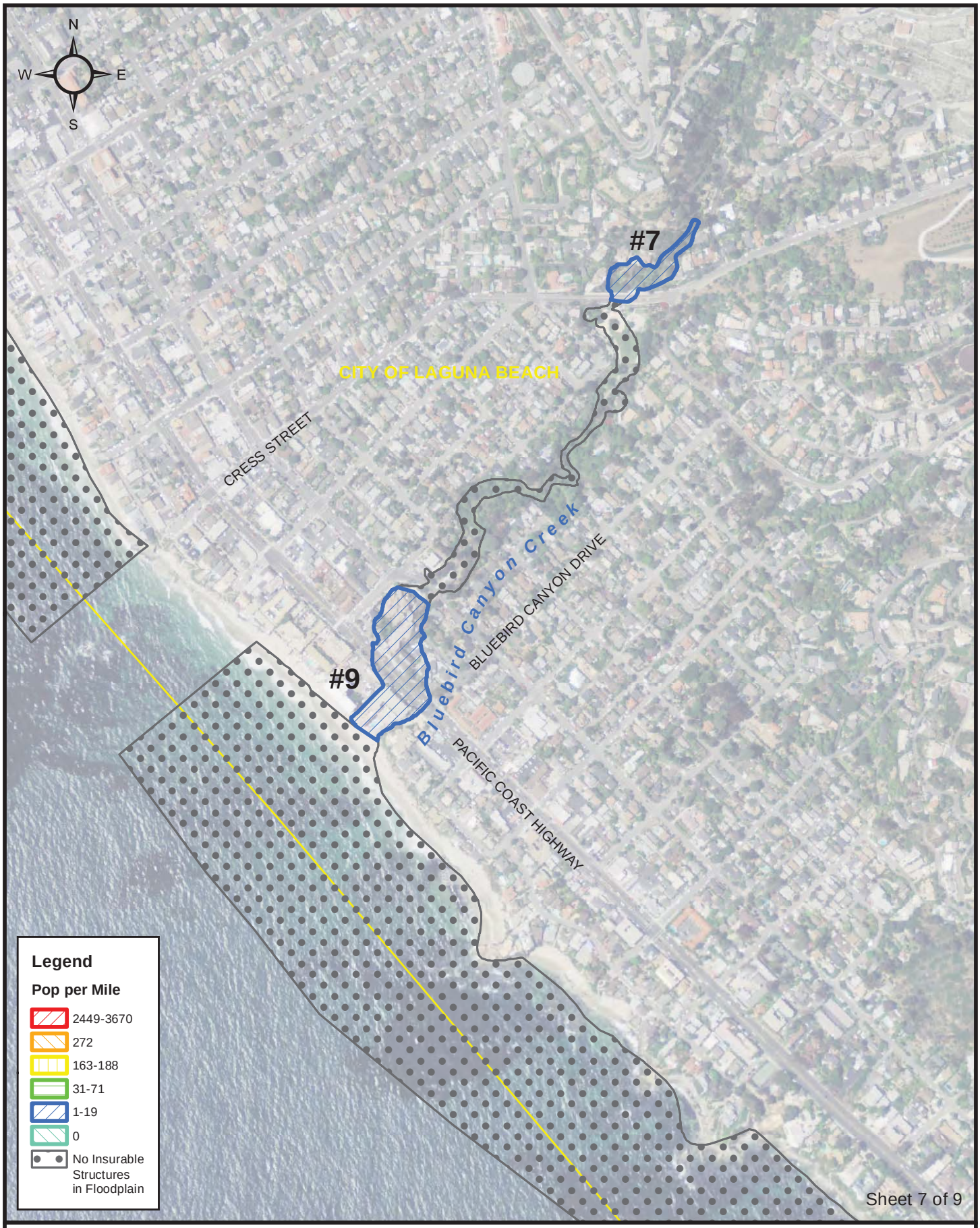
Aerial Source: NAIP 2012

Population in the Floodplain

0 625 1,250 2,500 Feet



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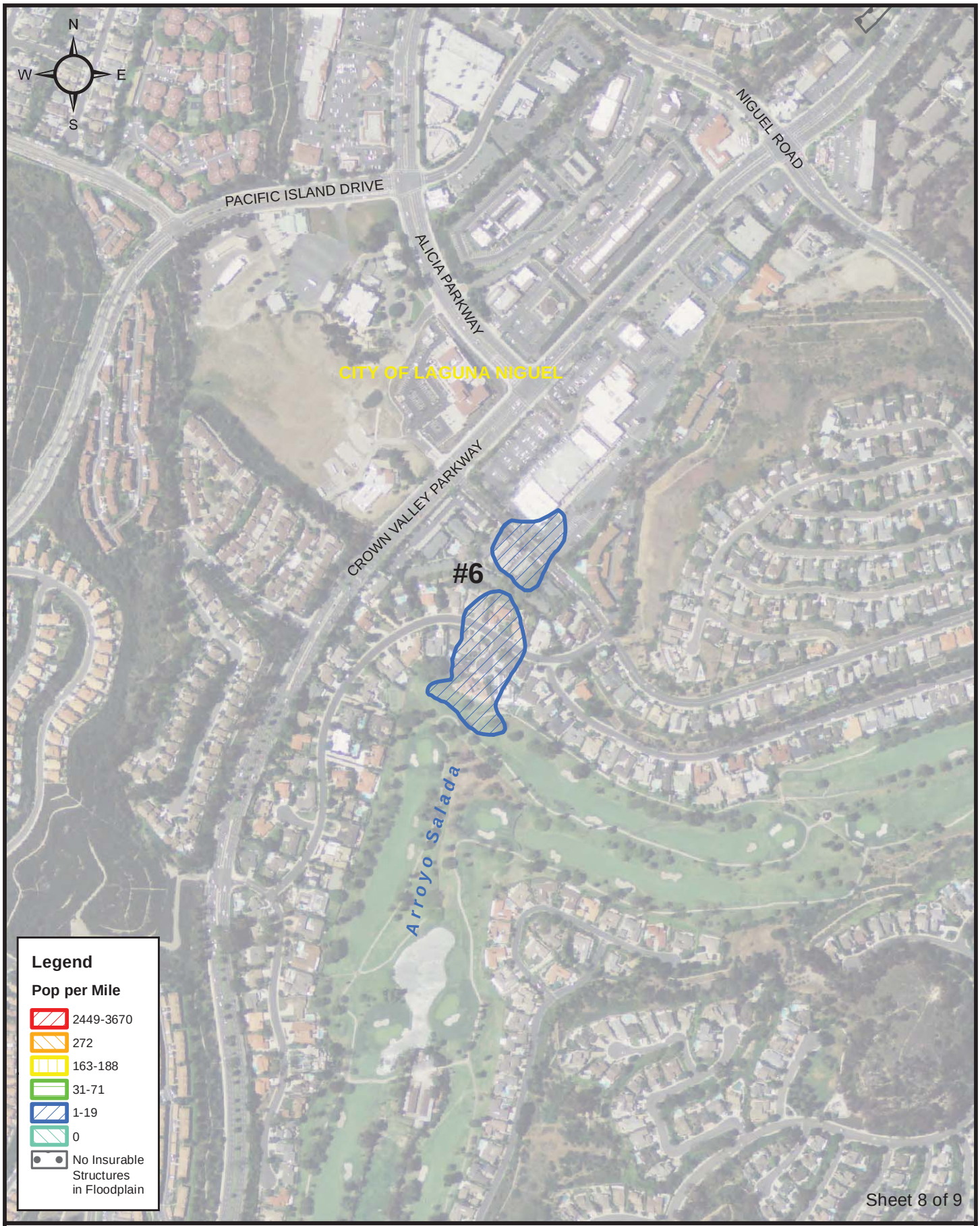
Population in the Floodplain

0 260 520 1,040 Feet



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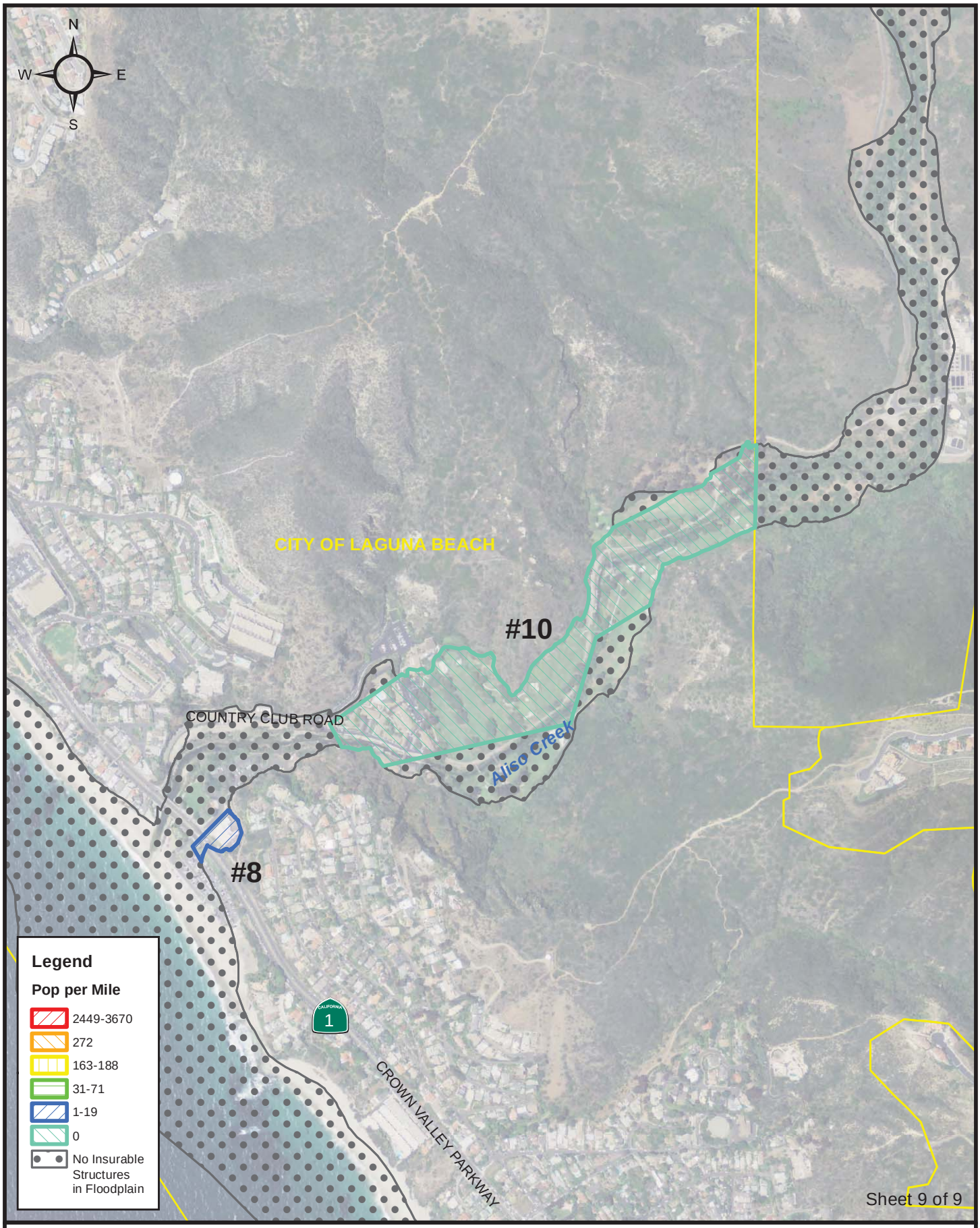
Population in the Floodplain

0 260 520 1,040 Feet



Sheet 9 of 9

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Aerial Source: NAIP 2012

Population in the Floodplain

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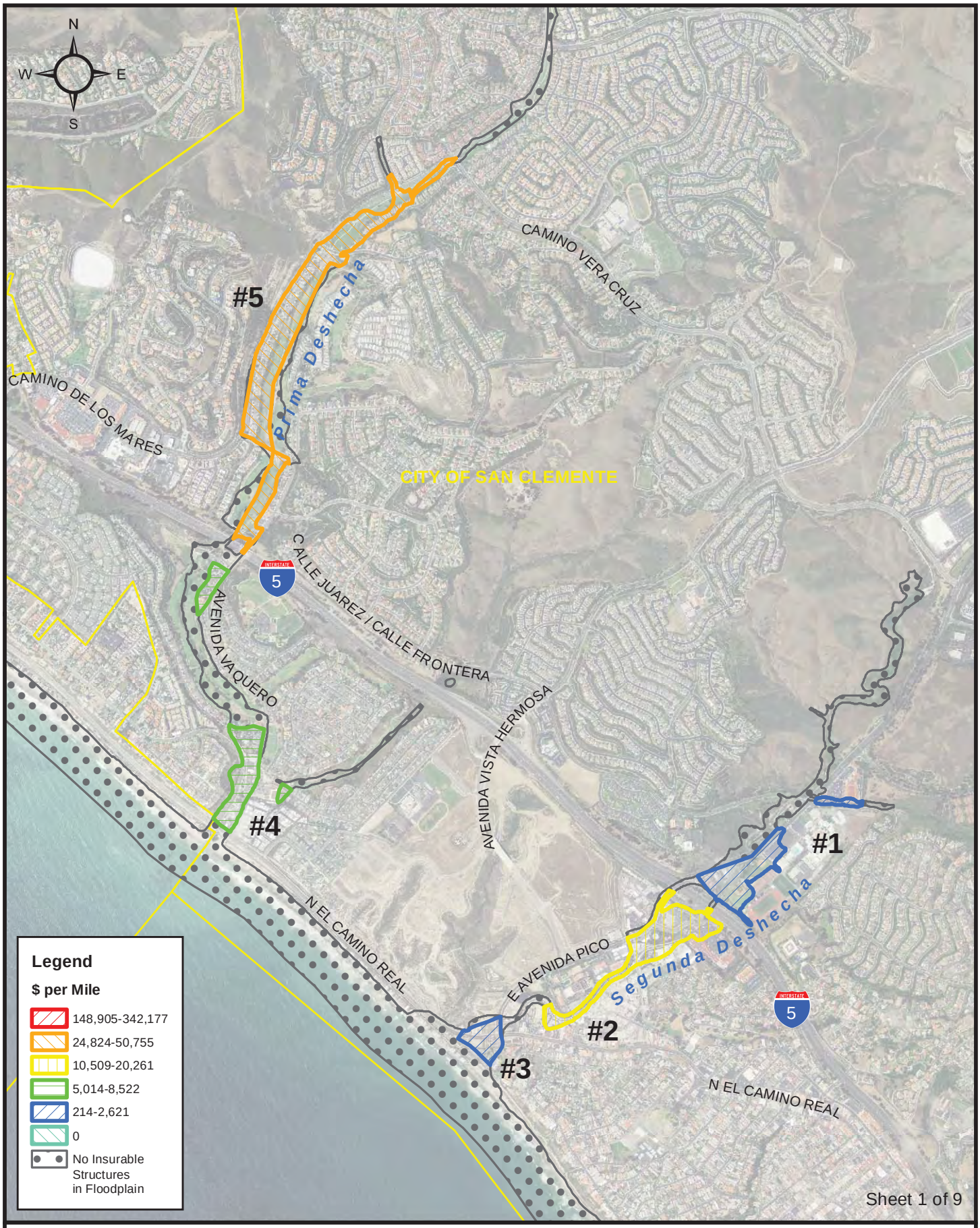
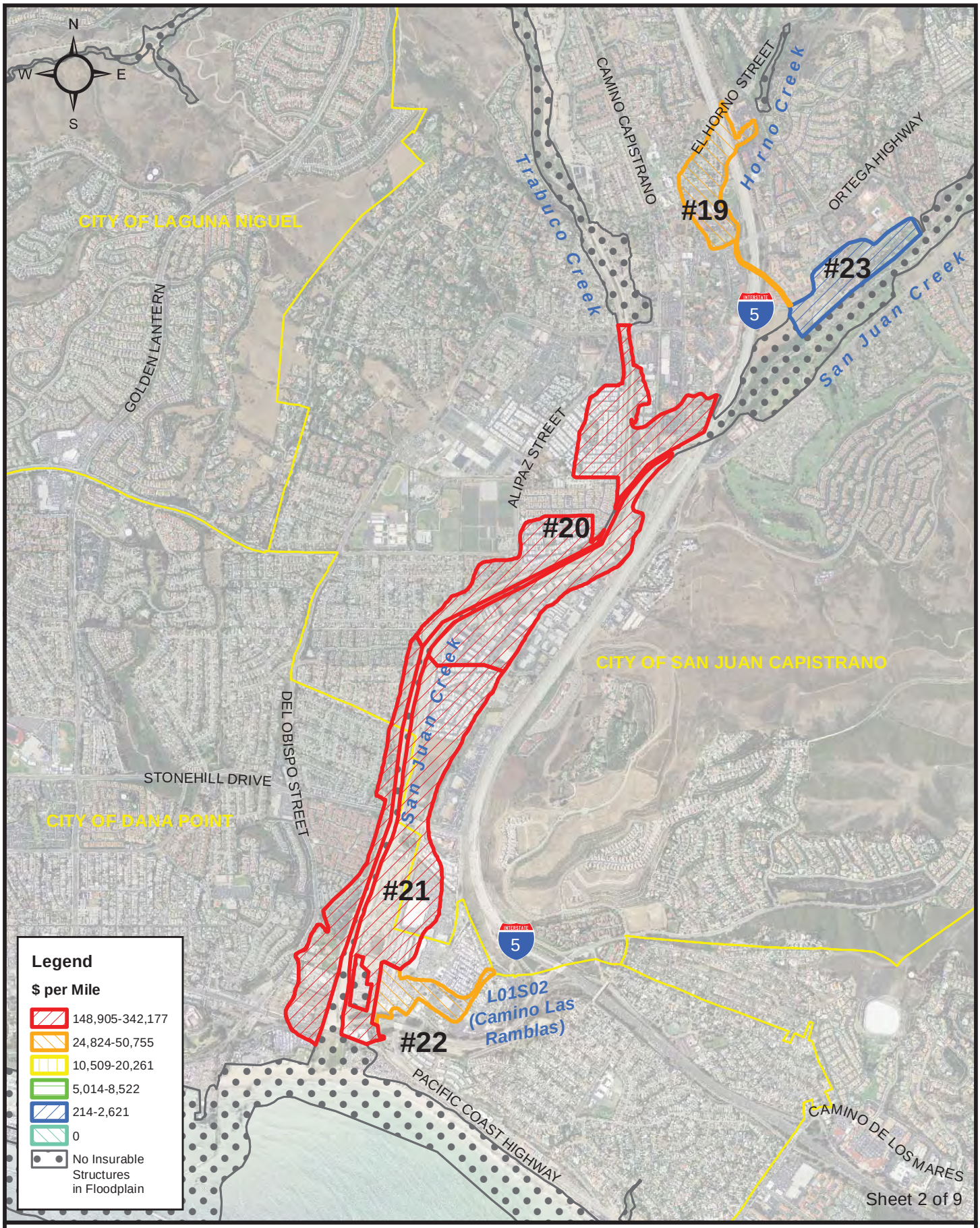


Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

0 900 1,800 3,600 Feet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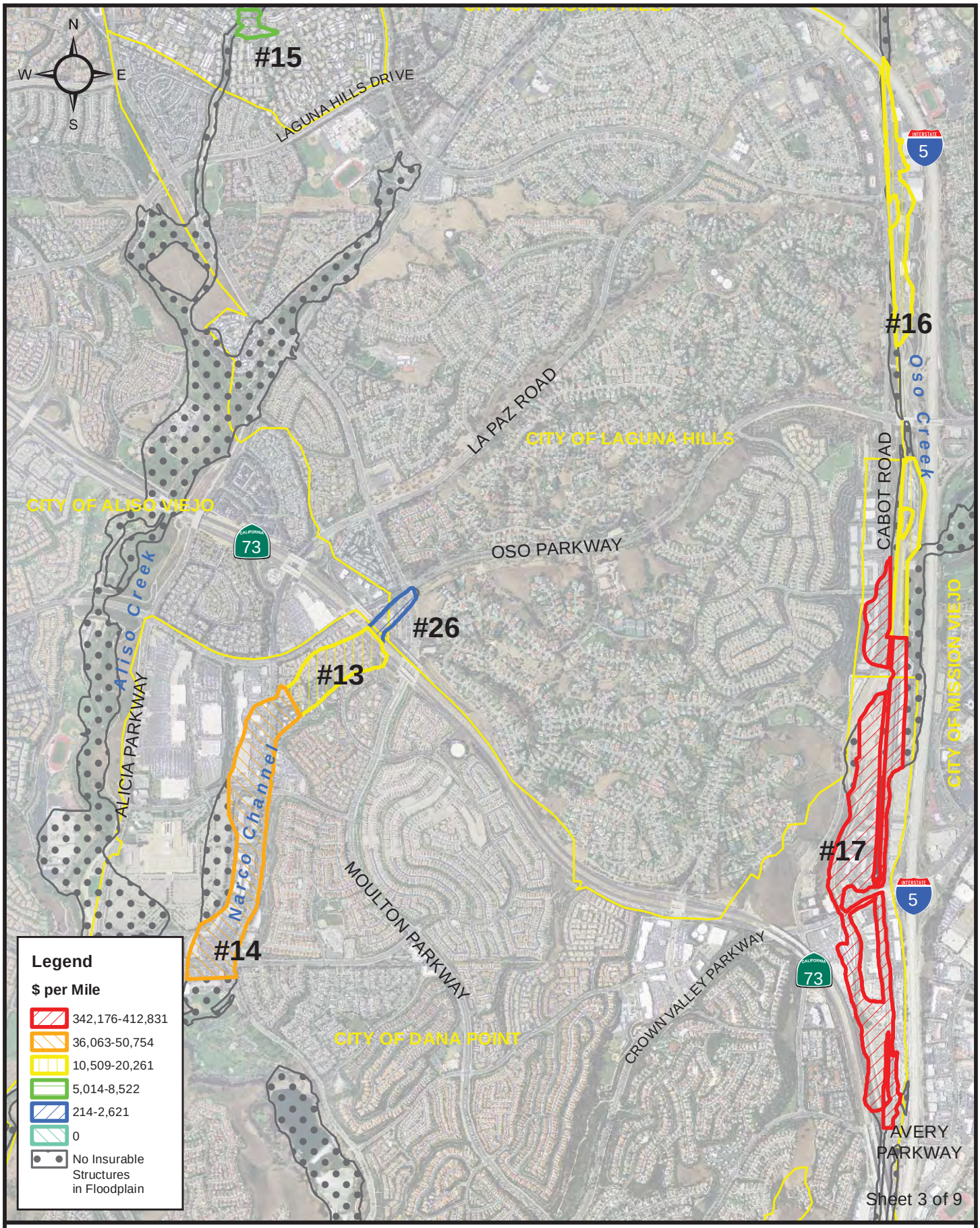
CITY OF LAGUNA NIGUEL
GOLDEN LANTERN
Trabuco Creek
CAMINO CAPISTRANO
EL HORNO STREET
Horno Creek
ORTEGA HIGHWAY
#19
#23
San Juan Creek
5
ALIPAZ STREET
#20
CITY OF SAN JUAN CAPISTRANO
San Juan Creek
DEL OBISPO STREET
STONEHILL DRIVE
CITY OF DANA POINT
#21
5
L01S02
(Camino Las
Ramblas)
#22
PACIFIC COAST HIGHWAY
CAMINO DE LOS MARES
Legend
$ per Mile
148,905-342,177
24,824-50,755
10,509-20,261
5,014-8,522
214-2,621
0
No Insurable
Structures
in Floodplain
Sheet 2 of 9
Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012
Structure Value in the Floodplain
0
1,100
2,200
4,400
Feet

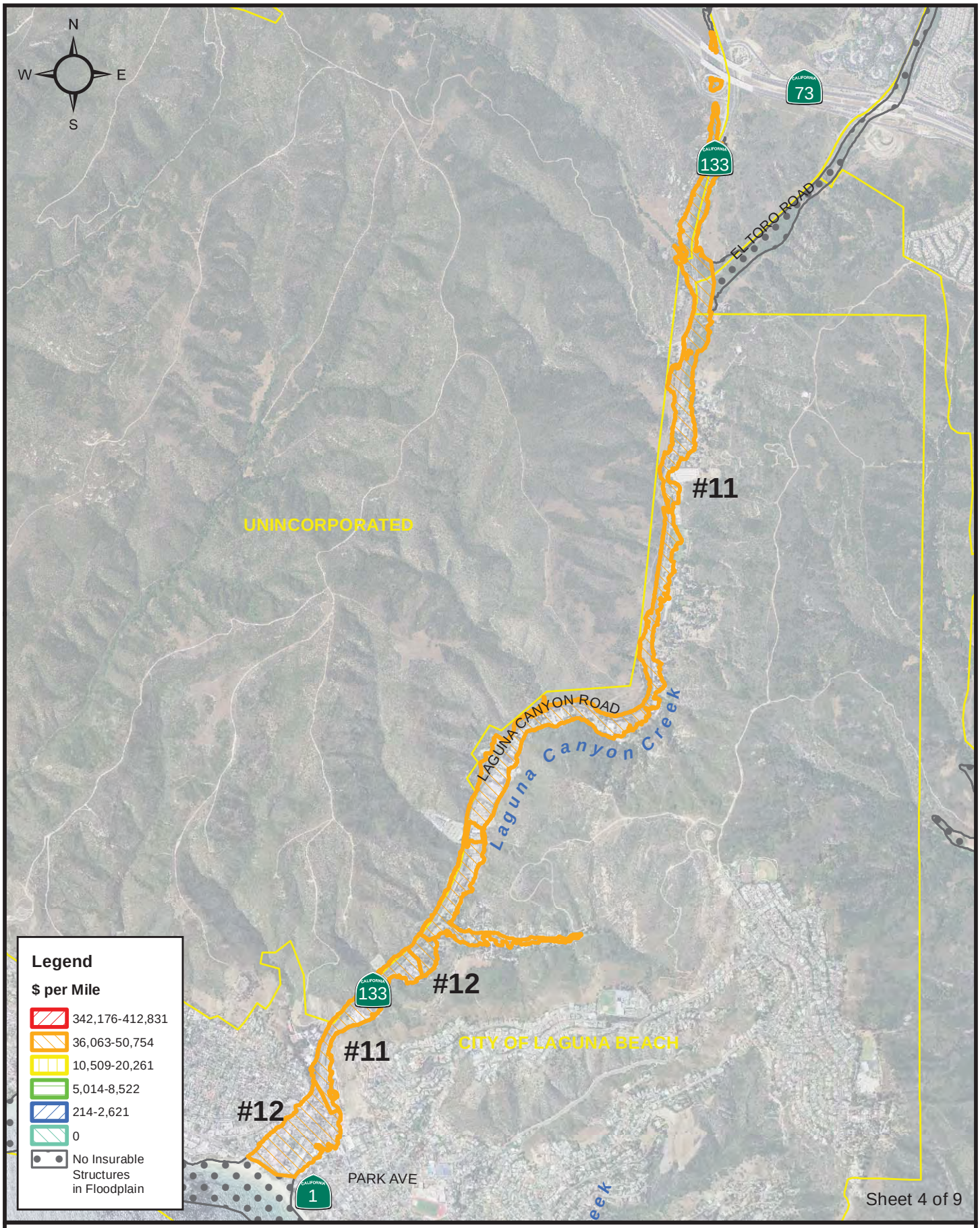


Sheet 3 of 9

Data Source: FEMA Hazus 2012, FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

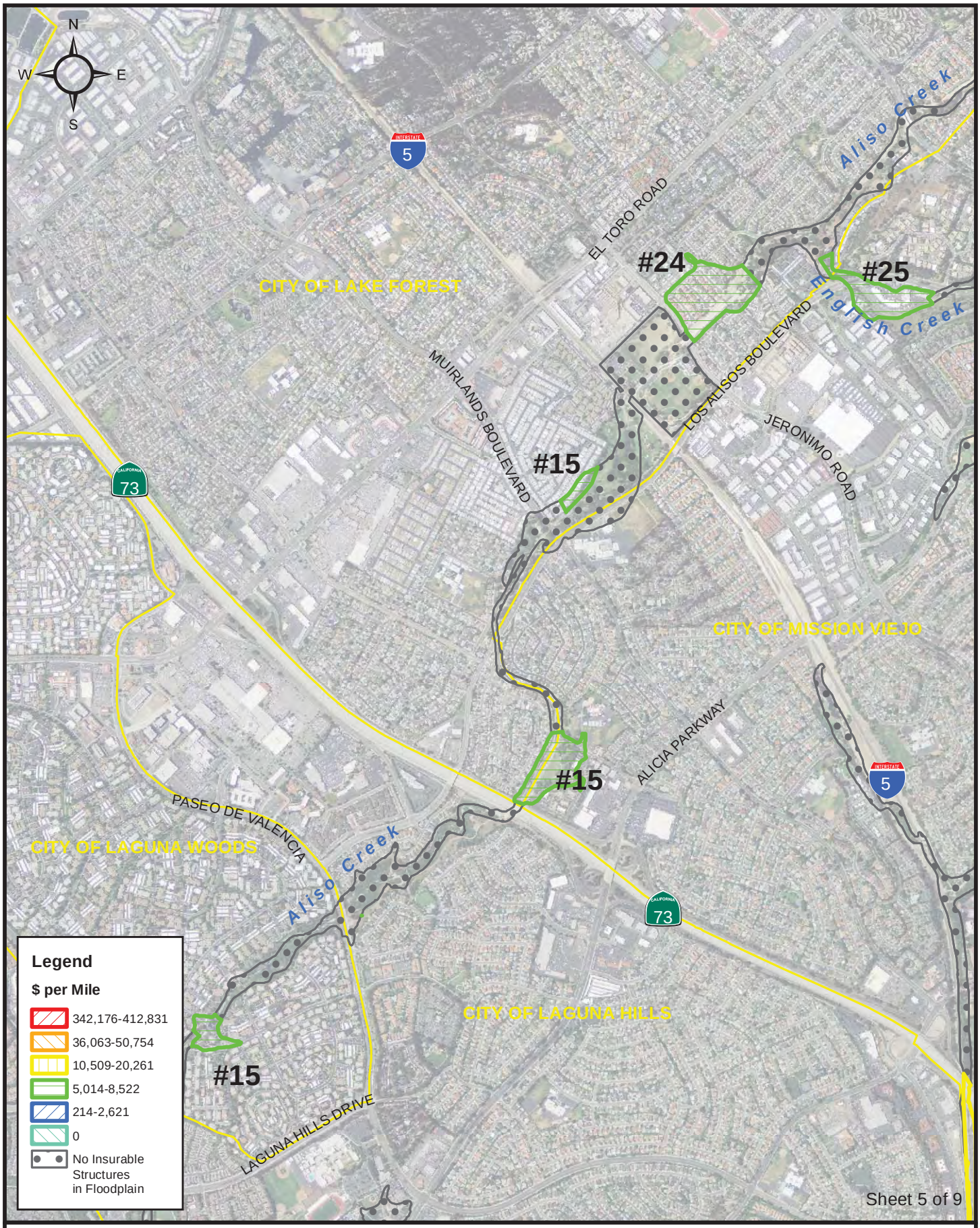
0 1,000 2,000 4,000 Feet



Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

0 1,000 2,000 4,000 Feet



Data Source: FEMA Hazus 2012,
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Aerial Source: NAIP 2012

Structure Value in the Floodplain

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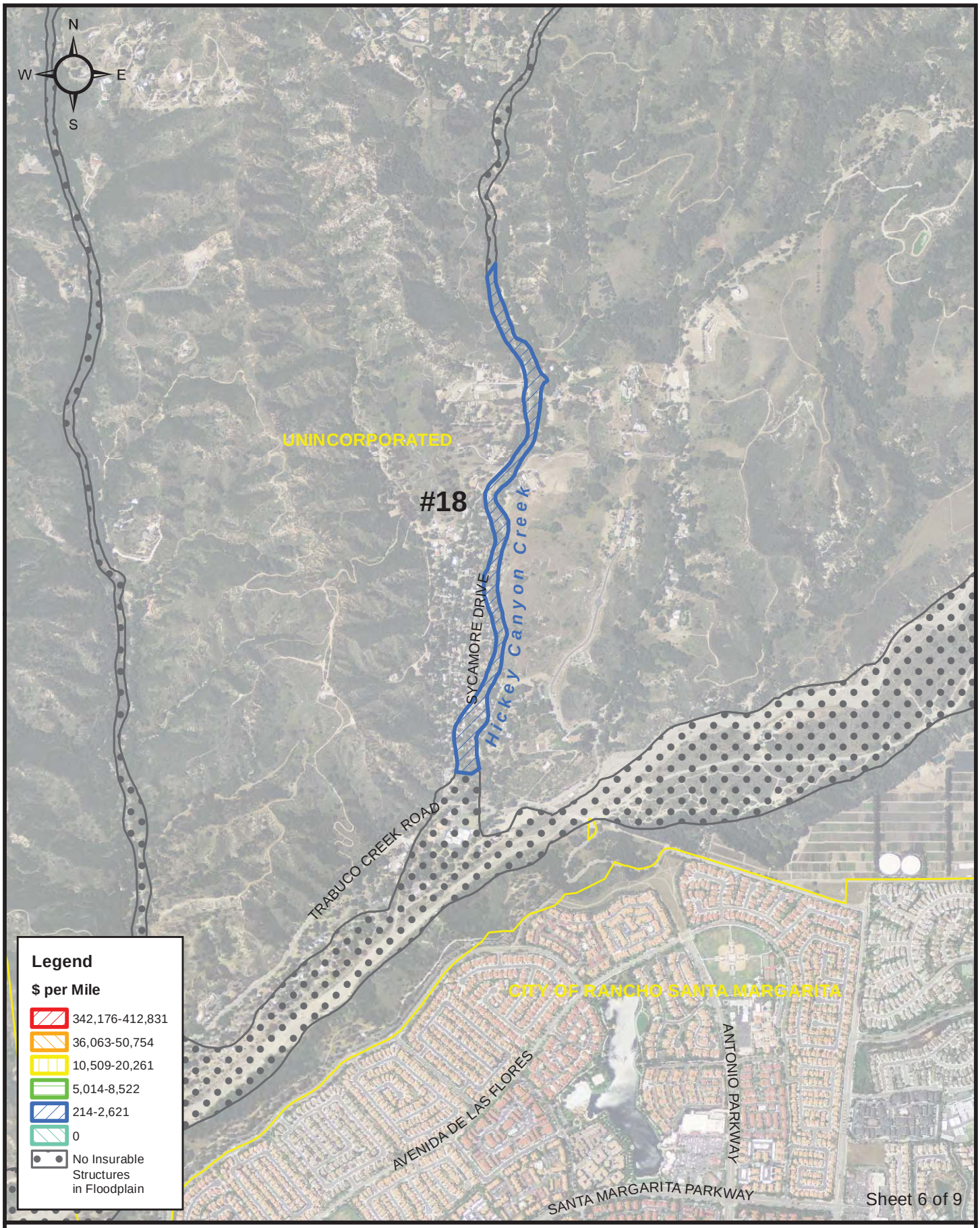
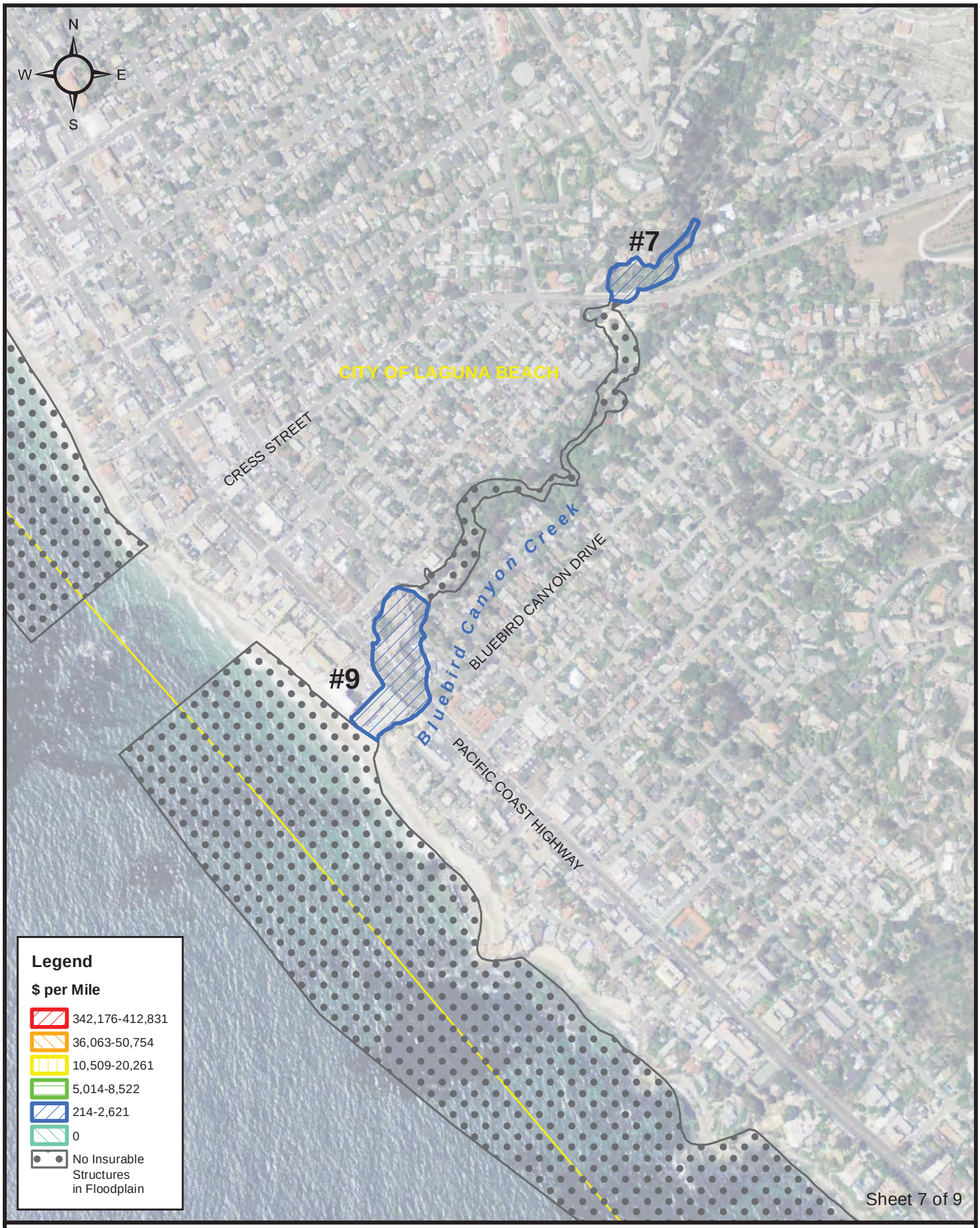


Data Source: FEMA Hazus 2012, FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

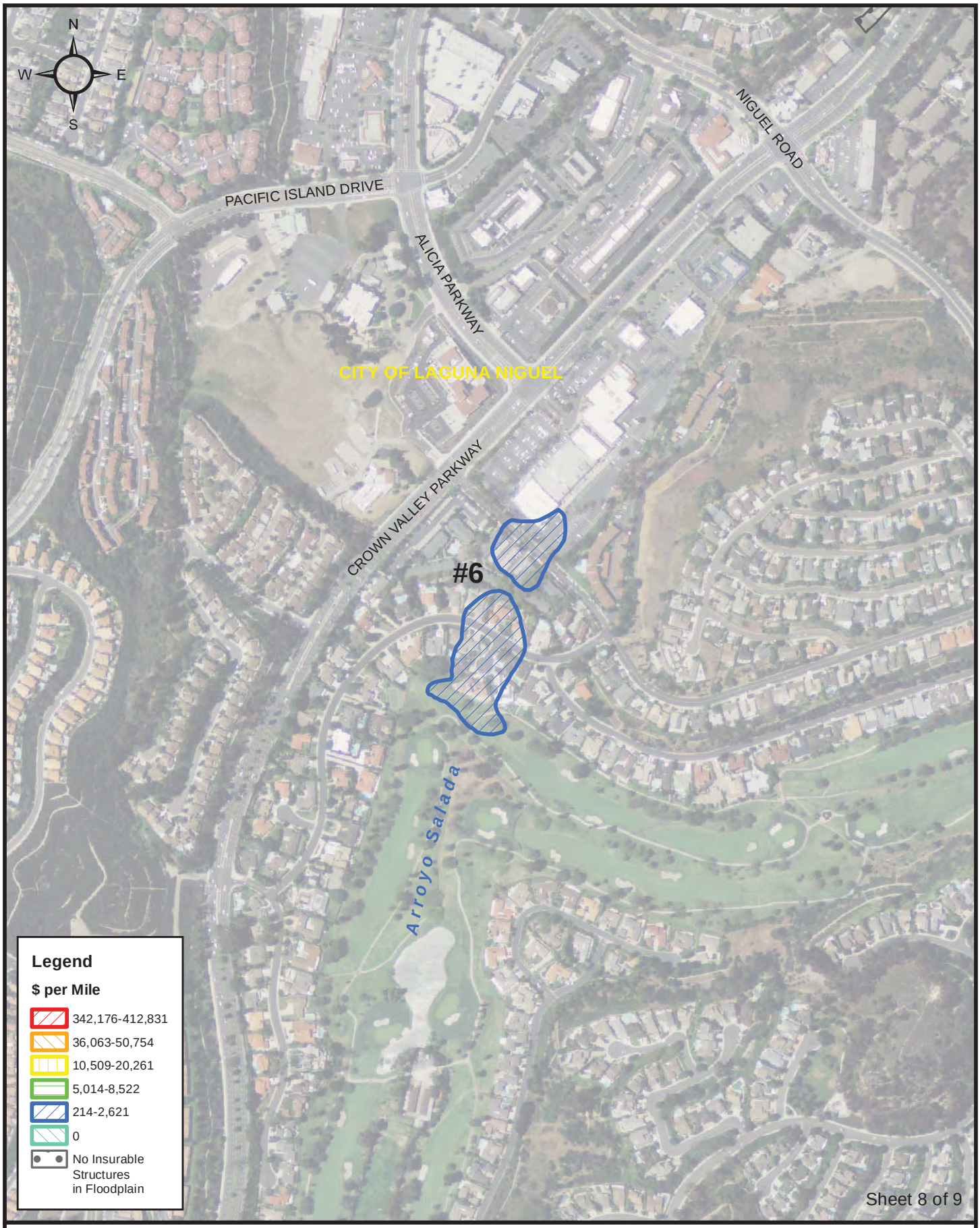
0 625 1,250 2,500 Feet



Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

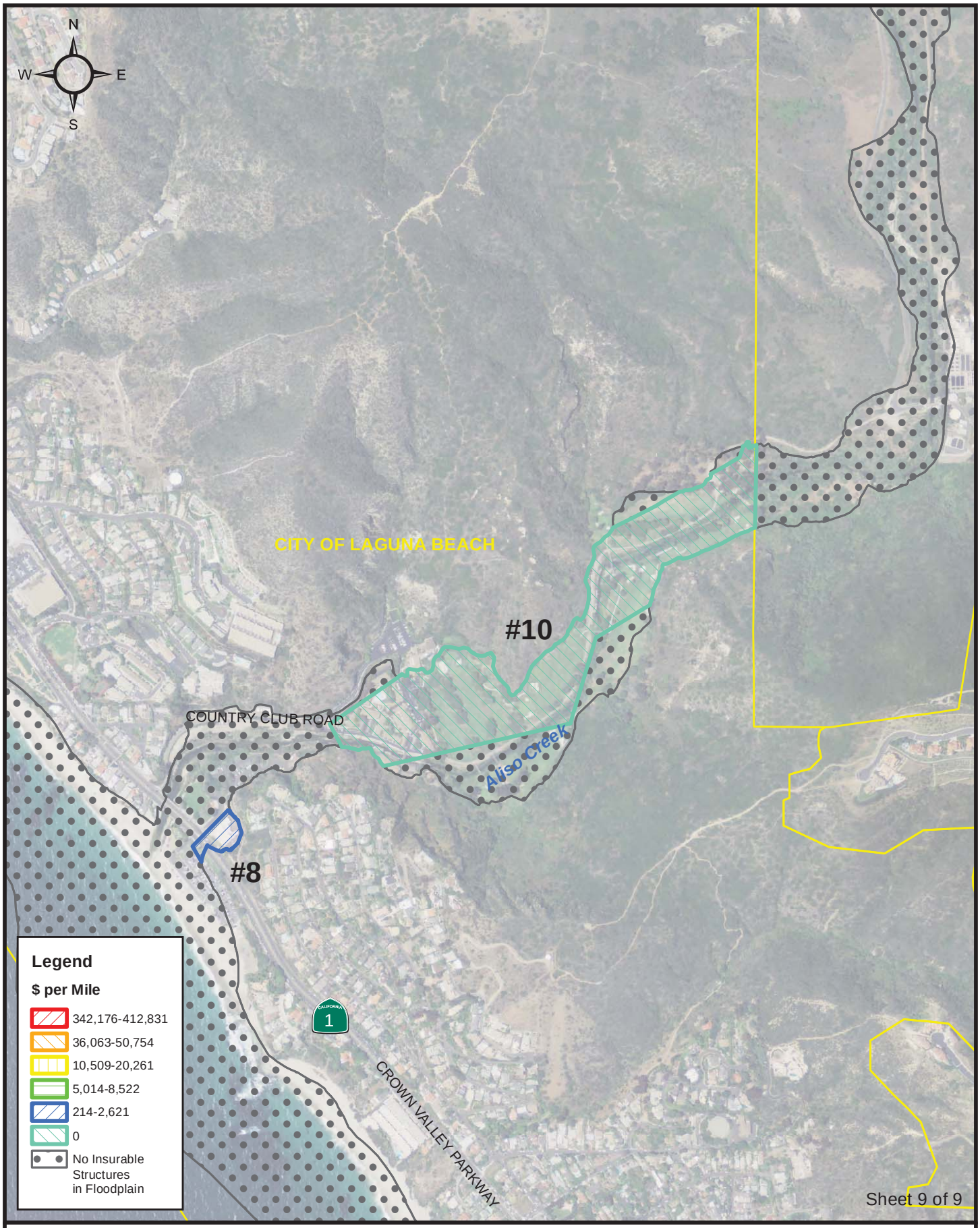
0 260 520 1,040 Feet



Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

0 260 520 1,040 Feet



Sheet 9 of 9

Data Source: FEMA Hazus 2012,
FEMA DFIRM 2012
Aerial Source: NAIP 2012

Structure Value in the Floodplain

0 370 740 1,480 Feet

APPENDIX I

Groundwater Management and Facility Plan

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Acronyms, Abbreviations, and Initialisms

acre-ft/yr	acre-feet per year
acre-ft	acre feet
ADA	American with Disabilities Act
ADT	Average daily traffic
AGR	Agricultural Supply
AWT	advanced water treatment
Basin Plan	Water Quality Control Plan for the San Diego Basin
Caltrans	The California Department of Transportation
Camp Pendleton	City of San Clemente and Marine Corps Base
CBC	California Building Code
CDC	California Department of Conservation
CDFG	California Department of Fish and Game
CDFM	cumulative departure from mean
CDPH	California Department of Public Health
CGS	California Geological Survey
CMIP3	Coupled Model Intercomparison Project Phase 3
CNDDB	Natural Diversity Data Base
CNPS	California Native Plant Society
CNPSEI	California Native Plant Society's Electronic Inventory
COLD	Cold Freshwater Habitat
CPT	cone penetration tests
CSC	California Species of Special Concern
CSJC	*City of San Juan Capistrano*
DOT	U.S. Department of Transportation
DWR	Department of Water Resources
FHWA	Federal Highway Administration
FMMP	Farmland Mapping and Monitoring Program
FSC	Federal Species of Concern
ft-bgs	feet below ground surface
FY	fiscal year
GCM	global circulation models
GFDL	Geophysical Fluid Dynamic Lab Model
gpm	gallons per minute
HA	Hydrologic Area

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Acronyms, Abbreviations, and Initialisms [continued]

HAS	Hydrologic Sub-Area
IND	Industrial Service Supply
IPCC	Intergovernmental Panel on Climate Change
JPA	Joint Powers Authority
LNAPL	Light Nonaqueous Phase Liquids
MCL	maximum contamination level
meq/L	milliequivalents per liter
mg/L	milligrams per litre
mgd	millions gallons per day
MNWD	Moulton Niguel Water District
MPAH	The Orange County Master Plan of Arterial Highways
MSL	mean sea level
MTBE	methyl-tert-butyl-ether
MUN	Municipal and Domestic Supply
MWDOC	Water District of Orange County
NCEP	National Centers for Environmental Predictions
NO3-N	nitrate as nitrogen
Ntu	Nephelometric Turbidity Units
OCTA	Orange County Transportation Authority
PCM	Parallel Climate Model
REC1	Contact Water Recreation (REC1)
REC2	Non-contact Water Recreation
RMAP	Radar Mean Areal Precipitation
RMV	Rancho Mission Viejo
RO	reverse osmosis
SCAG	Southern California Association of Governments
SCRRA	Southern California Regional Rail Authority
SCWD	South Coast Water District
SJBA	San Juan Basin Authority
SMWD	Santa Margarita Water District
SOCOD	South Orange County Ocean Desalter
SR-1	Pacific Coast Highway
SR-241	Foothill Transportation Corridor.
SR-241	State Route 241

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Acronyms, Abbreviations, and Initialisms [continued]

SR-73	State Route 73
SR-74	Ortega Highway
SRES	special report emissions scenarios
SWRCB	State Water Resources Control Board
SY	safe yield
TBA	tert-butyl-alcohol
TCWD	Trabuco Canyon Water District
TDS	total dissolved solids
TUa	acute toxic units
ug/L	micrograms per litre
UNEP	United Nations Environment Programme
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tanks
VMT	vehicle miles traveled
WARM	Warm Freshwater Habitat
WAS	waster activated sludge
WCRP	World Climate Research Programme
WEI	Wildermuth Environmental, Inc.
WILD	Wildlife Habitat
WMO	World Meteorological Organization
WRP	water reclamation plant

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In 2010 the San Juan Basin Authority (SJBA) engaged Wildermuth Environmental, Inc. (WEI) to update their San Juan Basin Groundwater Management and Facilities Plan (SJBGMFP). WEI teamed with Carollo Engineers and Michael Bradman and Associates to complete this work. This administrative draft report documents the efforts of the stakeholders and our team to update the SJBGMFP. Specifically, this report documents the current state of the basin (SOB), the conceptual model of the hydrologic system, the environmental and infrastructure resources in the investigation area, management goals and impediments to the goals, management alternatives, recommended management plan(s), and a monitoring and reporting plan.

1.1 Scope of Work

The SJBA member agencies include: the City of San Juan Capistrano (CSJC), the Moulton Niguel Water District (MNWD), the Santa Margarita Water District (SMWD), and the South Coast Water District (SCWD). All member agencies of the SJBA are highly dependent on imported water from the Metropolitan Water District of Southern California (Metropolitan). Metropolitan supplies consist primarily of State Water Project (SWP) water and Colorado River Aqueduct (CRA) water, both of which have been permanently reduced and are now less reliable. Metropolitan's water rates to retail agencies have increased dramatically in the last several years and are projected to continue to increase into the future. The SJBA member agencies need to develop more local supplies and local storage to improve supply reliability, reduce their demands on Metropolitan, mitigate temporary interruptions of supply from Metropolitan, and minimize their exposure to penalties in the drought allocation plan.

The range in groundwater management plans includes the following:

- Preserve the status quo. Complete existing planned projects and rely on Metropolitan to serve all water above and beyond existing local supplies. In this alternative the SJBA member agencies will purchase the maximum amount of Metropolitan water relative to other alternatives and be subject to Metropolitan's rate structure and drought penalties.
- Maximize the use of local water. Complete existing planned projects and then maximize the use of all local water including storm water, native groundwater, and recycled water. In this alternative, the SBJA members will use all their recycled water, the full yield of the groundwater basins and will maximize the recharge of storm water pursuant to the MS4 permit and other opportunistic storm water recharge projects. Existing infrastructure would be leveraged to the maximum extent possible and new infrastructure would be added as required.
- Maximize the use of local water and recycled water. This alternative is identical to the above alternative except that it recharges supplemental water as necessary to maintain or increase supply and supply reliability.

We investigated how to best manage the San Juan groundwater basin under these types of planning concepts, how each SJBA member and other stakeholders would be impacted, mitigation measures and costs. Some of the management concepts considered herein push the

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regulatory envelope and may require changes in the current Basin Plan and in the indirect recycled water reuse paradigm. We have identified how the current regulatory paradigm limits the management plan and developed reasonable changes in the regulatory paradigm to improve management plan performance and presented both types of plans to the SJBA for their consideration.

The scope of work included the following tasks:

- Task 1 Define Water Management Objectives
- Task 2 Describe Planning Area and its Resources
- Task 3 Describe Historical and Future Water Requirements
- Task 4 Describe Existing Resources
- Task 5 Describe Water Management Issues and Strategies
- Task 6 Define Alternative Management Plans
- Task 7 Evaluate Alternative Management Plans
- Task 8 Describe Recommended Management Plan.
- Task 9 Develop Monitoring and Reporting Protocols
- Task 10 Prepare Groundwater Management Plan Report
- Task 11 Project Meetings and Coordination Activities
- Task 12 Preliminary CEQA Analysis
- Task 13 Project Management

1.2 Organization of this Report

Section	Title	Description
1	Introduction	
2	Planning Area and its Resources	Describes planning area and the resources to be evaluated in a CEQA checklist
3	Existing Water Resources	Describes the surface and groundwater resources, water rights, groundwater response to continuing the current management plan, and water facilities infrastructure
4	Historical and Projected Water Demand	Describes the historical water use and sources and future water demands and supply plans
5	Management Goals and Impediments	Describes the management goals and impediments to the goals and other "issues needs and wants" of the SJBA member agencies
6	Strategies and Actions to Achieve	Describes strategies and actions that will

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Section	Title	Description
	Management Objectives	overcome the impediments to the management goals
7	Alternative Management Plans	Describes management plan alternatives
8	Evaluation of Management Plans	Describes the evaluation of the management plans based on ability to meet management plan goals, cost and ability to implement
9	Recommended Management Plan	Describes and recommends alternative management plan and implementation steps
10	Recommended Monitoring and Reporting Protocols	Describes and recommends monitoring and reporting protocols for the implementation of the recommended management plan
11	References	Contains a list of references consulted in the preparation of the SJBGMFP
A	Appendix – Comments and Responses to Comments	Contains verbatim comments and responses on the draft SJBGMFP report.

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This section describes the planning area, the various jurisdictions, and the environmental resources within the SJBA service area. The environmental resources are identified to provide a baseline of potential opportunities and constraints during the preparation of alternative management plan activities.

2.1 Regional Setting

2.1.1 Location

The SJBA is located in southern Orange County and encompasses approximately 100,110 acres or 156 square miles of land. Figures 2-1 and 2-2 show the boundaries of the SJBA in a regional context and in relation to the San Juan Creek Watershed, respectively. The SJBA is bordered by Cleveland National Forest to the east, the City of San Clemente and Marine Corps Base (Camp Pendleton) to the south, the Pacific Ocean to the west, and mostly urbanized Orange County to the north.

2.1.2 Setting

The SJBA is located within the coastal plains and foothills of southern Orange County (Figure 2-3). Elevations range from sea level to approximately 4,500 feet in the Santa Ana Mountains. Approximately half of the land within the basin is open space, park land, or designated agricultural land; the other half is primarily urbanized with residential, commercial, and industrial uses. There are five major roadways that traverse and/or terminate within the basin area, including Interstate 5 (I-5), State Route 73 (SR-73), Pacific Coast Highway (SR-1), SR-241, and Ortega Highway (SR-74). SR-241 currently terminates at Oso Parkway in the City of Mission Viejo. SR-73 merges with Interstate 5 just south of Crown Valley Parkway. The Ortega Highway begins at Interstate 5 in the City of San Juan Capistrano and continues east outside the boundary of the SJBA through Cleveland National Forest into Riverside County. The Pacific Coast Highway runs along the coast through the basin until it merges with Interstate 5 near Doheny State Beach.

There are nine cities located within or that have land area within the SJBA service area. These cities include Aliso Viejo, Dana Point, Laguna Beach, Laguna Hills, Laguna Niguel, Mission Viejo, Rancho Santa Margarita, San Clemente, and San Juan Capistrano. Two of these cities, San Clemente and Laguna Beach, have small amounts of land within the Authority's boundary. Figure 2-4 shows these cities within and adjacent to the SJBA. The land use discussion below includes further detail regarding the amount of land these cities have within the boundary.

There are four water districts within the SJBA service area boundary. These four water districts include the MNWD, the SCWD, the CSJC, and the SMWD (Figure 2-5). The sizes and specific locations of these districts are discussed below in Section 2.7 – Land Use.

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2.2 Aesthetics

The SJBA service area consists of urbanized flatlands and hills, sandy beaches, rocky coastal points, and mountain ridges, reaching elevations of nearly 4,500 feet above sea level. Broad sandy beaches extending into shallow offshore waters, coastal bluffs, uplifted marine terraces, and marshes characterize the Pacific shoreline. Views are characterized by the Santa Ana Mountains to the northeast, the Santa Margarita Mountains to the southeast, the San Joaquin Hills to the northwest, and the Pacific Ocean, which can be seen from many of the ridgelines within the SJBA's boundary. Scenic resources within the basin are characterized by the rise of coastal hills and ridges from the west to east, which provide rugged canyons with flowing creeks and streams.

Approximately half of the land located within the SJBA service area is urbanized and man-made, while the other half consists of designated parks, open space, and agriculture. Features of the built environment that influence the visual setting include residential, commercial, industrial, and utility-related structures; linear features such as highways, roads, transmission lines, walls, fences, and ditches; agricultural fields, orchards, parks, and golf courses; and dispersed ornamental landscaping that has replaced natural vegetative patterns and colors with row or field crops, fields of grass, and nonnative ornamental vegetation.

2.2.1 Location

There are no County-designated scenic highways that are within or run through the SJBA's boundary. The Pacific Coast Highway through Orange County, including through the SJBA area, has been proposed as a potential scenic highway but has not been officially designated.

2.2.2 Viewscape Corridors

According to the Orange County General Plan, there are roadway segments within the SJBA's boundary that are designated viewscape corridors. A viewscape corridor is a "[…] route which traverses a corridor within which unique or unusual scenic resources and aesthetic values are found" (OCGP, 2004). This designation is intended to minimize the impact the highway and land development has upon significant scenic resources along the route. The following is a list of designated viewscape corridors throughout the SJBA boundary.

2.2.2.1 Santa Margarita Parkway

This roadway is designated a viewscape corridor from Melinda Road to Avenida Empresa.

2.2.2.2 Oso Parkway

This roadway is designated a viewscape corridor from the intersection of Oso Parkway and SR-241 east until Oso Parkway ends.

2.2.2.3 Ortega Highway (SR-74)

This roadway is designated a viewscape corridor from the southern portion of Caspers Regional Park to the northeast where it meets the Orange County border.

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2.2.2.4 Pacific Coast Highway

This roadway is designated a viewscape corridor from where it enters the SJBA boundary in the City of Laguna Beach to the southeast where it extends to the San Diego Freeway (I-5) in the City of Dana Point.

2.2.2.5 Interstate-5

A short portion of I-5 is designated a viewscape corridor from where it merges with Pacific Coast Highway to where it leaves the SJBA boundary in the western portion of the City of San Clemente.

2.2.3 Landscape Corridors

According to the Orange County General Plan, there are roadway segments within the SJBA service area that are designated landscape corridors. A landscape corridor is a roadway that "[…] traverses developed or developing areas and has been designated for special treatment to provide a pleasant driving environment as well as community enhancement" (OCGP, 2004). Development within the corridor should serve to complement the scenic highway. The following is a list of landscape corridors throughout the SJBA boundary.

2.2.3.1 Santa Margarita Parkway

This roadway is designated a landscape corridor from Avenida Empresa to Plano Trabuco Road.

2.2.3.2 Antonio Parkway

This roadway is designated a landscape corridor from Avenida Empresa to Oso Parkway.

2.2.3.3 Oso Parkway

This roadway is designated a landscape corridor from Alicia Parkway to the interchange of SR-241 and Oso Parkway.

2.2.3.4 Alicia Parkway

This roadway is designated a landscape corridor from Paseo De Valencia south to Aliso Creek Road.

2.2.3.5 La Paz Road

This roadway is designated a landscape corridor from Paseo De Valencia south to Crown Valley Parkway.

2.2.3.6 Crown Valley Parkway

This roadway is designated a landscape corridor from I-5 south to its termination at Pacific Coast Highway.

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2.2.3.7 Ortega Highway

This roadway is designated a landscape corridor from I-5 northeast to the southern portion of Caspers Regional Park.

2.2.3.8 Niguel Road

This roadway is designated a landscape corridor from Crown Valley Parkway south to its termination at Pacific Coast Highway.

2.2.3.9 Camino Del Avion

This roadway is designated a landscape corridor from Crown Valley Parkway to Del Obispo Street.

2.2.3.10 Del Obispo Street

This roadway is designated a landscape corridor from Camino Del Avion to its termination at Pacific Coast Highway.

2.3 Agriculture

A little more than one-third of the land located within the boundary of the SJBA is designated agricultural land. This land is primarily located in the center to southeast part of the SJBA's boundary. The remaining approximate two-thirds of the project area are urbanized with residential, commercial, and light industrial land uses. The Cleveland National Forest is located in the eastern portion of the SJBA service area and is the County's largest single open space feature. Open space is also provided by County and City local parks within suburban and urban settings.

2.3.1 California Department of Conservation Farmland Classification

The California Department of Conservation (CDC) Farmland Mapping and Monitoring Program (FMMP) combines technical ratings of the soils and current land use information to determine the appropriate mapping land category as it relates to potential agricultural production. Agricultural land classifications for the proposed project area included mainly Grazing Land (approximately 28,379 acres in 2008), Prime Farmland (approximately 299 acres in 2008), Unique Farmland (approximately 770 acres in 2008), and Farmland of Statewide Importance (approximately 59.4 acres in 2008), totaling 29,507 acres of agricultural land out of approximately 100,110 acres of land within the SJBA service area (CDC, 2008). The locations of these lands and their classification are shown in Figure 2-6 and are further described below. Please note that the information regarding farmland was updated by the CDC in 2008. This means development could be planned or be taking place on land that was designated for agriculture, such as The Ranch Plan, which was approved in 2006 but has not yet been developed. See below, under Williamson Act Contract, for further information about agricultural land that is planned for development and is to be rezoned from agricultural use.

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2.3.1.1 Prime Farmland

Land with the best combination of physical and chemical features for the long-term production of agricultural crops is termed Prime Farmland by the CDC. This land can economically produce sustained high yields when treated and managed according to accepted modern farming methods. The land must have been used for the production of irrigated crops at some time during the two updated cycles prior to the current mapping date. Prime Farmland within SJBA is mostly concentrated south of Ladera Ranch and east of Antonio Parkway along Ortega Highway. There is Prime Farmland located along and west of I-5. This farmland is off Camino Del Avion and Camino Capistrano in the City of San Juan Capistrano. Lastly, a small piece of Prime Farmland is located in north Coto De Caza off Coto De Caza Drive. Refer to Figure 2-6 for the locations of this farmland.

2.3.1.2 Farmland of Statewide Importance

This is land with a good combination of physical and chemical features but with minor shortcomings, such as greater slopes, or with less ability to hold and store moisture. The land must have been cropped at some time prior to the mapping date. Farmland of Statewide Importance within the SJBA service area is located east of Antonio Parkway along Ortega Highway. There is also Farmland of Statewide Importance located along and west of I-5. This farmland is off Camino Del Avion and south of La Novia Avenue in the City of San Juan Capistrano. Lastly, two small pieces of Farmland of Statewide Importance are located to the north and south of Ortega Highway. Refer to Figure 2-6 for the locations of this farmland.

2.3.1.3 Grazing Land

Grazing land is land on which the existing vegetation, whether grown naturally or through management, is suitable for the grazing or browsing of livestock. This classification of farmland is located in the north central and eastern parts of the basin boundary. Grazing Land comprises most of the farmland designated within the basin. This is located north and south of Ortega Highway. Refer to Figure 2-6 for the locations of this farmland. Most of the grazing land is located within The Ranch Plan, which as discussed above, has already been approved.

2.3.1.4 Farmland of Local Importance

This is land of importance to the local agricultural economy and is determined by each county's Board of Supervisors and local advisory committees. Examples of this type of land could include dairies, dry land farming, aquaculture, and uncultivated areas with soils qualifying for Prime Farmland and Farmland of Statewide Importance. There is no land within the SJBA service area that is classified as Farmland of Local Importance.

2.3.1.5 Urban and Developed Land

This land is used for residential, industrial, commercial, construction, institutional, and public administrative purposes; railroad yards; cemeteries; airports; gold courses; sanitary landfills; sewage treatment plants; water control structures; and other development purposes. Approximately half of the land within the basin boundary is developed land.

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2.3.2 Williamson Act Contracts

The CDC provides an ftp site containing maps by county of lands under Williamson Act contracts. As mentioned above, the agricultural land classifications shown in Figure 2-6 were obtained from the CDC and was updated in 2008. This is the most recent information available. Taking this into consideration, there was land that was classified as agricultural land in 2008 that is now no longer under Williamson Act contracts. According to the Ranch Plan, of the total 29,507 acres of designated agricultural land in 2008, 9,840 acres of agriculture land previously under a Williamson Act contract were not renewed in 2008, and a good portion of this land is planned to be developed under The Ranch Plan. This land is located around Ortega Highway, approximately 2.5 miles east of Antonio Parkway.

2.4 Biological/Ecological Resources

2.4.1 Introduction

Approximately half of the land within the SJBA service area is urban and developed, leaving the remaining land zoned agricultural, recreational, and open-space. The basin is bound by the Santa Ana Mountains to the northeast and the San Joaquin Hills to the southwest and contains a series of canyons and creeks throughout. Below is a detailed account of endangered, threatened, and special-status species (plants and wildlife) that exist within the project area.

2.4.1.1 Literature and Data Review

Information regarding the occurrences of special-status species in the vicinity of the San Juan Basin boundary was obtained from searching the California Department of Fish and Game's (CDFG) Natural Diversity Data Base (CNDDB, February 2011) and the California Native Plant Society's Electronic Inventory (CNPSEI, February 2011). These databases contain records of reported occurrences of federal- or State-listed endangered or threatened and proposed endangered or threatened species, former Federal Species of Concern (FSC), California Species of Special Concern (CSC), or otherwise sensitive species or habitat that may occur within or in the immediate vicinity of the basin. Lists from the U.S. Fish and Wildlife Service (USFWS) and the CDFG were also reviewed, and lists of sensitive wildlife and plant species potentially occurring within the vicinity of the basin boundaries were developed. The search range encompasses a sufficient distance to accommodate for regional habitat diversity and to overcome the limitations of the CNDDB; the CNDDB is based on reports of actual occurrences and does not constitute an exhaustive inventory of every resource.

2.4.1.2 Biological Differences

There are 27 sensitive wildlife species identified within the SJBA service area. Figure 2-7 shows where these species occur within the basin. Of the 27 sensitive wildlife species, seven are considered federally endangered and one is considered federally threatened. Two species are considered endangered by the State, and 22 species are considered "California Species of Concern," according to the California Department of Fish and Game. Table 2-1 lists these species by their common and scientific names and shows their federal and state statuses.

There are 15 sensitive plant species identified within the SJBA boundary. Figure 2-8 is a map showing where these species occur within the SJBA service area. Of the 15 species, three are considered to be federally threatened and According to the State of California, two are considered to be threatened and one endangered. All of the species listed in Table 2-2 have a California Native Plant Society (CNPS) rating of 1B.1 or 1B.2. These ratings are defined as plants being rare, threatened, or endangered by the CNPS rating system Table 2-2 lists these plant species by their common and scientific names.

2.4.1.3 Critical Habitat

According to the USFWS, there are five critical habitats that occur within SJBA service area. These habitats and their areas are listed in Table 2-3 and their locations are shown in Figure 2-9. Steelhead, San Diego fairy shrimp, Arroyo toad, thread-leaved brodiaea, and Coastal California gnatcatcher all have critical habitat with in the basin.

2.4.2 Habitat Descriptions

2.4.2.1 Arroyo Toad

Arroyo toads can be found in washes, streams, and arroyos. They can also be found on sandy banks in riparian woodlands and along rivers that have shallow gravelly pools adjacent to sandy terraces.

2.4.2.2 Coastal California Gnatcatcher

The Coastal California gnatcatcher typically occurs in or near coastal sage scrub habitat. This species is found within coastal Southern California from Ventura County down to the northern coastal parts of Mexico.

2.4.2.3 San Diego Fairy Shrimp

The San Diego fairy shrimp is a small aquatic crustacean, which is generally restricted to vernal pools and other ephemeral basins in coastal Orange and San Diego Counties. Vernal pools in Southern California typically contain water in the winter and are dry in the summer. The San Diego fairy shrimp can be found in pools that are 2 to 12 inches deep.

2.4.2.4 Thread-leaved Brodiaea

Thread-leaved brodiaea typically occurs on gentle hillsides, valleys, and floodplains. It grows in southern needlegrass grassland and alkali grassland plant communities that are associated with clay, loamy sand, or alkaline silty-clay soils.

2.4.2.5 Steelhead

Steelhead typically occur in coastal rivers. Steelhead critical habitat, as shown in Figure 2-9, occurs within San Juan Creek. This critical habitat extends from the mouth of San Juan Creek at the Pacific Ocean to approximately 2.6 miles upstream, where San Juan Creek meets the I-5. Steelhead critical habitat is also identified from the Arroyo Trabuco and San Juan Creek confluence to approximately 2.5 miles upstream within the Arroyo Trabuco.

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2.5 Geological Hazards

2.5.1 Seismicity and Faulting

2.5.1.1 Groundshaking

According to the 2001 California Building Code (CBC), the SJBA boundary is in Seismic Zone 4. Seismic Zone 4 includes those areas that lie in a zone of major historic earthquakes (i.e. Mw magnitude greater than 7.0) and recent high levels of seismicity. Major damage, corresponding to intensities VIII or higher on the Modified Mercalli Intensity Scale, should be expected within this zone. The amount of earthquake shaking at a site is a function of earthquake magnitude, the type of earthquake source (i.e. type of fault), the distance between the site and the earthquake source; the geology of the site, and how the earthquake waves subside (attenuate) as they travel from their source to a given location. Larger, nearer quakes will increase the degree of groundshaking at a given location. Soil and rock type may act to amplify or attenuate seismic waves and consequent groundshaking. Generally, areas that are underlain by bedrock tend to experience less groundshaking than those underlain by unconsolidated sediments such as artificial fill.

There are two major fault zones that occur within the SJBA service area: the Cristianitos fault zone and the Mission Viejo fault zone. The Cristianitos fault zone passes through the central portion of the SJBA service area, from north to south, while the Mission Viejo fault zone passes through the eastern portion of the SJBA service area, from north to south. There are other unnamed faults located in the southwestern, north-central, and northeastern part of the SJBA boundary. Figure 2-10 shows the locations of these faults within and around the basin.

2.5.2 Soil Constraints

2.5.2.1 Liquefaction

Liquefaction is a phenomenon in which saturated soils lose strength and cohesion when subjected to dynamic forces, such as shaking during an earthquake. Liquefaction can occur in unsaturated soils with low cohesion, such as uniformly fine sand. Liquefaction potential is greatest in areas with shallow groundwater and saturated soils. Soil type, climate, topography, slope geometry, and excavations influence the potential for slope failures and landslides. Liquefaction and related phenomena have been responsible for a tremendous amount of damage during earthquakes, as soil cohesion is lost along with the support that it normally supplies to building foundations. Ground failure resulting from liquefaction can include sand boils, ground settlement, ground cracking, lateral spreading, slope toe failure, and ground warping. Liquefaction within the SJBA service area is generally confined to the creeks and stream areas. Figure 2-11 shows this in detail for liquefaction throughout the basin.

2.5.2.2 Landslides

Landslides, rock falls, and debris flows are all forms of mass wasting—the movement of soils and rock under the influence of gravity. A landslide may occur if the source material on a slope is triggered by some mechanism. Source materials include fractured and weathered

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bedrock and loose soils. Triggering mechanisms include earthquakes, saturation from rainfall, and erosion.

Shaking during an earthquake may lead to seismically induced landslides, especially in areas that have previously experienced landslides or slumps, in areas of steep slopes, or in saturated hillsides. The California Geological Survey (CGS) has identified areas subject to landslides within the SJBA service area. These areas are shown in Figure 2-12. Potential areas where seismically induced landslides could occur are in the foothill portions of the SJBA service area.

2.5.2.3 Tsunami and Seiche

A tsunami (Japanese word meaning "harbor wave") or "seismic sea wave" is a water wave or a series of waves generated by a sudden displacement of the surface of the ocean or other deep body of water. Tsunamis can travel across oceanic basins and cause damage thousands of miles from their sources. Most tsunamis are caused by a rapid vertical movement along a break in the Earth's crust (i.e. a tectonic fault rupture on the bottom of the ocean resulting in the displacement of the column of water directly above it). Earthquake ruptures along subduction zones trigger the majority of tsunamis.

A seiche is a periodic oscillation or "sloshing" of water in an enclosed basin caused by an earthquake. The period of oscillation is dependent upon the size and configuration of the water body and may range from minutes to hours. A seiche may occur in a lake, bay, or other enclosed body of water.

Any unprotected coastal area may have some degree of risk from tsunamis. The presence of active offshore faults would indicate an additional tsunami risk to low-lying areas near the Orange County coast. The risk from a seismic seiche in lakes and reservoirs in the County also exists to some degree and would be related to the size and depth of the water body and its proximity to the epicenter of a major quake.

2.5.3 Soil Types

Soils in the area are characteristic of the Southern California coastal plain, consisting of alluvial deposits and floodplain soils. The major soil series, permeability, and degree of limitation for development at shallow excavations are identified in Table 2-4. Much of the alluvial and fluvial soils underlying SJBA boundary were deposited from runoff of the Santa Ana Mountains. Such deposits are composed of variable amounts of sand, silt, and clay. The SJBA area consists of 28 different soil series that make up the basins ground composition.

A soil's permeability is defined in three categories; Slow, Moderate, and Rapid. These are the general rates at which water and air are absorbed into the soils. Figure 2-13 shows the categories of permeability throughout the basin. The degree of limitation defines the development constraints—slight, moderate, and severe—for structures being installed. The United States Department of Agriculture "building site development" classification of shallow excavations was chosen due to the likelihood of water facilities, such as pipelines being constructed at a depth of 3 to 6 feet. The constraints of slight, moderate, and severe are defined as follows:

- Slight means that the soil properties are generally favorable and that the limitations are minor and easily overcome.
- Moderate means that the limitations can be overcome or alleviated by planning, design, or special maintenance.
- Severe means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

Figure 2-14 shows the degrees of limitation throughout the basin.

2.6 Hydrology

2.6.1 Water Courses

The major watercourse that feeds the San Juan Creek Watershed is San Juan Creek. The San Juan Creek watershed is located in southern Orange County, California. The watershed encompasses a drainage area of approximately 176 square miles, and extends from the Cleveland National Forest in the Santa Ana Mountains to the Pacific Ocean at Doheny State Beach near Dana Point Harbor. The upstream tributaries of the watershed flow out of steep canyons. As the streams flow, they coalesce and widen out into several alluvial floodplains. The major streams in the watershed include San Juan Creek, Bell Canyon Creek, Canada Chiquita, Canada Gobernadora, Verdugo Canyon Creek, Oso Creek, Trabuco Creek, and Lucas Canyon Creek (Figure 2-15). Elevations range from 5,687 feet at Santiago Peak to sea level at the mouth of San Juan Creek. The San Juan Creek watershed is bounded on the north by the Aliso Creek watershed and on the south by the San Mateo Creek watershed. The Lake Elsinore watershed, which is a tributary of the Santa Ana River watershed, is adjacent to the eastern edge of the San Juan Creek watershed. A brief description of the major streams that feed into San Juan Creek is provided below.

2.6.1.1 Bell Canyon Creek

Bell Canyon is a large sixth order sub-basin in the central San Juan Creek watershed (Figure 2-15). The Bell Canyon and San Juan confluence is 12.62 miles upstream of the coast. Bell Canyon represents about 28.4 percent of the San Juan Creek watershed area upstream of the Bell Canyon and San Juan Creek confluence. The mouth of Bell Canyon enters San Juan Creek immediately upstream of Verdugo Canyon, about 1.5 miles downstream of Lucas Canyon. Bell Canyon's longest continuous stream length is approximately 15 miles.

2.6.1.2 Cañada Chiquita

Cañada Chiquita is an elongated north-south oriented sub-basin. Cañada Chiquita and Chiquita creek are located between Cañada Gobernadora to the southeast and Arroyo Trabuco Canyon to the northwest. Cañada Chiquita and Chiquita creek begin close to where SR-241 ends near Oso Parkway. The longest continuous stream length is approximately 6.5 miles, extending from the mouth of the stream near the Santa Ana Mountains its confluence with San Juan Creek, approximately 3 miles east of the Ortega Highway and I-5 interchange.

2.6.1.3 Cañada Gobernadora

Cañada Gobernadora is an elongated north-south oriented sub-basin that is similar in drainage form to Cañada Chiquita to the west and Bell Canyon to the east. The longest watercourse in the sub-basin is approximately 9.7 miles. Cañada Gobernadora's area represents about 11.6 percent of the San Juan Creek watershed area, upstream of the Cañada Gobernadora and San Juan Creek confluence. Cañada Gobernadora's confluence with San Juan Creek is approximately 1 mile upstream of the Cañada Chiquita confluence.

2.6.1.4 Verdugo Canyon

The Verdugo Canyon sub-basin is located in the eastern central portion of the San Juan Basin, just south of the Lucas Canyon sub-basin (Figure 2-15). Similar to Lucas Canyon, the Verdugo Canyon watershed has roughly an east-west orientation with several tributary channels entering the main valley stream from the north and south. The longest continuous watercourse is approximately 8 miles. Verdugo Canyon's area represents about 6.2 percent of the San Juan Creek watershed area, upstream of the Verdugo Canyon and San Juan Creek confluence. It is roughly 14.5 miles downstream to the Pacific Ocean along the route of San Juan Creek.

2.6.1.5 Lucas Canyon

The Lucas Canyon sub-basin is located in the eastern central portion of the San Juan Creek watershed (Figure 2-15). The central valley and main stream course of this sub-basin is oriented along an east-west axis while most tributary channels enter Lucas Canyon from the north or south. The longest continuous watercourse of the sub-basin is approximately 6 miles. The Lucas Canyon and San Juan Creek confluence occurs roughly 1.5 miles upstream of the Bell Canyon and Verdugo Canyon outlets. Lucas Canyon's area represents about 14.3 percent of the San Juan Creek watershed area, upstream of the Lucas Canyon and San Juan Creek confluence.

2.6.1.6 Arroyo Trabuco

The Arroyo Trabuco Creek sub-basin is located in the central western portion of the San Juan Creek watershed (Figure 2-15). The central valley and main stream course of this sub-basin is oriented along a north-south axis within the SJBA service area. As the stream leaves the basin boundary, though still within the watershed, it takes an eastward turn and becomes oriented on an east-west axis. The longest continuous stream course for Arroyo Trabuco is 17 miles. The Arroyo Trabuco and Oso Creek confluence is approximately 1.3 miles north of the SR-74 and I-5 interchange. These two creeks converge with San Juan Creek approximately 1 mile south of the Ortega Highway and I-5 interchange or approximately 2.2 miles south of the Arroyo Trabuco and Oso Creek confluence.

2.6.1.7 Oso Creek

The Oso Creek sub-basin is located just west of the Arroyo Trabuco sub-basin, on the western border of the San Juan Creek watershed. The main stream course is oriented on a north-south axis with most tributaries entering the main stream course from the east and west. The longest continuous stream course for Oso Creek is approximately 12.8 miles in length.

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Oso Creek does not directly flow into San Juan Creek; however, it does have a confluence with Arroyo Trabuco approximately 2.2 miles upstream of the San Juan Creek and Arroyo Trabuco confluence.

2.6.1.8 Aliso Creek

Aliso Creek is located within the Aliso Creek watershed; however, it is identified in this evaluation because it is within the boundary of the SJBA. Aliso Creek's main stream course is mostly on a northeast to southwest axis. This creek is located in the western portion of the SJBA boundary and does not have a confluence with San Juan Creek. Aliso Creek's longest continuous stream course is approximately 15.6 miles in length. This creek has a termination point at the Pacific Ocean around Aliso Creek County Park.

2.6.2 FEMA Hazards

Hazards due to floods within the San Juan Basin area are generally confined to the canyon and creek areas. Figure 2-16 shows which areas are subject to flooding during a major storm event. As Figure 2-16 shows, the areas identified in Zone A are most prone to flooding. Zone A is the only FEMA flood designation area that appears within the San Juan Basin Authority boundary. Zone A is defined by having a 1 percent yearly chance of flooding and a 26 percent chance of flooding over the time of a 30-year mortgage. The areas most prone to flooding within the San Juan Basin area are San Juan Creek, Bell Canyon, Canada Goberadora, Canada Chiquita, Arroyo Trabuco, Oso Creek, and Aliso Creek. Approximately 4,602 acres of land within the basin is located in a flood hazard area or Zone A. Although these areas are located within Zone A according to FEMA, these areas are self-contained and would not result in any damage or inundation to surrounding land uses. Other areas within the basin are designated flood Zone X or X500. Zone X areas are defined as being the area between the limits of the 100-year and 500-year floods.

2.7 Land Use

2.7.1 Setting

The SJBA's boundary encompasses approximately 100,110 acres of land, most of southern Orange County, south of the City of Lake Forest. This includes all and portions of nine cities and four water district areas. Approximately half of the SJBA area is urbanized developed land that contains residential, commercial, industrial, and other uses. The areas that remain undeveloped are concentrated in the central and southern portions of the SJBA service area and are designated mostly agricultural, open-space, and recreational wilderness.

2.7.2 Cities and Agencies

2.7.2.1 Cities

As previously mentioned, there are nine cities that have land area within the SJBA service area (refer to Figure 2-4). Table 2-5 lists these cities and their acreages within the SJBA service area.

The SJBA boundary completely encompasses some of these cities and only partly encompasses others. As seen in Figure 2-4, the cities of San Clemente, Laguna Beach, and Rancho Santa Margarita have only portions of land area within the boundary.

2.7.2.2 Water Districts

As previously mentioned, there are four water districts that serve the area within the SJBA service area (refer to Figure 2-5 for locations and boundaries). Table 2-6 lists these water districts and their acreages. All four water districts are contained within the SJBA service area. The SMWD has the largest land area, followed by MNWD, CSJC, and SCWD.

2.7.3 Land Uses within Basin

As previously mentioned, approximately half of the land area within the SJBA service area is urbanized, while the remaining is undeveloped and mostly unincorporated. Most of the developed land within the basin is designated residential and commercial. Table 2-7 provides the approximate acreages, according to information provided by the Southern California Association of Governments (SCAG), for land use designations within the SJBA service area. Figure 2-17 shows these land uses.

Note that the information provided by SCAG for land use designations did not cover the entire basin, and small portions on the fringes of unincorporated land were left out; this is why the land use acreages in Table 2-7 do not add up to the approximate 100,110 acres within the SJBA service area. As Table 2-7 shows, Single Family Residential encompasses approximately 19,000 acres of land area, a large portion of developed land within the basin. Single Family Residential is shown as yellow in Figure 2-17 and can be seen scattered throughout the western portion of the SJBA. Recreation and Open Space encompasses a large portion of land area within the basin as well, approximately 22,300 acres. This can be seen more clearly in Figure 2-18.

Vacant land comprises approximately 35,400 acres of land within the basin. Note that SCAG defines this as land in a natural state, containing tree, brush/shrub, and/or grassland vegetation. Also, parts of undeveloped parks could be included in this category as well as rangeland. Therefore, it is not uncommon to expect land designated by the CDC as grazing land—seen in Figure 2-6, within the Agricultural discussion above—to be included in this "Vacant" designation.

2.8 Transportation Infrastructure

2.8.1 Streets and Highway System

Residents of Orange County depend on automobiles and trucks for the majority of their local and regional transportation requirements. As a result, a variety of interstate and state routes, as well as local arteries, exist for vehicles to travel through Orange County to other locations. The freeway system is the backbone of the transportation network, with interstates and state routes supplemented by conventional highways and toll roads. A network of arterial highways serves as a feeder system to the freeway system and also provides local travel corridors for drivers and transit-users within Orange County.

2.8.1.1 Freeways and Tollways

Figure 2-19 displays San Juan Basin Authority's freeway, toll road, and arterial road system. The major interstate route running through the basin is I-5, which is a major regional north-south route leading to adjacent Los Angeles and San Diego Counties. Major state routes running within and through the basin include SR-73, SR-1, and SR-74. In addition, the SJBA boundary includes privately franchised toll roads, including SR-73 (San Joaquin Hills Transportation Corridor [southern portion of SR-73]) and SR-241 (Foothill Transportation Corridor). The California Department of Transportation (Caltrans) is responsible for the design, construction, maintenance, and operation of the California State Highway System as well as the portion of the Interstate Highway System within the state's boundaries. Caltrans District 12 is responsible for the design, construction, maintenance, and operation of the California State Highway System in Orange County and vicinity, while the U.S. Department of Transportation (DOT), Federal Highway Administration (FHWA) provides oversight on road projects in Orange County that involve federal highways and federal funding.

While Caltrans constructs and maintains the freeways in Orange County, the Orange County Transportation Authority (OCTA) assists with planning and funding for all freeway improvements. In addition, OCTA administers regional street and road improvement projects in Orange County as well as a variety of funding programs for cities to widen streets, improve intersections, coordinate signals, build Smart Streets, and rehabilitate pavement.

2.8.1.2 Master Plan of Arterial Highways

The importance of the arterial street system in Orange County can be illustrated by the fact that it carries slightly over half the vehicle miles traveled (VMT) in the county. The Orange County Master Plan of Arterial Highways (MPAH) ensures consistent standards and coordinated planning of the arterial streets in Orange County. The MPAH consists of a network of major thoroughfares composed of freeways, transportation corridors, and five main arterial highway classifications: principal, major, primary, secondary, and collector. In addition, one other arterial highway subcategory—Smart Streets—is part of the MPAH system. Figure 2-19 displays the entire MPAH at buildout. Table 2-8 presents average daily traffic (ADT) for the various roadway classes based on the criteria given in the Orange County CMP as well as ADT for local residential (neighborhood-serving) streets.

2.8.2 Public and Rapid Transportation

Orange County has a variety of public transportation systems available to its residents and visitors. Most of the rapid transportation system is located within the northern and central areas of Orange County.

2.8.2.1 Orange County Bus System

OCTA is the primary provider of bus service in Orange County. The Long Beach Transit, the Riverside Transit Agency, the Los Angeles County Metropolitan Transportation Authority, and the North San Diego County Transit District also offer limited service. Additionally, a number of Orange County cities operate local community bus routes or specialized transit services.

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OCTA provides local fixed route, express, and rail connector (Station Link) bus services throughout Orange County with a fleet of more than 600 vehicles, ranging in size from 60-foot articulated buses—used on high density corridors in the central county—to 25-foot mini buses—used for lightly traveled routes. During fiscal year (FY) 2008/09, approximately 1,800,000 vehicle service hours were operated on 87 routes. Annual boarding's (passengers carried) are over 57 million (OCTA 2009). Figure 2-20 displays Orange County's fixed route bus system within the SJBA service area.

In addition to fixed route bus services, OCTA also provides paratransit services (i.e. "curb to curb" on-demand transit and shared ride services) designed to meet the needs of persons with disabilities and senior citizens. This includes ACCESS service designed to meet the requirements of the *Americans with Disabilities Act* (ADA) and "Special Agency" service which provides service to nutrition centers for the Office on Aging.

2.8.2.2 Passenger/Commuter Rail

Metrolink commuter rail service uses existing freight rail corridors to provide passenger services between residential and employment centers in Orange, Los Angeles, Riverside, San Bernardino, and Ventura Counties. In 1991, these counties formed the Southern California Regional Rail Authority (SCRRA)—a Joint Powers Authority (JPA)—to administer, operate, and market the Metrolink regional commuter rail service. Figure 2-20 displays the Metrolink commuter rail system operating within and through the basin.

2.8.2.2.1 Orange County Line

Metrolink service in Orange County was launched in 1994 with service between Oceanside in northern San Diego County with Orange County and Los Angeles Union Station along the Orange County Line. OCTA owns 42 miles of railroad right-of-way along this route (the Orange Subdivision) from the San Diego County line to the Fullerton Transportation Center. The Orange County Line currently provides 19 daily trips between Orange and Los Angeles Counties. There are two stations within the basin where Metrolink and Amtrak's Pacific Surfliner stop for passengers: the Laguna Niguel/Mission Viejo Station and the San Juan Capistrano Station.

Amtrak passenger rail service also operates along the Orange County Line in central and southern Orange County, providing service between San Diego and Orange Counties.

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3.1 Introduction

This section of the report describes the existing water resources in the San Juan Basin area with an emphasis on the surface and groundwater resources in the investigation area which includes the basin area bounded by the Ortega Highway on San Juan Creek, the confluence of Arroyo Trabuco and Oso Creek and the Pacific Ocean. What follows is an inventory of the surface and groundwater hydrology, geologic conditions and storage, water quality, water infrastructure and interpretation of groundwater modeling work conducted by the Municipal Water District of Orange County (MWDOC) in support of the South Orange County Ocean Desalter (SOCOD) project.

3.2 Surface Water Hydrology

This section of the report characterizes the surface water hydrology of the watershed tributary and overlying the groundwater resources of the investigation area.

3.2.1 Topographic and General Setting

The San Juan Creek watershed is located in Southern Orange County on the western flank of the Santa Ana Mountains, as shown in Figure 3-1. The headwaters originate in the Cleveland National Forest near the Orange/Riverside County border at an elevation of approximately 3,300 feet above sea level and flow about 29 miles south-southwest to the Pacific Ocean at Doheny State Beach in Dana Point. The total watershed drainage area covers approximately 175 square miles and consists of two major tributaries to San Juan Creek, known as the Arroyo Trabuco and Oso Creek. The upper third of the watershed is extremely rugged with steep slopes and deep cutting narrow canyons with minor tributaries from these areas flowing out from sharp canyons. The center third is dominated by rolling hills, and the downstream third is a highly developed floodplain. As the streams come out of the canyon mouth, they widen out into several alluvial floodplains (Pace 2008). These floodplains comprise the alluvial sediments from which groundwater is extracted. Land rises from sea level the where San Juan Creek discharges to the Pacific Ocean to 5,687 ft at the peak of Santiago Mountain. There are three principal streams that drain the watershed: Oso Creek, the Arroyo Trabuco and San Juan Creek. There are numerous other small streams that feed into the principal streams. Figure 3-2 shows the locations of the principal streams and some other tributaries in the lower part of the San Juan Basin where these streams traverse the underlying groundwater resources of interest in the groundwater management plan.

About 30 percent of the watershed is incorporated into 10 cities and unincorporated area. The larger cities and communities in the watershed include the Cities of Laguna Niguel, Laguna Hills, Mission Viejo, Rancho Santa Margarita, and San Juan Capistrano; and the unincorporated areas of Coto de Gaza, Dove Canyon and Trabuco Canyon.

The area has experienced continuous urban development since the 1970s. Some of this growth has been documented by SCAG in their periodic compilations of land use data. Since 1990, SCAG has developed GIS coverages of land use in its service area based on a four-level Anderson landuse coding system to characterize landuse. The latest land use coverage

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available from SCAG is from 2008. Residential landuse of all types has increased from about 9,400 acres in 1990 to about 13,500 acres in 2008, an increase of about 46 percent in 18 years; and relative to the watershed itself, the residential landuse has increased from about 8 percent of the watershed in 1990 to about 11 percent in 2008. Other urban land uses have also grown over time including institutional, commercial and industrial uses. Urban development significantly modifies the land surface and the hydrologic process in the watershed.

3.2.2 Precipitation

Table 3-1 lists major precipitation gauges in and around San Juan Basin. There are six active gauges with long history of records in or adjacent to the San Juan Creek Watershed the locations of which are shown in Figure 3-1. The annual average precipitation is about 12 to 13 inches per year at the coast (Laguna Beach, station number 100, period of record 1929 through 2010; Palisades Reservoir San Clemente, station number 186 period of record 1965 through 2010) and increases going inland with increasing elevation, to about 33 inches at Santiago Peak (Santiago Peak, station number 208, period of record 1949 through 2010).

Figure 3-3 shows the annual precipitation time history recorded at the Laguna Beach station for the period 1929 to 2010. The Laguna Beach station has the longest active precipitation history in the investigation area. Also shown in Figure 3-3 is the cumulative departure from mean (CDFM) precipitation. When the slope of the CDFM curve trends downward from left to right, the annual precipitation is less than the average precipitation: if the slope continues downward for more than one year then the CDFM is indicating a dry period. When the slope of the CDFM curve trends upward from left to right, the annual precipitation is greater than the average precipitation: if the slope continues upward for more than one year then the CDFM is indicating a wet period. The CDFM curve in Figure 3-3 suggests that the area experienced

- A long dry period from 1946 to 1977 that was punctuated with two very wet years in 1958 and 1969,
- a wet period from 1978 through 1983,
- a dry period from 1984 through 1992,
- a wet period from 1993 through 1998,
- a dry period from 1999 through 2010 punctuated with a very wet year in 2005

Figure 3-4 illustrates the monthly variation of precipitation at the Laguna Beach station, including the maximum, minimum , and median precipitation for the each month, and the 25th and 75th percentiles. Most of the precipitation occurs in the November through April period. The months of October through March have the greatest extremes as characterized by the maximum monthly precipitation relative to its median precipitation.

3.2.2.1 Doppler Radar Precipitation Estimates

As is evident in Figure 3-1, there are too few precipitation stations in the San Juan Creek watershed to accurately estimate areal variation in precipitation in the watershed. This

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situation has improved recently with newer spatially resolved datasets. In late 2001, the National Centers for Environmental Predictions (NCEP) began generating "Stage IV" radar-based precipitation estimates. These data are compiled from regional multi-sensor data (Stage III) produced by the 12 Regional Forecast Centers that cover the contiguous United States. In January 2002, archived spatial-temporal, high-resolution gridded precipitation estimates (Stage IV) became available for download from the National Center for Atmospheric Research (http://data.eol.ucar.edu/codiac/dss/id=21.093). Daily Radar Mean Areal Precipitation (RMAP) data for the San Juan watershed were downloaded and processed to obtain daily average precipitation estimates over the San Juan Creek watershed on approximately 2.5 by 2.5-mile grid. These daily precipitation estimates were aggregated to estimate annual precipitation for each year for the 2001 through 2009 period.

Figures 3-5 and 3-6 show radar-generated precipitation for 2007 (July 1, 2006 through June 30, 2007, a dry year) and 2005 (July 1, 2004 through June 30, 2005, a wet year), respectively. These maps show the spatial distribution of precipitation over the watershed and the annual total precipitation for precipitation stations in and around the watershed. This type of characterization is not possible with the data from the precipitation stations alone. The amount of precipitation falling in the watershed increases from the southwest on the coast to the northeast going inland following a classic orographic precipitation pattern – precipitation increases with altitude as moisture laden air from the sea flows up and over the Santa Ana Mountains. This effect can be observed in both the precipitation stations and the gridded precipitation estimates.

The difference between the annual precipitation estimates at the precipitation gauges and the annual value for each corresponding grid cell suggests there is significant spatial variability in the vicinity of the gauges. For example, the annual precipitation measured at the Santiago Peak station is substantially different than the precipitation estimate in the corresponding grid cell. In 2007 (Figure 3-5), the grid estimate is 2.69 inches and the station estimate is 8.04 inches. This suggests that the gauge estimate is not a good indicator of precipitation in the area of gauge and that highly localized intense precipitation occurs at the gauge due to its elevation and exposure. This same anomaly is observed for 2005, as shown in Figure 3-6. Another interesting observation is that during dry years the Doppler radar precipitation estimates suggest that the variability of precipitation across the watershed is substantially less than the variability in a wet year. For example, precipitation over the watershed in 2007 ranged from about1.9 inches near the coast to about 3.0 inches inland, an increase of about 2.1 inches, or 58 percent, relative to precipitation at the coast. In contrast, precipitation over the watershed in 2005, a wet year, ranged from about 23.1 inches near the coast to about 43.0 inches inland, an increase of about 19.9 inches, or 86 percent, relative to the precipitation at the coast. The implication of the areal variability of precipitation shown in Figures 3-5 and 3-6 are that the spatial variability increases with increasing precipitation, and that the use of an average value or a constant areal precipitation pattern computed from observed gauge estimates will likely not yield accurate estimates of watershed precipitation and runoff.

3.2.2.2 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by two United Nations Organizations, the World Meteorological Organization (WMO) and the

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United Nations Environment Programme (UNEP) to assess "the scientific, technical and socioeconomic information relevant for the understanding of the risk of human-induced climate change." IPCC produced a series of assessment reports on climate change in 1990 1995, 2001 and 2007. In 1992, the IPCC released its initial carbon dioxide emissions scenarios to be used for driving global circulation models (GCM's) to develop climate change scenarios, so-called IS92 scenarios. The IPCC revised the emissions scenarios in 1996 for its third assessment report. The emissions scenarios are based on four different narrative storylines, A1, A2, B1, and B2 that describe consistently the relationships between emission driving forces and their evolution and add context for the scenario quantification. Each storyline represents different demographic, social, economic, technological and environmental developments. For each storyline, several scenarios were developed using various modeling approaches to examine the range of outcomes that arise from the various models that use similar assumptions about driving forces. This resulted in a total of 40 special report emissions scenarios (SRES). After evaluating all SRES, the IPCC picked six scenarios to consider further: A1F1, A1T, A1B, A2, B1, and B2. A detailed discussion can be found in the third assessment report (IPCC, 2001) or in the summary report (IPCC, 2000).

3.2.2.2.1 Climate Change Approach Adopted by the California Department of Water Resources

The California Department of Water Resources (DWR) has incorporated climate change into its planning process[6]. DWR evaluated possible future impacts on California's water supply, and specifically the State Water Project (SWP), using its CalSIM II model and the results of climate changes models. DWR constructed four planning alternatives that were based on two IPCC greenhouse gas emission scenarios, A2 and B1, and two GCM's, the Geophysical Fluid Dynamic Lab Model (GFDL) and the Parallel Climate Model (PCM). These four planning alternatives were used in the 2007 State Water Project Delivery Reliability Report (DWR, 2008). This work was updated and reported in the 2009 State Water Project Delivery Reliability Report (DWR, 2009). In this update the DWR used its CALSIM II to evaluate the SWP delivery reliability with the precipitation, temperature estimates from the MPI-ECHAM5 for the A2 greenhouse gas emissions scenarios.

3.2.2.2.2 Projected Climate Change for the San Juan Basin

In order to conduct water resources impact analyses for climate change scenarios, the coarse spatial representation of global climate model data must be refined in a process called downscaling. Such data can be obtained from the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project Phase 3 (CMIP3) multi-model dataset (Maurer et al, 2007)[7]. This data archive consists of bias-corrected and spatially downscaled climate projections derived from CMIP3 data. The data is available for 1/8th degree latitude/longitude resolution.

Figure 3-7 shows monthly average temperature predicted for the MPI-ECHAM5 A2 scenario for the 1950 through 2100 period. The 1950 through 2000 period was used to calibrate the models and the 2000 through 2100 period are model projections for the A2 scenario. The

[6] This discussion is based on the 2009 SWP Delivery Reliability Report
http://www.water.ca.gov/news/.../2010/01262010reliabilitysummary.pdf

[7] http://gdo-dcp.ucllnl.org /downscaled_cmip3_projections/

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best-fit linear regression lines are also plotted in Figure 3-7 to emphasize the trend. In this scenario, the average temperature will rise about 3°C, or about 5°F, in winter months, and about 5°C, or about 9°F, in summer months, over the 150-year period. The significance of the historical and projected temperature increases is the corresponding increase in the evapotranspiration of vegetation.

Figure 3-8 shows the annual precipitation estimated under MPI-ECHAM5 A2 scenario for the 1950 through 2100 period. The chart shows the 50-year average precipitation for three sequential 50-year periods, 1950-1999, 2000-2049, and 2050-2099, and the 75-year average precipitation for two sequential 75-year periods, 1950-2024 and 2025-2988. The table below compares the basic statistics of the annual precipitation estimates for these periods.

Annual Precipitation Estimates

Period	Average	Standard Deviation	Coefficient of Variation	Minimum	Maximum
50-Year Interval					
1950-1999	13.66	4.67	34%	6.12	22.20
2000-2049	12.69	4.63	36%	4.95	24.92
2050-2099	13.72	6.14	45%	2.96	30.99
75-Year Interval					
1950-2024	13.13	4.57	35%	4.95	24.03
2025-2099	13.58	5.74	42%	2.96	30.99

Figure 3-8 and the above table suggests that the future will have: wetter wet years (a higher period maximum precipitation value), drier dry years (a lower period minimum precipitation value) and greater variability (greater standard deviations and coefficients of variation for the period). Interestingly, the mean precipitation is not significantly different among the periods. The projected increase in variability means that more storage for surface and groundwater than is currently used will be required to achieve the same native water supply utilized in the past.

Figure 3-9 shows the projected annual precipitation projection from the GCM for the area that includes the Laguna Beach precipitation station and the CDFM for that projection. Comparison of the annual measured precipitation at the Laguna Beach precipitation station and its associated CDFM shown in Figure 3-3 to the projection in Figure 3-9 for the overlapping record indicates that the GCM projection does not match the measured data very well (the wet periods and dry periods do not correlate well). The implication of this finding is that the reliability of the GCM precipitation projections for the San Juan Creek watershed is unknown.

3.2.3 Surface Water Hydrology

The USGS maintains several stream gauging stations that can be used to characterize the surface water hydrology in the San Juan Basin, the locations of which are shown in Figure 3-2. Table 3-2 lists these stations, their location and period of record. The most important gauging station is located on San Juan Creek at the Ortega Highway bridge crossing. The location of this gauging station has varied in the past and the record represents discharge time histories for slightly different drainage areas. The drainage area for the three gauges varies from 106 square miles to 117 square miles. Figure 3-10 shows the cumulative discharge curve (mass curve) of surface water discharge in San Juan Creek from the combined records of these three surface water discharge gaging stations for the 1928 to 2011 period. The average slope of the mass curve for the three distinct records shows the effect of the drainage area size on discharge. These slopes were used to normalize the historical record for the 11046500 and 11046550 gaging stations to be roughly equivalent to the record at the 11046530 gauging station. The result is the annual discharge record shown in Figure 3-11 and its associated CDFM annual discharge. The wet and dry periods suggested by the CDFM plot in Figure 3-11 are identical to the wet and dry periods observed for precipitation at the Laguna Beach precipitation station. That said, the variability in annual discharge is greater than the variability in precipitation.

Figure 3-12 illustrates the monthly variation of San Juan Creek discharge at the 11046530 gauging station including the maximum, minimum, and median precipitation for the each month, and the 25th and 75th percentiles. Most of the discharge occurs in the December through May period. The months of January through March have the greatest extremes as characterized by the maximum monthly discharge relative to its median discharge. This is a non-stationary time series due to urban development in watershed. The discharge record indicates that the discharge in San Juan Creek is highly variable and difficult to regulate for water development purposes without surface water storage.

3.3 Groundwater Hydrology

Four principal groundwater basins have been identified in the San Juan watershed: (1) Lower Basin, (2) Middle Basin, (3) Upper Basin, and (4) Arroyo Trabuco. These basins were first delineated by the DWR in 1972, based on water quality differences. These groundwater basins are shown in Figure 3-13. CDM (1987), NBS Lowery/PSOMAS (1994, annual reports), and others have modified the DWR delineations to suit the needs of their respective studies. Figure 3-13 shows the limits of the basins included this investigation. The Upper Basin was excluded because a majority of the land overlying the basin is privately owned, the groundwater resource is small and is managed by the Rancho Mission Viejo (RMV), and the RMV would not make their data available to the SJBA. The Arroyo Trabuco basin was divided into a lower and upper portion, with the Lower Arroyo Trabuco included in this investigation. The Lower Trabuco, Middle, and Lower Basins contain approximately 5.9 square miles of water bearing alluvium.

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3.3.1 Geologic Setting

The San Juan Creek watershed is located on the western flank of the Santa Ana Mountains. The Santa Ana Mountains are part of a northwest-southeast trending fault block that has been tilted at a shallow angle in a westerly direction by the Elsinore fault system. The San Juan Creek watershed is underlain by plutonic, volcanic, metamorphic, and sedimentary rocks (Morton, 2004). The two major faults in the San Juan Creek watershed are the northwest/southeast trending Mission Viejo and Cristianitos Faults. The Cristianitos Fault displaces Tertiary sedimentary rocks and the Mission Viejo Fault bounds the Cretaceous sedimentary rocks on the west (Taylor, 2006).

3.3.2 Stratigraphy

In this report, the stratigraphy of the San Juan Creek watershed is divided into three divisions: (1) Mesozoic and older bedrock units, (2) Tertiary bedrock units, and (3) late Holocene to Early Pleistocene surficial deposits, as shown in Figure 3-13. The Mesozoic and older bedrock units are further differentiated as (a) Cretaceous Age Formations of Sedimentary Origin, (b) Pre-Cretaceous Metamorphic Formations of Sedimentary and Volcanic Origins, and (c) Granitic and other intrusive crystalline rocks. The tertiary bedrock units are further differentiated as (a) fine-grained formations and (b) coarse-grained formations. The Late Holocene to Early Pleistocene Surficial Deposits are further differentiated as (a) younger alluvial deposits, (b) landslide deposits, and (c) older alluvial deposits. The main water bearing unit in the watershed consists of the younger alluvial deposits. Below, these geologic formations are generally described in stratigraphic order, starting with the oldest formations first.

3.3.2.1 Mesozoic and Older Bedrock Units

The Mesozoic crystalline igneous rocks, the Pre-Cretaceous metasedimentary rocks of the Bedford Canyon Formation, and the metamorphic rocks of the Menifee Valley Formation are exposed in the northeastern portion of the San Juan Creek watershed and are considered non-water bearing. Overlying the igneous and metamorphic basement units are the Cretaceous sandstone and conglomerate sandstone of the Williams Formation and the non-marine conglomerate and sandstone of the Trabuco Formation.

3.3.2.2 Tertiary Bedrock Units

The tertiary bedrock units are divided into fine-grained and coarse-grained formations, as grouped in the California Geological Survey CGS Special Report 217. The fine-grained formations include the Capistrano and Monterey Formations and the coarse-grained formations include the Santiago, Sespe, and Niguel Formations.

3.3.2.2.1 Coarse-Grained Formations

The Santiago and Sespe Formations are bounded to the east by the Mission Viejo Fault and to the west by the Cristianitos Fault, as shown in Figure 3-13. The DWR (1971) identified both the Santiago and Sespe Formations as potential aquifers. The Santiago Formation is a chiefly marine conglomerate with interbedded very fine to coarse grained sandstones and is estimated to be about 3,000 feet thick (DWR, 1971). The Sespe Formation consists of non-marine

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conglomeratic sandstone, sandstone, and silty sandstone, and is estimated to be about 1,500 feet thick.

In Bulletin No. 104-7, the DWR reported that a test hole was drilled into the Santiago Formation and yielded groundwater at 48 gallons per minute (gpm) with a drawdown of 257 feet and a specific capacity of about 5 gpm/ft. In the same report, the DWR collected several outcrop samples from the Sespe Formation and determined the porosity to range between 20 and 25 percent.

The Pliocene Niguel Formation is younger than the Santiago and Sespe, but they are grouped together because the Pliocene Niguel Formation is coarse-grained. The Niguel Formation is about 350 feet thick and is comprised of sandstone interbedded with sandy siltstone that is exposed in the southwest portion of the watershed where it overlies the Capistrano and Monterey Formations (DWR, 1971).

3.3.2.2.2 Fine-Grained Formations

The Capistrano and Monterey Formations outcrop in the southeast portion of the watershed. The Capistrano Formation is about 2,400 feet thick and consists of white to pale gray, massive to crudely bedded siltstone and mudstone (DWR 1971). The Monterey Formation is a brown to yellow grey silty shale. Both the Capistrano and Monterey Formations are very prone to landslides in the surrounding hills.

The Capistrano Formation forms the bottom of the alluvial aquifer in the basins south of the Cristianitos Fault. The Capistrano Formation has been described in driller's logs as greenish black siltstone, grey siltstone, blue shale, and green shale. About sixty wells in the study area encountered the Capistrano Formation at depths ranging from about 30 feet to 160 feet below ground surface (bgs). A more detailed discussion of the bottom of aquifer can be found in *Section 3.3.3 Geologic Cross Sections* and *Section 3.3.5 Effective Base of the Alluvial Aquifer*.

3.3.2.3 Late Holocene to Early Pleistocene Surficial Deposits

The late Holocene to Early Pleistocene deposits are divided into three groups: (1) older alluvial deposits, (2) landslide deposits, and (3) younger alluvial deposits.

3.3.2.3.1 Older Alluvial Deposits

The very old and older alluvial deposits are stream terraces ranging in age from the Early to Late Pleistocene. These terrace deposits are composed of clays, silts, sands, and gravels, and range in thickness from about 13 to 98 feet (Taylor, 2006). These terrace deposits are normally above the water table; however, they may overlie stream channel deposits (DWR, 1971).

3.3.2.3.2 Landslide Deposits

The landslides in the study area typically occur in the Capistrano and Monterey Formations. Like the stream terraces, they may overlie the water bearing stream channel deposits.

3.3.2.3.3 Younger Alluvial Deposits

The main water bearing sediments of the San Juan Creek watershed are the Younger Alluvial Deposits of the Late Pleistocene to the Holocene. The younger alluvium occupies

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streambeds, washes, floodplains, and other areas of recent sedimentation. The alluvial deposits' average thickness is about 90 feet throughout the study area, and they consist of a heterogeneous mixture of sand, silt, and gravel. The sediment is derived from the erosion of the more resistant bedrock formations that make up most of the watershed.

3.3.3 Geologic Cross Sections

Figure 3-14 shows the geology in greater detail in the management plan investigation area and the location of three cross sections developed for this investigation. These cross sections are shown in Figures 3-15 through 3-17. Plotted on these cross-sections are well and borehole data, including, where available, graphical borehole lithology, well casing perforations, geophysical data, and recent water levels.

Cross section A-A', which is orientated northeast-southwest and bisects the Middle and Lower Basins along San Juan Creek is shown in Figure 3-15. The northeast section terminates in terrace deposits that overly the coarse-grained Tertiary Capistrano Formation and the southeastern section terminates in the Pacific Ocean. A-A' traverses the two deepest portions of the San Juan Basin: (1) the CSJC desalter well field (CVWD-1) at about 160 ft-bgs and (2) Doheny State Beach where MWDOC MW-2 was drilled to 188 ft-bgs without penetrating the Capistrano Formation. The alluvial thickness through this section averages approximately 100 feet. The aquifer material is generally composed of coarse-grained materials (gravel and sand layers) with few interbedded silt and clay layers. A 5 to 10-foot thick basal gravel bed occurs in the wells that penetrate the Capistrano Formation. A 6 to 10-foot thick aquitard was observed in SCWD wells MW-1 and MW-4 (Geoscience, 2010). The average thickness-weighted specific yield of the wells on this cross section is about 16.5 percent.

Cross section B-B', which is oriented north-south and bisects the lower portion of Arroyo Trabuco, is shown in Figure 3-16. This cross section crosses the Arroyo Trabuco and San Juan Creek. The north section terminates in very old alluvial deposits that overlie the Capistrano Formation, and the southern end terminates in landslide deposits that also overly the Capistrano Formation. The aquifer is about 130 feet thick where the CSJC's northern production well field is located (North Open Space and Rosenbaum wells) and about 113 feet thick at the City's Dance Hall well. The aquifer material is generally composed of coarse-grained materials (gravel and sand layers) with few interbedded silt and clay layers. As in Cross section A-A', a 5 to 10-foot thick basal gravel bed occurs in the wells that penetrate the Capistrano Formation. The average thickness-weighted specific yield of the wells on this cross section is about 15 percent.

Cross section C-C', which is aligned east-west along the southern boundaries of both the Arroyo Trabuco and the Middle Basins, is shown in Figure 3-17. This cross section bisects Arroyo Trabuco, Horno, and San Juan Creeks. Both the east and west sides terminate into terrace deposits that overlie the Capistrano Formation. The aquifer thickness is about 130 feet in the vicinity the Hollywood 2A production well, thins in east to about 25 feet near Interstate 5 in the Arroyo Trabuco portion, and is about 80 feet thick near San Juan Creek. The aquifer material is generally composed of coarse-grained materials (gravel and sand layers) with few interbedded silt and clay layers. The basal gravel that overlies the Capistrano

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Formation is about 15 to 20 feet thick in the channel cut by Arroyo Trabuco. The average thickness weighted specific yield of the wells on this cross section is about 16 percent.

3.3.4 Groundwater Occurrence and Movement

Groundwater within the San Juan Creek watershed primarily occurs in the relatively thin alluvial deposits along the valley floors and within the major stream channels. The State Water Resources Control Board (SWRCB) has characterized this groundwater, from a water rights perspective, as flow of an underground stream. The physical nature of the San Juan Basin groundwater reservoir is described below with regard to basin boundaries, recharge, groundwater flow, and discharge.

3.3.4.1 San Juan Basin Boundaries

The physical boundaries of the San Juan Basin are shown in Figure 3-13 and include:

- **Santa Ana Mountains.** The Santa Ana Mountains are composed of impermeable granitic and metamorphic bedrock and form the northern boundary of the watershed.
- **Sedimentary bedrock formations.** Sedimentary bedrock formations form the sides of the water bearing canyons of the Upper Basin and Arroyo Trabuco (i.e. Cañada Chiquita, Cañada Gobernadora, and Bell Canyon).
- **Pacific Ocean.** The entire watershed drains south-southwest and into the Pacific Ocean, which forms the southern boundary of the basin.

3.3.4.2 Groundwater Recharge and Discharge

The predominant sources of recharge to the San Juan Basin include:

- Streambed infiltration in San Juan Creek, Horno Creek, Oso Creek, and the Arroyo Trabuco
- Subsurface boundary inflows at the head of these creeks on the upstream boundaries to the management plan investigation area and other minor subsurface inflows along the other boundaries
- Deep infiltration of precipitation and applied water
- Flow from fractures and springs

Groundwater discharge from the San Juan Basin occurs as:

- Groundwater production from wells
- Rising groundwater
- Evapotranspiration
- Subsurface outflow to the Pacific Ocean

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In general, groundwater flow within the study area follows the surface topography: from areas of recharge in the surrounding highlands towards the central axis of the basin and then southwesterly along the axis of the basin before exiting into the Pacific Ocean. Figures 3-18 and 3-19 show groundwater elevation contours for the spring of 1987 and the fall of 2010, respectively. The direction of groundwater flow is perpendicular to the groundwater elevation contours. These maps show similar groundwater gradients and flow directions for the two time periods. A groundwater pumping depression, resulting from desalter production, is evident in the lower basin in the fall 2010 map.

3.3.5 Effective Base of the Freshwater Aquifer

Figure 3-20 depicts the effective base of the freshwater aquifer by equal depth contour lines. Underlying this shallow alluvial aquifer system is what is commonly referred to in well completion reports as a green or blue clay/shale (believed to represent the Capistrano Formation), which likely acts as an aquitard preventing the downward movement of groundwater (Psomas, 2009). The effective base of the freshwater aquifer contours honored sixty borings that penetrated the alluvial aquifer with depths that range from 30 to 50 feet bgs near the bedrock outcrops to about 150 to 160 feet bgs near the confluence of Arroyo Trabuco Creek and San Juan Creek.

3.3.6 Aquifer Storage Properties

Younger alluvial deposits comprise the aquifer material within the study area and consist of a heterogeneous mixture of sand, silts, and gravel.

Specific yield or effective porosity is a property of rocks that describes the ability of the rock to store water that can be recovered. A commonly used definition of specific yield is the quantity of water which a unit volume of aquifer, after being saturated, will yield by gravity, expressed either as a ratio or as a percentage of the volume of the aquifer. In other words, specific yield is a measure of the water available to wells. The specific yield of the aquifer-system sediments in the San Juan Basin study area was estimated through the analysis of lithologic descriptions from well driller's reports. WEI maintains a library of well driller's reports of all known boreholes that have been drilled in the San Juan Basin. The lithologic descriptions from the well driller's reports were input into a relational database along with corresponding estimates of specific yield by sediment description. A thickness-weighted, average specific yield was calculated at each borehole in the San Juan Basin, and these point values were imported to ArcGIS. Using a Kriging interpolation method within the Geostatistical Analyst extension of ArcGIS, a specific yield raster was created to interpolate specific yield of aquifer sediments between wells. Figure 3-21 shows the wells labeled by thickness-weighted, average specific yield. Specific yield values in the San Juan Basin average about 15 percent and range between 4 and 25 percent.

3.3.7 Historical Groundwater Level Monitoring

Groundwater level data has been collected from wells in the San Juan Basin since the late 1940s and early 1950s. These data have been collected by well owners, water district staff, and various consultants. In 2004, the SJBA installed nine monitoring wells with pressure transducers/data loggers that collect water level readings every 15 minutes. All of the

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groundwater level data collected in this investigation were carefully checked and uploaded into a relational database through WEI's HydroDaVE^{SM} system.

Figures 3-22 through 3-24 show groundwater level time histories at selected wells for the Lower and Middle San Juan Basins and for the lower portion of the Arroyo Trabuco Basin, respectively, for the 1979 through 2010 period. Figures 3-22 through 3-24 were constructed to compare groundwater level time histories to common drivers of groundwater level change: climate and production. The wells featured in the time-history plot are located on the map inset on the right hand side of each figure. On each chart, groundwater level time histories are plotted with the CDFM precipitation curve from the Laguna Beach precipitation station. Positive sloping lines on the CDFM curve indicate wet years or wet periods. Negatively sloping lines indicate dry years or dry periods. For example, the periods between 1978 to 1983, 1990 to 1998, and 2004 to 2005 are wet periods, and are represented as positively sloping lines. The periods 1983 through 1989 and 1998 through 2010 are drought periods and are represented as negatively sloping lines. Each chart also contains the time history of groundwater pumping in each basin as a stacked bar chart illustrating the magnitude of production by well in each basin. Thus, the groundwater level, climate and production time histories can be viewed together to explore how climate and production drive groundwater level changes.

Figure 3-22 illustrates the groundwater level time history for select wells in the Lower Basin. Groundwater levels in the Lower Basin ranged between 10 and 20 ft-bgs prior to the start up of the CSJC's desalter operations in 2005. After the commencement of desalter production, groundwater levels fluctuated between 20 and 40 ft-bgs. Groundwater levels at the two shallow screened monitoring wells MW-2 (perforated 14-74 ft) and MW-7 (perforated 10-90 ft) do not appear to respond to desalter production but fluctuate between 15 and 25 ft-bgs in response to climatic variations. During the wet period in the mid-1990s, groundwater levels at SJBA-2 reacted more like MW-2 and MW-7 and only fluctuated between 15 and 20 ft-bgs.

Figure 3-23 illustrates the groundwater level time history for select wells in the Middle Basin. Groundwater levels in the shallow SJBA monitoring wells (MW-4, MW-5, and MW-6) located along San Juan Creek fluctuate in response to climatic variations. As is shown in Figure 3-15, the groundwater-level and streambed of the San Juan Creek are essentially at the same elevation in this section of the study area. In other words, the Middle Basin was full of water in the spring of 2010.

Figure 3-24 illustrates the groundwater level time history for select wells in the lower Arroyo Trabuco Basin. Groundwater levels at several wells have declined from about 60 to 90 ft-bgs since the mid-1990s. Groundwater levels at MW-8 and Hollywood 2A have not undergone the same decline and fluctuate in response to climatic variations due to their close proximity to Arroyo Trabuco Creek. The lower Arroyo Trabuco Basin appears to be the only basin that may be suitable for artificial recharge due to the approximate 60 to 80 feet of unsaturated alluvium.

3.3.8 Groundwater Production Time Histories

Historical groundwater production data have been kept by private well owners and water agencies. Production data from 1978 through 2008 were compiled by MWDOC as part of their groundwater investigations for SOCOD, and the remaining data were collected from the

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CSJC and the South Coast Water District. Table 3-3 shows production wells by owner and annual production for the 1978 to 2010 period. Figures 3-22 through 3-23 show the time series of annualized groundwater production at wells for the Lower, Middle, and the lower Arroyo Trabuco sub-basins, respectively. Prior to 2005, production was greatest in the lower Arroyo Trabuco Basin with average production at about 1,600 acre-ft/yr. On average, about 500 acre-ft/yr was pumped from the Middle Basin during the 1978-2010 period. Since the installation of the CSJC's desalter well field in 2005 and the South Coast Water District's desalter in 2007, groundwater production has averaged about 3,500 acre-ft/yr.

3.3.9 Groundwater Storage Time History

The storage capacity of the alluvial areas in the San Juan Watershed was first calculated by DWR in 1972 (DWR, 1972). DWR simplified the storage calculation by dividing the alluvial aquifer into segments with similar hydrogeologic characteristics. Estimates of specific yield, area, and average alluvial thickness were made for each segment, which were, in turn, used to calculate the storage capacity of each segment. In the 1994 *San Juan Basin Groundwater Management and Facility Plan*, NBS Lowry calculated a combined storage capacity of about 41,600 acre-feet for the Lower San Juan, Middle San Juan and lower Arroyo from the ground surface to the base of the aquifer. In their Annual Integrated Environmental Monitoring Reports (Psomas, 2004 through 2010), Psomas created six polygons that approximately correspond to the alluvial aquifer segments delineated by the DWR in 1972 in order to make storage change calculations on an annual basis. The total storage capacity of the basins was calculated to be about 26,924 acre-ft by multiplying the area of each segment by the DWR's estimates of average thickness and specific yield. This is a difference of about 14,000 acre-ft, or 34 percent, from the DWR's estimate.

This study attempted to refine the estimates of storage capacity, groundwater currently in storage, and storage change within the study area. A GIS-based storage model was developed, and the following steps were taken: 1) develop a fine rectangular grid (i.e. GIS polygon layer) over the area, 2) compute the amount of groundwater storage in 2010, and 3) compute the total storage capacity in the each cell. These steps are described in more detail below.

1. *Develop a fine rectangular grid.* The grid cell size used in the calculation was 100x100 meters (see Figure 3-21). Where a grid cell is split by a storage segment, it is assigned parameters based on the apportionment of the grid cell in each segment (determined by area).

2. *Compute the volume of groundwater in storage in each grid cell based on the current condition.* Groundwater elevation contours for fall 2010 groundwater conditions (Figure 3-19), bottom of the aquifer elevation contours (Figure 3-20), and specific yield estimates (Figure 3-21) were used to calculate the total storage volume of each grid cell. The groundwater elevations and the bottom of aquifer elevations for each grid cell were estimated with an automated gridding program that interpolates between contours. The volume of groundwater in a grid cell for a single-layer aquifer is computed as:

$$V_i = A_i * (WL_i - B_i) * SY$$

Where V_i = volume of groundwater in the ith grid cell

A_i = grid cell area (10,000 square meters for a square grid cell)

WL_i = average elevation of groundwater in the ith grid cell (feet above mean sea level [ft-msl])

B_i = average elevation of the effective base of aquifer in the ith grid cell (ft-msl)

SY = specific yield

3. *Compute the total storage capacity from the ground surface to the base of the aquifer.* The CSJC's 2-ft ground surface elevation contours, bottom of aquifer contours, and specific yield estimates were used to calculate the total storage capacity of the alluvium within the study area. The total storage capacity[8] in a grid cell for the alluvial aquifer is computed as:

$$SC_i = A_i * (GS_i - B_i) * SY$$

Where SC_i = storage capacity in the ith grid cell (acre-ft)

A_i = grid cell area (10,000 square meters for a square grid cell)

GS_i = average streambed elevation in i^{th} grid cell (ft-msl)

B_i = average elevation of the effective base of the aquifer in the ith grid cell (ft-msl)

SY = specific yield

The total storage capacity of the San Juan Basin was calculated to be about 39,208acre-ft, and the amount of groundwater in storage in 2010 was calculated to be about 28,771 acre-ft. The amount of unused storage in the San Juan Basin is about 6,150 acre-ft. Table 3-4 compares the total storage capacity estimates made by DWR, Psomas, and WEI.

3.4 Water Rights

Several water rights permits and agreements exist to allocate groundwater production from the San Juan Basin. A list of the existing and pending water rights permits is shown in the table below.

Applicant	Application Number	Permit Number	Diversion Amount Eligible Under Current Permit and Agreements (acre-ft/yr)	Diversion Amount Potentially Eligible to be Permitted and Agreement (acre-ft/yr)	Purpose of Use
SCWD	A31741	21256	88	88	Irrigation
SCWD	A30337	21138	976	1,300	Municipal

Applicant	Application Number	Permit Number	Diversion Amount Eligible Under Current Permit and Agreements (acre-ft/yr)	Diversion Amount Potentially Eligible to be Permitted and Agreement (acre-ft/yr)	Purpose of Use
SJBA	A30123	21074	8,026	10,702	Municipal
SMWD	A25557	17489	611 (Nov to Apr)	611 (Nov to Apr)	Irrigation
SMWD	A25733	17692	32 (Nov to Apr)	32 (Nov to Apr)	Irrigation
San Juan Golf	A30171	21142	450	450	Irrigation
CSJC	A30696[9]	N/A	3,325[10]	3,325	Municipal
Totals			13,508	16,508	

SJBA holds the right to the majority of the water in the basin. The SCWD and the CSJC both own individual water right permits for municipal use. The key provisions of the SJBA and SCWD Water Rights Permits are[11]:

- SJBA rights can be pumped out of the desalter project.
- SJBA right can be increased by 2,676 acre-ft/yr upon showing the availability of un-appropriated water and approval by the SWRCB Chief, Division of Water Rights.
- Allocation of water between SCWD and the SJBA is recognized as governed by agreements of Nov 21, 1995, Mar 1, 1998 and joint letter of Mar 13, 1998.
- Monitoring wells shall be used to measure groundwater levels on a minimum quarterly basis.
- The project shall not cause injury to the reasonable and beneficial uses of water recognized in the Basin Plan.
- Downstream TDS and chloride concentration in groundwater shall be monitored when SJBA extractions exceed 4,800 acre-ft/yr (Phase 2). Extractions shall not cause Basin Plan Objectives to be exceeded or further degradation to occur.
- Mitigation monitoring of stresses to native vegetation is required when SJBA extractions exceed 4,800 acre-ft/yr), and if groundwater pumping has caused significant stresses to the vegetation then the SJBA will be required to cease pumping until the stress has been reduced to acceptable levels.

[9] The CSJC's withdrew its application and its rights were memorialized per agreement among the CSJC, the SCWD and the SJBA and are referenced in the SJBA's water rights permit.

[10] Per agreement among the CSJC, the SCWD and the SJBA.

[11] The following three bullet lists summarizing the features of the water rights permits and subsequent agreements among the applicants is based on reviews of the seminal documents and a March 18, 2013 memo prepared by Richard Bell of the Municipal Water District of Orange County.

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- Extractions by all pumpers shall not exceed the total recharge and the condition is satisfied as long as groundwater storage does not fall below 50 percent of the storage capacity of the basin.
- The SJBA pumping right is subject to the prior riparian right of San Juan Golf and shall not cause significant impact on water quality.

The groundwater rights and other conditions were agreed to by the three parties in three agreements.

- Nov 1995 SJBA/City Agreement.
  - By this Agreement, SJBA recognized and agreed that it would not challenge the City extractions up to 3,325 acre-ft/yr
  - SJBA agreed to not operate its Groundwater Recovery Project in a manner that would infringe upon the City's extraction of water.

- Mar 1, 1998 SCWD/SJBA Settlement Agreement
  - SJBA to establish a Project Committee 10 "Basin Management Committee" which would serve as the "Basin Manager". The Basin Manager is responsible for determining on an annual basis the amounts of Available Safe Yield (ASY) which can be diverted by SCWD and SJBA from their water rights.
  - SCWD Base Allocation was set at 20 percent of the ASY up to a maximum of 1300 acre-ft/yr.
  - SJBA Base Allocation was set at 80 percent of ASY, up to a maximum of 12,500 acre-ft/yr.
  - Either party can use the other parties unused allocation.
  - SCWD is responsible for artificial replenishment when necessary to achieve the SCWD's annual diversion but both parties agree to work to avoid diversions that will result in the need for artificial replenishment.
  - SCWD to become a member of SJBA.
  - SCWD agreed to not interfere with City water rights in total of 3,325 acre-ft/yr.
  - SCWD expressed that it had no interest in the SJBA water right or desalter project.

- Oct 2002 Project Implementation Agreement San Juan Basin Desalter Project
  - City's allocated interest in the SJBA water rights were set at 5,800 acre-ft/yr from the desalter project.
  - SJBA has no obligation to provide make-up water to the City as the allocation exceeds City's base right of 3,325 acre-ft/yr.

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3.5 Recent Results of MWDOC Groundwater Model Application to the San Juan Basin

The MWDOC and five agencies – Laguna Beach County Water District, MNWD, City of San Clemente, CSJC, and SCWD – have been investigating the feasibility of improving local water reliability in south Orange County through the development of SOCOD. This project would decrease the area's dependence upon imported drinking water supplies. Currently, South Orange County depends on water imported from northern California and the Colorado River to meet approximately 95 percent of its local demand[12].

The proposed ocean desalination facility would be located north of Doheny State Beach in Dana Point, adjacent to San Juan Creek on the inland side of Pacific Coast Highway. It would produce approximately 15 million gallons of drought-proof water per day (16,000 acre-ft/yr), which is approximately 25 percent of the area's potable water demand. This new, local water supply would also benefit the area during emergencies and outages of the regional imported water delivery system. The projected SOCOD project construction cost is estimated at about $175 million (estimated 2015 dollars), and the unit cost of water would be about $1,300/acre-ft – with the cost being reduced to $1,050/acre-foot with incentives from Metropolitan[13].

The project would divert seawater into the treatment plant through slant wells drilled into the near and offshore parts of the San Juan groundwater basin. These wells will induce seawater into the aquifer as wells as draw groundwater from the landward side of the well field. The use of this forced seawater intrusion into the slant wells will greatly reduce the cost of pre filtration and eliminate the environmental challenges caused by direct intake of seawater.

Two phases of project feasibility testing have been conducted successfully at Doheny Beach since 2005. The project entered Phase 3: Extended Pumping & Pilot Plant Testing in early 2010 and was completed in May 2012. If pumping results are favorable, efforts would be initiated to move forward with development of a full-scale project description and environmental impact report (EIR). Successful adoption of the EIR and the receipt of all necessary permits from all appropriate regulatory agencies would be the next steps prior to project implementation and the initiation of construction. As planned, the project would be constructed and operational within two years, and water deliveries could begin as early as fall 2016[14].

The implementation of the SOCOD project will have significant impacts on the San Juan groundwater basin and include a reduction in the yield of the basin by diversion of groundwater from the landward side of the slant well intake system, and by the likely creation of a seawater intrusion barrier caused by the slant wells system. As to the latter, the regional groundwater level depression caused by the SOCOD intake could virtually eliminate future seawater intrusion regardless of how the San Juan groundwater basin is managed. Therefore if implemented, the natural yield of the San Juan groundwater basin would likely decline and the

[12] http://www.mwdoc.com/pages.php?id_pge=68

[13] ibid

[14] ibid

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basin could be operated at lower levels during drought periods without the fear of seawater intrusion. These findings are preliminary and based on preliminary groundwater modeling conducted by MWDOC and its consultants. Additional surface and groundwater modeling and other investigations will be required to validate and refine these findings.

3.5.1 Summary Description of MWDOC's Groundwater Model of the San Juan Basin

[There is no written documentation of the model referenced above other than pdf's of Powerpoint presentations located on the MWDOC website. If MWDOC produces a modeling report prior to the completion of this project report then we will insert a summary of the model here]

There are always limitations in the application of models. The specific limitations that were identified from the review of presentation materials and supplementary materials provided by MWDOC include the following[15]:

- There is very little data that can be used to calibrate the model under high pumping stresses. This reduces confidence (or requires greater faith) in the models ability to predict future groundwater levels during dry periods and higher than historical production. This challenge can be addressed in the future through monitoring. Also, MWDOC should consider conducting sensitivity analysis to explore the how their model would predict groundwater level changes with alternative but plausible data sets.
- The subsurface boundary inflows are purported to average 2,700 acre-ft/yr, with this value being tied to other upstream surface modeling work. There is insufficient data to support the plausibility of this assumption given the limited size of the aquifers upstream of the model boundaries and the great variability in the hydrology upstream of these boundaries. As will be seen below, a constant subsurface inflow of 2,700 acre-ft/yr is a substantial part of the production yield of the basin during wet and dry periods. The implication to producers in the San Juan groundwater basin is that the model will likely over-estimate the ability to produce groundwater during dry periods.
- Seawater intrusion in the vicinity of the SCWD wells was estimated with a model that is not capable of simulating groundwater flow with variable density fluids. This may or may not be a limitation – presumably the appropriateness of the present model application will be demonstrated in forthcoming model documentation.
- The model projections due not include a provision in the water rights agreement limiting groundwater production when groundwater storage falls below half of the basin's storage capacity. The implication is that the model may project greater groundwater pumping during dry periods than may be allowed per the SWRCB permits. In fairness the permit is not clear on how production would be reduced when

[15] MWDOC consultant provided WEI with supplementary information including certain water budget, model parameters and other hydrologic data and these comments are based on MWDOC power point presentations and supplementary information.

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storage falls below half the basins storage capacity. This is explored in the section below.

3.5.2 MWDOC 2013 Groundwater Model Results for the SJBGWMFP Baseline and Implications for the SJBGWMFP

As mentioned above, the MWDOC model documentation is in preparation and was not available at the time this document was being prepared. WEI did request and obtain certain information to enable us to characterize the basin response to baseline stresses. This characterization is described herein.

Table 3-11 shows the baseline water budget for the San Juan basin model area for a constant 2014 groundwater production projection and the hydrologic period 1947 through 2010. The water budget shown in Table 3-11 represents how the basin would respond under 2014 production if that production were held constant for a long representative hydrologic period. The hydrologic period shown in Table 3-11 includes statistical summaries for a wet period (1978-1983), a dry period (1947-1976), the so called "average" period (1963-1992) and the entire simulation period. The simulation period 1947 through 2010 period contains very similar statistics to the average period and therefore the average period is not included in the subsequent discussion. Table 3-11 shows the hydrologic year, the recharge components, discharge components, the change in storage (sum of recharge components minus the sum of discharge components), end of period storage, deviation from minimum storage to maintain maximum production, and the unmet production demand.

The recharge components include underflow from upgradient groundwater resources in San Juan Creek, Horno Creek, Arroyo Trabuco and Oso Creek (column 1); streambed infiltration in the model area including natural flows and dry-weather flows (column 2); the deep infiltration of return flows (column 3); subsurface boundary inflows from adjacent non water bearing areas (column 4); and subsurface (underflow) from the ocean (column 5). The total inflow is shown in column 6 and ranges from low of about 4,300 acre-ft/yr to a high of about 24,000 acre-ft/yr, averages about 10,200 acre-ft/yr – about 1,000 acre-ft/yr less than the amount requested by all the groundwater producers in the basin, and the median is about 8,400 acre-ft/yr which is about 2,800 acre-ft/yr less than the amount requested by all the groundwater producers in the basin. The total recharge is dominated by the streambed infiltration that ranges from 1,400 to 19,100 acre-ft/yr, averages about 6,700 acre-ft/yr and has a median value of about 5,000 acre-ft/yr. The underflow from the ocean shown in column 5 is seawater intrusion and ranges from 0 in the first year to about 600 acre-ft/yr, averages about 300 acre-ft/yr and has a median value of 400 acre-ft/yr. This seawater intrusion is predicted to impact the SCWD desalter wells in the early 2020s. Both the SJBA and the SCWD diversion permits, contain language that prohibits water quality degradation due the exercise of rights conferred by the permits. Review of Table 3-11 indicates that the underflow from the ocean is essentially positive for all years meaning that seawater intrusion is projected to occur even for groundwater production levels less than the planned amounts.

This seawater intrusion will degrade the basin water quality and thus the production allowed for within the permits will have to be reduced to the point that no seawater intrusion occurs[16].

The discharge components include groundwater production (column 7), evapotranspiration (column 8), rising groundwater discharge to streamflow (column 9), and underflow to the ocean (column 10). The total discharge is shown in column 11 and ranges from low of about 7,900 acre-ft/yr to a high of about 12,900 acre-ft/yr, averages about 10,300 acre-ft/yr, and the median is also about 10,300 acre-ft/yr which is about 900 acre-ft/yr less than the planned groundwater production. The total discharge is dominated by the model-predicted groundwater production that ranges from 7,400 to 11,200 acre-ft/yr, averages about 9,600 acre-ft/yr and has a median value also of about 9,600 acre-ft/yr. The 2014 groundwater production was estimated initially by the SJBA TAC members and represents the potential maximum groundwater production for the basin for 2014. The SJBA TAC members supplied individual well production estimates and drawdown constraints that limit groundwater production at wells when the groundwater production falls below the drawdown constraint. The 2014 production was estimated as follows:

- 7,758 acre-ft/yr – CSJC desalter wells
- 1,023 acre-ft/yr – CSJC other wells
- 1,585 acre-ft/yr – SCWD desalter wells
- 850 acre-ft/yr – Other private wells
- 11,216 acre-ft/yr – Total "requested" production

In practice when the groundwater model predicts a groundwater level at or below water level constraint at a well, the model will adjust the production at the well to try to maintain groundwater levels at or about the constraint. The annual production totals listed in table 3-11 show that production was limited by groundwater levels falling below drawdown constraints in 56 of 63 years of the simulation period or about 90 percent of simulation period.

The other discharge components are relatively minor and in aggregate range from about 500 to 1,600 acre-ft/yr, average about 700 acre-ft/yr and have a median value of about 600 acre-ft/yr.

The end of period storage is equal to the storage at the beginning of the year (the end of period storage for the prior year, column 13) and the change in storage for the current year (column 12). For example the end of period storage for 1948 is equal to the end of period storage for 1947 (17,637 acre-ft) plus the change in storage for 1948 of -5,781 acre-ft and

[16] Model predictions of seawater intrusion are not conclusive. The SJBA is conducting groundwater monitoring to determine if and when seawater intrusion occurs and will take appropriate measures if and when seawater intrusion is detected.

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equals 11,857 acre-ft. The end of period storage ranges from 7,500 acre-ft to 43,900 acre-ft, average about 18,400 acre-ft and has a median value of about 17,200 acre-ft.

Figure 3-25 shows the relationship of end of period storage to model predicted groundwater production. The chart shows that requested or planned groundwater production is usually achievable if the end of period storage is greater than 27,000 acre-ft, and that the predicted production is highly variable and sometimes substantially less when the end of period storage is less than 27,000 acre-ft. The variability in predicted production is due to the variability in stream infiltration when the prior year end of period storage is less than 27,000 acre-ft.

Figure 3-25 shows the frequency of end of period storage based on the end of period time series shown in column 13 in Table 3-11. Review of Figure 3-26 indicates that the end of period storage will be less than half of the basin capacity at least 71 percent of the time, or seven out ten years.

The take-aways from this baseline simulation is that planned production by the CSJC and SMWD along with private producers seems to exceed the production capabilities of the basin and will result in production levels less than planned and potentially seawater intrusion. The average production from the basin under the baseline plan appears to be about 9,600 acre-ft/yr and ranges from about 7,400 acre-ft/yr to about 11,200 acre-ft/yr. The firm yield of the basin appears to be less than 7,000 acre-ft/yr. The limiting factors on yield are storage and the ability to capture and recharge surface water during and after storms. The management plan moving forward will need to include increased recharge, decreased production or some combination of the two to meet the water needs of those dependent on the basin.

3.5.3 The Impacts of SOCOD on San Juan Basin Production

At the March 21, 2013 SOCOD Technical Advisory Committee meeting, MWDOC presented the results of its most recent model investigations of the projected impacts of the SOCOD project on producers in the San Juan Basin. The average decline in yield over the dry period of 1947 through 1976 is projected to be about 1,500 acre-ft/yr – no information was presented to characterize the SOCOD impacts on production during the driest years (no annual minimum). MWDOC estimated that implementation of the SOCOD project would result in an average decline of 1,800 acre-ft/yr of production among basin producers during the "average" climate period of 1963 through 1992.[17]

3.6 Yield Concepts for the SJBGWMP

3.6.1 Definition of Safe Yield

Water managers, civil engineers, hydrogeologist have wrestled with the term "safe yield" since the turn of the last century. The goal was to scientifically define and estimate a term for how much groundwater can extracted from a groundwater basin in a reliable manner.

Lee (1915) defined safe yield as the limit to the quantity of water which can be withdrawn regularly and permanently without dangerous depletion of the storage reserve. He noted that

[17] Handouts from the March 21, 2013 SOCOD TAC meeting, Agenda item 2.

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water permanently extracted from an underground reservoir reduces by an equal quantity the volume of water passing from the basin by way of natural channels, i.e., the natural discharge.

Theis (1940) recognized that all groundwater of economic importance is in constant movement through a porous rock stratum, from a place of recharge to a place of discharge. He reasoned that under pristine conditions, aquifers are in a state of approximate dynamic equilibrium. Discharge by pumping is a new discharge superimposed on a previously stable system; consequently, it must be balanced by: an increase in natural recharge; a decrease in natural discharge; a loss of storage in the aquifer; or a combination thereof. Significantly, Theis (1940) distinguished between natural recharge and available recharge.

The most common definition of safe yield is attributed to Todd (1959): the rate at which groundwater can be withdrawn perennially under specified operating conditions without producing an undesirable result. Most modern groundwater adjudications use some form of this definition. The definition also ties the safe yield to the cultural conditions of a specific year—presumably a near current year if cultural conditions are changing. Undesirable results commonly listed in literature include the depletion of groundwater reserves, intrusion of water of undesirable quality, contravention of existing water rights, excessive increases in production costs, stream flow depletion, and subsidence (Freeze & Cherry, 1979; Todd, 1959).

Safe yield is incorporated in the physical solution of adjudicated groundwater basins. Most of these physical solutions use different definitions of safe yield but they are all directed to enable a groundwater basin to be managed in a sustainable way.

3.6.2 Alternative Yield Concepts for the SJBGWMP

The concept of safe yield does not strictly apply to the San Juan Basin as the storage in the groundwater basin is small relative to recharge and production. The SWRCB has found that the San Juan basin is "flow of an underground stream" which means that they consider the groundwater in the basin a surface water.

A more appropriate yield term for the San Juan basin is "firm yield" a term used by the U.S. Bureau of Reclamation to describe the maximum quantity of water that can be guaranteed with some specified degree of confidence during a specific critical period. The critical period is that period in a sequential record that requires the largest volume from storage to provide a specified yield[18].

More water can be produced form the basin most of time. What's needed is an articulation of how much can be produced given a specific amount of storage going into each production season and a statistical characterization of that production – an adaptive yield that's large enough to meet local demands with the potential to be augmented through various management schemes including artificial recharge. Given what has been learned in this investigation it appears that the minimum yield (firm yield) of the San Juan basin is slightly less

[18] www.usbr.gov/projects/glossary.jsp

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than 7,000 acre-ft/yr; and that the basin could be managed to produce, with current production facilities and additional facilities that could constructed in the near term, between 7,000 and 11,000 acre-ft/yr. This would require intensive monitoring and facilities to protect the basin from seawater intrusion. The adaptive yield could also be augmented through aggressive means including the recharge of supplemental water.

The SJBA should consider adopting the term "adaptive yield" which in magnitude is bracketed by firm yield on the low end and a maximum yield consisting of natural and artificial recharge, and where the yield for a given year is established in the spring based on the groundwater levels in the spring and planned artificial recharge during the spring, summer and fall.

3.7 Water Quality

3.7.1 Data Sources

3.7.1.1 Surface Water Data Sources

All available surface water quality data in the San Juan Basin were collected for surface water sites along the San Juan Creek and its tributaries from a number of different data sources. Table 3-5 summarizes the different data sources and surface water stations from which water quality data were collected. The most continuous surface water quality monitoring program in the San Juan Basin is the County of Orange's storm water monitoring program. Grab and composite surface water quality samples for the County of Orange's Bioassesment and Mass Emissions storm water monitoring programs were collected for six sites in the study area with data from 2000 to 2009, and four sites with data from 1993 to 2009. Surface water quality data were collected from the San Diego Regional Water Quality Control Board, with data from 2002 to 2003 and 2009 to 2010 for their Surface Water Ambient Monitoring program. Surface water quality data were collected for the five SJBA monitoring sites along San Juan Creek, and for two SMWD monitoring sites at the Oso and Horno Creek Barriers. Additional surface water quality data were collected for project-specific monitoring programs for studies performed by Wildermuth Environmental (WEI, 1999) and CDM (1987). Figure 3-27 shows the locations of all the surface water quality monitoring sites in the San Juan Basin along the San Juan Creek and its tributaries.

3.7.1.2 Groundwater Data Sources

All available groundwater quality data for wells in the San Juan Basin were collected from a variety of resources for the period from 1952 to 2010. Table 3-6 summarizes the different sources from which water quality data were collected. Previous studies by DWR (1972), WEI (1999), CDM (1987), NBS Lowery (1994), and GeoTechnical Consultants, Inc. (GTC, 2001) provided sporadic historical groundwater quality data for various private and public wells the San Juan Basin. Groundwater quality data from production wells were extracted from the State of California Department of Public Health (CDPH) database for wells owned by the City, SCWD, Rancho Mission Viejo (Well 7), and SJBA. Additional production well data was provided by the City and SMWD. Monitoring well data from the California State Water Resources Control Board GeoTracker website were collected for point-source contamination sites. Monitoring well water quality was provided by the SJBA for their

nine San Juan Basin monitoring wells. Figure 3-28 shows the location of wells were water quality data were collected in the San Juan Basin.

3.7.1.3 Information Management

All groundwater and surface water quality data were uploaded into HydroDaVE. These data are readily accessed through the HydroDaVE Explorer interface where the user can perform spatial and temporal queries. All data collected for this project will be delivered in a HydroDaVE project file. Maintaining water resources data in HydroDaVE will make these data available for future projects and will save money.

3.7.2 Beneficial Uses

The Water Quality Control Plan for the San Diego Basin (Basin Plan) identifies the beneficial uses for surface waters in the study area as AGR, REC1, REC2, WARM, COLD, and WILD. Surface waters in the San Juan Watershed have "been exempted by the Regional Board from the municipal use designation [MUN] under the terms and conditions of State Board Resolution No. 88-63, Sources of Drinking Water Policy." The Basin Plan identifies the beneficial uses for groundwater as MUN, AGR, and IND. Because of the interaction of surface water and groundwater in the watershed, this technical memorandum also compares surface water constituent concentrations with drinking water standards. The beneficial uses designations are defined as follows:

- Agricultural Supply (AGR) – Includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
- Contact Water Recreation (REC1) – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.
- Non-contact Water Recreation (REC2) – Includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- Warm Freshwater Habitat (WARM) – Includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
- Cold Freshwater Habitat (COLD) – Includes uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
- Wildlife Habitat (WILD) – Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

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- Municipal and Domestic Supply (MUN) – Includes uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
- Industrial Service Supply (IND) – Includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

3.7.3 General Surface Water Quality Characterization

Figure 3-27 shows all surface water stations with water quality monitoring data. Constituents in surface water were compared with both water quality objectives in the Basin Plan and California water quality standards (primary and secondary MCLs and NLs) enforced by DPH. California drinking water MCLs were used because they are the same or more stringent than federal drinking water standards.

Basin Plan water quality objectives "must protect the most sensitive of the beneficial uses which have been designated for a water body. Water quality objectives may be numerical values for water quality constituents or narrative descriptions. Water quality objectives must be based upon sound scientific water quality criteria needed to protect the most sensitive of the beneficial uses which have been designated for a water body. Water quality objectives must be as stringent or more stringent than water quality criteria [developed under the Clean Water Act]. " Tables 3-2 and 3-3 in the Basin Plan list water quality objectives for inland surface waters and for groundwater. Other constituents are prospectively incorporated by reference in the following tables in the Basin Plan:

- Table 3-4: Inorganic Chemicals
- Table 3-5: Organic Chemicals
- Table 3-6: Secondary MCLs for Consumer Acceptance Limits

The Basin Plan also includes narrative objectives, including the following calculation for percent sodium:

$$\%\, Na = \frac{100 \cdot Na}{(Na + Ca + Mg + K)}$$

where Na, Ca, Mg, and K are expressed as milliequivalents per liter (meq/L) concentrations. To the extent data were available, environmental concentrations were compared with these narrative objectives.

Drinking water quality standards are promulgated by federal and state agencies. Primary MCLs are enforceable criteria that are set due to health effects. They are developed by the USEPA from MCL Goals and by CDP from Public Health Goals or from one-in-a-million incremental cancer risk estimates for carcinogens and threshold toxicity levels for non-carcinogens. Secondary standards are related to the aesthetic qualities of the water, such as

taste and odor. For some chemicals, there are "Notification Level" (NL) criteria that are set by the CDPH. These are health-based advisory levels established by CDPH for chemicals that lack MCLs. When notification levels are exceeded, the CDPH recommends that the utility inform its customers and consumers about the presence of the contaminant and any health concerns associated with exposure. The level at which the CDPH recommends the drinking water system remove the affected drinking water source from service is the "Response Level." These levels range from 10 to 100 times the notification level, depending on the chemical.

Table 3-7 in this report list all the constituents for which Primary or Secondary Drinking Water MCLs or State NLs were exceeded at surface water sites in the San Juan Basin. The first portion of the table lists the Primary and Secondary MCLs, and State NLs for those constituents, and is primarily California State MCLs unless otherwise noted. The remaining portion of the table shows statistics for the occurrence of an MCL or NL exceedance for two time periods; the last five years (2006 to 2010) and the historical record prior to the last five years (1987 to 2005). The two time periods are shown because data for the last five years is not representative of all of the surface water data collected in the San Juan Basin at the various sites, as shown in Table 3-7. The exceedance statistics summarize the count and percentage of sites and samples exceeding an MCL or NL, and the count and percentage of sites and samples not exceeding an MCL or NL. As an example, in the period 1987 through 2005, there were 19 surface water stations where TDS exceeded the secondary MCL of 500 mg/L and 10 stations where the MCL was not exceeded. In this period, 192 samples (88 percent) were greater than the MCL and 27 samples (12 percent) were less than the MCL.

Table 3-8 in summarizes compliance with the San Diego RWQCB surface water objectives for constituents shown in Table 3-2 of the Basin Plan for all surface water sites along San Juan Creek and tributaries in the San Juan Basin. As stated in the Basin Plan, the concentrations of these constituents are not to exceed the objective more than 10 percent of the time during any one-year period. This table shows surface water objective compliance by evaluating data per calendar year. Surface water sites are organized by surface water body from upstream to downstream, and objective compliance is shown for the entire period of record, and for all of the constituents in Table 3-2 of the Basin Plan where data is available. For each surface water station, all the constituents sampled are listed showing the time period and number of years the constituent was sampled and the number of years the concentration was above and below the objective based on the 10 percent metric. As an example, surface water station SJC @ La Novia has a record of TDS data for 1987 through 2009, a period of 23 years. Over this 23 year period, TDS was not sampled in 18 of the 5 years in which TDS was sampled, the TDS concentration measured at SJC @ La Novia was above the objective more than 10 percent of the time in all five years. Additionally, the TDS concentration was never below the objective more than 90 percent of the time in any of the five years that the site was sampled.

3.7.4 General Groundwater Quality Characterization

Figure 3-28 shows all wells in the San Juan Basin for which groundwater quality data were available. Inorganic and organic constituents detected in groundwater samples from wells in the San Juan Basin through June 2010 were analyzed synoptically and temporally. This analysis included all available data from production and monitoring wells. Hence, the data do not

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represent a programmatic investigation of potential sources nor do they represent a randomized study that was designed to ascertain the water quality status of San Juan Basin. These data do, however, represent the most comprehensive information available to date. Monitoring wells targeted at potential sources tend to have greater concentrations than municipal or agricultural production wells. Wells with constituent concentrations greater than one-half of the MCL represent areas that warrant concern and inclusion in a long-term monitoring program. In addition, groundwater in the vicinity of wells with samples greater than the MCL may be impaired from a beneficial use standpoint, which for the study area are MUN, AGR, and IND.

Table 3-9 in this report list all the constituents for which Primary or Secondary Drinking Water MCLs or State NLs were exceeded at wells in the San Juan Groundwater Basin. The first portion of the table lists the Primary and Secondary MCLs, and State NLs for those constituents, and is primarily California State MCLs unless otherwise noted. The remaining portion of the table shows statistics for the occurrence of a MCL or NL exceedance for the last five years (2006 to 2010). The exceedance statistics summarize the count and percentage of sites and samples exceeding a MCL or NL, and the count and percentage of sites and samples not exceeding an MCL or NL. As an example, during 206 to 2010 there were 22 wells where TDS exceeded the secondary MCL of 500 mg/L and no wells stations where the MCL was not exceeded. During this period, 424 samples (100 percent) were greater than the MCL and no samples (0%) were less than the MCL.

Table 3-10 in this report summarizes compliance determination of the San Diego RWQCB groundwater quality objectives for constituents shown in Table 3-3 of the Basin Plan for all wells in San Juan Groundwater Basin study area where groundwater quality data was collected. Table 3-10 shows the constituents with the corresponding groundwater quality objectives. As stated in the Basin Plan, the concentrations of these constituents are not to exceed the objective more than 10 percent of the time during any one year period. This table shows groundwater quality objective compliance by evaluating data per calendar year for the time period of 2006 to 2010. Wells are group by groundwater basin hydrologic Sub Area, and compliance of objectives for each well is summarized by the constituent, the number of years the constituent was sampled for during the five year period, and the number of years the concentration was above and below the objective based on the 10 percent metric.

3.7.5 Surface Water and Groundwater Quality Areal and Temporal Distribution

Figures were developed to depict the areal distribution of surface and groundwater quality in the study area. For each of the groundwater maps, time-history plots of constituent concentrations are also shown for four key wells: Rosenbaum Well 1, Hollywood Well 2A, San Juan Hills Golf Course Well, and SJBA #2. These wells were chosen because of their relatively long time history of water quality data. For each of the groundwater maps, the well symbols denote the maximum concentration of a given constituent for the last five years: 2006 through 2010. Because of the paucity of surface water quality data, the surface water maps depict the maximum concentration over the entire record of data.

Groundwater and surface water quality maps were prepared for following constituents where the MCL was exceeded at 10 percent or more of the groundwater sample during 2006 to 2010: total dissolved solids (TDS); manganese; iron; sulfate; and chloride. Groundwater quality maps only were prepared for methyl-tert-butyl-ether (MTBE), tert-butyl-alcohol (TBA), benezene, and arsenic where the MCL was exceeded in 10 percent or more of samples which were predominantly at wells associated with the known point source contamination monitoring; these maps are discussed in a later section. A nitrate as nitrogen (NO3-N) groundwater map was also prepared because nitrate is a constituent generally used to characterize the overall water quality of a basin and often used in compliance determination.

For the figures that depict water quality distributions in the San Juan Basin, the following convention is followed in setting class intervals in the legend (where WQS is the applicable water quality standard [see table below]).

Water Quality Class Interval Symbology

Symbol	Class Interval
○	Not Detected
●	<0.5x WQS, but detected
●	0.5x WQS to WQS
●	WQS to 2x WQS
●	2x WQS to 4x WQS
●	> 4x WQS

3.7.5.1 Total Dissolved Solids

TDS comprise inorganic salts dissolved in water; the major ions are sodium, potassium, calcium, magnesium, bicarbonates, chlorides, and sulfates Under Title 22, TDS is regulated as a secondary contaminant; high concentrations of TDS may be objectionable to consumers from an aesthetic standpoint. Secondary MCLs are established as guidelines to assist public water supply agencies in managing drinking water supplies for taste, odor, and color. The California secondary drinking water MCL for TDS is 500 mg/L. The following table lists the drinking water standard, and the surface water and groundwater objectives for TDS:

TDS Concentration Objectives in the Basin Plan

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
California Secondary MCL		500
	Surface Water	
	Mission Viejo HA	500
	Groundwater	
	Oso HSA	1,200

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Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
	Upper Trabuco HSA	500
	Middle Trabuco HSA	750
	Gobernadora HSA	1,200
	Upper San Juan HSA	500
	Middle San Juan HSA	750
	Lower San Juan HSA	1,200
	Ortega HSA	1,100

Figure 3-29 shows the distribution of the maximum TDS concentrations in groundwater in the San Juan Basin from 2006 through 2010 as well as time history plots of the four key wells. All wells exceeded the secondary MCL for TDS, and several wells exceeded the Basin Plan objective for their respective sub areas. Note that there are numerous wells in the study area that do not have recent data (last five years).

Figure 3-30 shows the TDS concentrations in surface water in the San Juan Watershed. With the exception of the upper reaches of Arroyo Trabuco and San Juan Creek, TDS is generally greater than the MCL and the objective for the Mission Viejo HA. TDS is highest in the Oso and the Lower San Juan HSAs.

The relatively higher TDS in the lower portions of the basin can be attributed to irrigation return flows (agricultural and domestic landscape irrigation), fertilizer use, consumptive use, and the dissolution of ions from weathered rock surfaces and evaporate salts. As water percolates through soil, it dissolves ionic and non-ionic particles from mineral surfaces and exchange sites.

3.7.5.2 Nitrate Nitrogen

Nitrate can be naturally-occurring and it can also be associated with agriculture, septic systems, POTW discharges. Nitrate can be converted into nitrite, especially in the gastrointestinal system of infants; nitrite is a concern because it can interfere with the ability of red blood cells to transmit oxygen, potentially leading to a condition called methemoglobinemia, or "blue-baby syndrome."

The primary MCL for nitrate as nitrogen (NO3-N) in drinking water is 10 mg/L . The following table lists the drinking water standard, and the surface water and groundwater objectives for NO3-N:

Nitrate-Nitrogen Concentration Objectives in the Basin Plan

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
California Primary MCL		10
	Surface Water	

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
	Mission Viejo HA	footnote[19]
	Groundwater	
	Oso HSA	10
	Upper Trabuco HSA	10
	Middle Trabuco HSA	10
	Gobernadora HSA	10
	Upper San Juan HSA	10
	Middle San Juan HSA	10
	Lower San Juan HSA	10
	Ortega HSA	10

Figure 3-31 shows the distribution of the maximum nitrate-nitrogen concentrations in groundwater in the San Juan Basin from 2006 through 2010 as well as time history plots of the four key wells. Nitrate is typically below the MCL for wells in the study area with data. The only two wells that exceeded the MCL were the Stonehill well and MW-20A (associated with Chevron Service Station #9-3417) in the Lower San Juan HSA. The MCL for nitrate was not exceeded at surface water stations in the study area based on the available data.

3.7.5.3 Sulfate

Sulfate is an inorganic compound dissolved in water. Under Title 22, sulfate is regulated as a secondary contaminant; high concentrations of sulfate may be objectionable to consumers from an aesthetic standpoint and may cause diarrhea. The California secondary drinking water MCL for sulfate is 250 mg/L. The following table lists the drinking water standard, and the surface water and groundwater objectives:

Sulfate Concentration Objectives in the Basin Plan

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
California Secondary MCL		250
	Surface Water	
	Mission Viejo HA	250
	Groundwater	
	Oso HSA	500
	Upper Trabuco HSA	250
	Middle Trabuco HSA	375
	Gobernadora HSA	500
	Upper San Juan HSA	250

[19] "Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth." *Ibid.* p. 3-14

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
	Middle San Juan HSA	375
	Lower San Juan HSA	500
	Ortega HSA	450

Figure 3-32 shows the distribution of the maximum sulfate concentrations in groundwater in the San Juan Basin from 2006 through 2010 as well as time history plots of the four key wells. Most of the wells exceeded the secondary MCL for TDS, and many wells exceeded the Basin Plan objective for their respective sub areas. Note that there are numerous wells in the study area that do not have recent data (last five years).

Figure 3-33 shows the sulfate concentrations in surface water in the San Juan Watershed. With the exception of the upper reaches of Arroyo Trabuco sulfate is generally greater than the MCL and the objective for the Mission Viejo HA. Sulfate is generally highest in the Oso and the Lower San Juan HSAs.

3.7.5.4 Chloride

Chloride is an inorganic constituent dissolved in water and is naturally occurring. Higher concentrations can be associated with consumptive use, marine sediments, and sea water intrusion. Under Title 22, chloride is regulated as a secondary contaminant; high concentrations of chloride may make drinking water taste salty (especially if sodium concentrations are high, there is less of an effect with calcium or magnesium). The California secondary drinking water MCL for sulfate is 250 mg/L. The following table lists the drinking water standard, and the surface water and groundwater objectives for chloride:

Chloride Concentration Objectives in the Basin Plan

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
California Secondary MCL		250
	Surface Water	
	Mission Viejo HA	250
	Groundwater	
	Oso HSA	400
	Upper Trabuco HSA	250
	Middle Trabuco HSA	375
	Gobernadora HSA	400
	Upper San Juan HSA	250
	Middle San Juan HSA	375

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Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
	Lower San Juan HSA	400
	Ortega HSA	375

Figure 3-34 shows the distribution of the maximum chloride concentrations in groundwater in the San Juan Basin from 2006 through 2010 as well as time history plots of the four key wells. Most of the wells exceeded the secondary MCL for TDS, and several wells exceeded the Basin Plan objective for their respective sub areas. Chloride is higher in the Lower San Juan HSA.

Figure 3-35 shows the chloride concentrations in surface water in the San Juan Watershed. Surface water stations along Arroyo Trabuco, Canada Chiquita, Canada Gobernadora, the middle to upper reaches of San Juan Creek all reported samples with chloride concentrations generally below the MCL and basin plan objective. Surface water stations along Oso Creek, Horno Creek, and the lower reaches of San Juan Creek all reported concentrations that were generally greater than the MCL and basin plan objective.

3.7.5.5 Manganese

Manganese is an inorganic constituent dissolved in water and is naturally occurring through the dissolution of manganese-bearing minerals. At low concentrations, manganese is an essential micronutrient. Higher concentrations can be associated with industrial effluent, acid-mine drainage, sewage and landfill leachate. Under Title 22, manganese is regulated as a secondary contaminant; high concentrations of manganese may give drinking water a bitter and metallic taste and may cause staining of clothes. The California secondary drinking water MCL for manganese is 0.05 mg/L. The following table lists the drinking water standard, and the surface water and groundwater objectives:

Manganese Concentration Objectives in the Basin Plan

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
California Secondary MCL		0.05
	Surface Water	
	Mission Viejo HA	0.05
	Groundwater	
	Oso HSA	0.05
	Upper Trabuco HSA	0.05
	Middle Trabuco HSA	0.05
	Gobernadora HSA	0.05
	Upper San Juan HSA	0.05
	Middle San Juan HSA	0.05
	Lower San Juan HSA	0.05

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Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
	Ortega HSA	0.05

Figure 3-36 shows the distribution of the maximum manganese concentrations in groundwater in the San Juan Basin from 2006 through 2010 as well as time history plots of the four key wells. With the exception of two wells in the Oso and Lower Trabuco HSA, all of the wells exceeded the secondary MCL for manganese by as much as 40 times.

Figure 3-37 shows the manganese concentrations in surface water in the San Juan Watershed. With the exception of the upper reaches of Arroyo Trabuco, Bell Canyon, Canada Chiquita, Canada Gobernadora, and San Juan Creek, manganese is generally greater than the MCL and the objective for the Mission Viejo HA. The surface water station, SN-1A, in the upper reach of Arroyo Trabuco is on a mine adit from a former tin mine that discharges into Arroyo Trabuco.

3.7.5.6 Iron

Iron is an inorganic constituent dissolved in water and is naturally occurring through the dissolution of iron-bearing minerals. At low concentrations, iron is an essential micronutrient. Higher concentrations can be associated with industrial effluent, acid-mine drainage, sewage and landfill leachate. Under Title 22, iron is regulated as a secondary contaminant; high concentrations of iron may give drinking water a bitter and metallic taste and may cause staining of clothes. The California secondary drinking water MCL for iron is 0.3 mg/L. The following table lists the drinking water standard, and the surface water and groundwater objectives:

Iron Concentration Objectives in the Basin Plan

Drinking Water Standard	Hydrologic Area (HA) or Hydrologic Sub Area (HAS)	Objective or MCL (mg/L)
California Secondary MCL		0.3
	Surface Water	
	Mission Viejo HA	0.3
	Groundwater	
	Oso HSA	0.3
	Upper Trabuco HSA	0.3
	Middle Trabuco HSA	0.3
	Gobernadora HSA	0.3
	Upper San Juan HSA	0.3
	Middle San Juan HSA	0.3
	Lower San Juan HSA	0.3
	Ortega HSA	0.3

Figure 3-38 shows the distribution of the maximum iron concentrations in groundwater in the San Juan Basin from 2006 through 2010 as well as time history plots of the four key wells. With the exception of Rosenbaum Well 1 in the Oso HSA, all of the wells exceeded the secondary MCL for manganese by as much as 60 times.
Figure 3-39 shows the iron concentrations in surface water in the San Juan Watershed. With the exception of Arroyo Trabuco, and the upper reaches of San Juan Creek, iron is generally greater than the MCL and the objective for the Mission Viejo HA. The surface water station, SN-1A, in the upper reach of Arroyo Trabuco is on a mine adit from a former tin mine that discharges into Arroyo Trabuco.

3.7.6 Point Sources of Concern/Geo Tracker

The State Water Resources Control Board's GeoTracker database was queried interactively using the HydroDaVE Explorer interface to determine if there are any current open cases/sites in the study area. GeoTracker "is the Water Boards' data management system for managing sites that impact groundwater, especially those that require groundwater cleanup (Underground Storage Tanks [USTs], Department of Defense, Site Cleanup Program) as well as permitted facilities such as operating USTs and land disposal sites." Ten point-source contaminant sites were identified within the study area as potentially impacting the groundwater basin in the vicinity of active production wells (Figure 3-40).

3.7.6.1 Ultramar/San Juan Service (GeoTracker Global ID T0605902555)

The Ultramar/San Juan Service site is located at 26572 Junipero Serra Road in San Juan Capistrano. The site is on the southern side of Junipero Serra Road just east of the 5 Freeway. Junipero Serra High School is located south and west of the site. In 1998, five, single-walled USTs were removed, along with the associated fuel dispensers and product piping (Frey, 2005):

- Three 8000-gallon gasoline USTs
- One 12,000-gallon diesel UST
- One 280-galling waste oil UST

TPH, benzene, MTBE, and TBA have been detected in groundwater at concentrations up to 23,000 micrograms per litre (ug/L), 150 ug/L, 34,000 ug/L, and 62,000 ug/L, respectively. In the most recent sampling event reported (August 4, 2010), these constituents were still detected above their MCLs or NLs: 1,000 ug/L, 9.2 ug/L, 14 ug/L and 17,000 ug/L. Figures 3-41, 3-42, and 3-43 show the maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area.

3.7.6.2 Former Shell Station (GeoTracker Global ID T0605902592)

The former Shell Station site is located at 27101 Ortega Highway in San Juan Capistrano, CA. In May of 1986 a petroleum hydrocarbon leak was discovered. Several soil investigations occurred between 1987 and 2005. These investigations included installation and sampling of several monitoring wells and soil borings (OCHCA, 2006; MBE, 2006). Significant

concentrations of MTBE and TBA were detected in the soils onsite, and in groundwater beneath the site and at offsite wells. Remedial activities at the site included excavation of USTs and surrounding soil, vapor extraction system, and a pump and treat program. TBA and MTBE concentrations decreased over this time. During 2004 and 2005 a mathematical model and HydroPunch groundwater samples collected on the downgradient side of the 5 Freeway concluded that plume would not move more than 450 feet offsite. A submittal for site closure was approved on March 6, 2006 (OCHCA, 2006).

The contaminant plume is characterized by elevated concentrations of MTBE, TBA, and benzene. Concentrations of ethylbenzene and naphthalene were detected above the California or Federal, Primary or Secondary MCLs for drinking water. Figures 3-41, 3-42, and 3-43 show maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area. The last groundwater quality monitoring event at the sites monitoring wells was conducted in January 2006. At the cessation of monitoring in 2006 MTBE concentrations ranged from non-detect (<0.5 ug/L) to 59 ug/L, TBA concentrations ranged from non-detect (2 ug/L) to 34,000 ug/L, and benzene concentrations ranged from non-detect (0.5 ug/L) to 1 ug/L.

3.7.6.3 76 Station 5425 (GeoTracker Global ID T0605902561)

The 76 Station 5425 site is located on the south side of the Ortega Highway, east of Interstate 5 in San Juan Capistrano, CA. In 1985, during a UST removal, hydrocarbons were detected in the soil surrounding the UST excavation. Between 1985 and 1994 soil removal and a vapor extraction system were used to remediate the soil and groundwater beneath the site. Several site investigations were conducted from 1986 to 1994. Data from borings drilled in late 1994 within the affected areas resulted in closure of the OCHCA case in late 1995 (TRC, 2006).

In 1998, during a product piping and dispenser island upgrade, hydrocarbons were detected in the soil surrounding the UST excavation. TPH as gasoline and MTBE were detected in the soil under three of the four dispenser sites (TRC, 2006). Between 1998 and 2008 contaminated soil was removed and several soil borings and monitoring wells were drilled to assess soil and groundwater contamination onsite and offsite (TRC, 2006; Delta Consultants, 2010). Groundwater quality monitoring is conducted quarterly at the monitoring wells

The contaminant plume is characterized by elevated concentrations of MTBE, and TBA. Concentrations of ethylbenzene, benzene, toluene, and total xylene were detected above the California or Federal, Primary or Secondary MCLs for drinking water. These constituents have been primarily non-detect since December 2004 with the exception of the sample from September 2009 when all of these constituents were detected in almost all monitoring wells, and one sample of total xylene in late 2005. Maximum concentrations of TPH were reached in 2004 (24,000 ug/L) and have been declining since to primarily non-detect. MTBE concentrations have decreased from a maximum of 8,600 ug/L at one well in 2000 to concentrations of less than 8 ug/L at all sites in late 2010. Figure 3-41 through Figure 3-43 show maximum concentrations of MTBE, TBA, and benzene over the past 5 years (2006 to 2010) in the San Juan Basin study area. MTBE concentrations have ranged from non-detect (<0.5 ug/L) to 1200 ug/L at the sites monitoring wells during 2006 to 2010. TBA

concentrations have ranged from non-detect (<10 ug/L) to 6,900 ug/L at the sites monitoring wells during 2006 to 2010. Benzene concentrations have ranges from non-detect (<0.5 ug/L) to 20 ug/L in the sites monitoring wells during 2006 to 2010.

3.7.6.4 Chevron Service Station #9-8719 (GeoTracker Global ID T0605902510)

The Chevron Service Station #9-8719 site is located at 26988 Ortega Highway in San Juan Capistrano, CA. The station began operating in 1967, and is currently still in operation. During UST system upgrades in 1987, TPH as gasoline was detected in the soils beneath the site, resulting in the Orange County Local Oversight Program (OCLOP) opening of case #87UT233. During 1998 to 1993 contaminated soil was removed, and four monitoring wells were constructed and monitored for petroleum hydrocarbons, but not analyzed for MTBE or other oxygenates which were not of concern at the time (HFA, 2011b). The OCLOP case #87UT233 was closed in 1993. During additional facility upgrades in 1995, elevated concentrations of TPH and benezene were detected in soils resulting in the opening of OCLOP case # 95UT002, which was transfer to the San Diego RWQCB in 2009. Between 1995 and 2010, 43 soil borings, 18 groundwater monitoring wells, and 3 soil vapor wells were installed to assess the contamination on and off the site. Results of soil and groundwater sampling indicate that benzene, MTBE, and other constituents are present in soil below the site, and groundwater onsite and offsite to the south. Groundwater monitoring has been conducted quarterly since November 1995.

The contaminant plume is characterized by elevated concentrations of TPH as gasoline, MTBE, TBA, and benzene. Concentrations of 1,2-DCA, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethylbenzene, naphthalene, styrene, total xylenes, and toluene above the California or Federal, Primary or Secondary MCLs for drinking water. TPH as gasoline concentrations ranged from non-detect (<22 ug/L) to 25,000 ug/L between 2006 and 2010. MTBE concentrations have been declining since a maximum of 1660 ug/L was reached in 2001 at an onsite well. Figure 3-41 through Figure 3-44 show maximum concentration of MTBE, TBA, benezene, and 1,2-DCA for the past 5 years (2006 to 2010) in the San Juan Basin study area During 2006 to 2010, concentrations of MTBE ranged from non-detect (<0.5 ug/L) to 420 ug/L at the sites monitoring wells; During 2006 to 2010 TBA ranged from non-detect (<2 ug/L) and 4,500 ug/L at the sites monitoring wells. Benzene concentrations ranged from non-detect (<0.5 ug/L) to 1100 ug/L during 2006 to 2010 at the sites monitoring wells. 1,2-DCA concentrations ranged from non-detect (<0.5 ug/L) to 62 ug/L during 2006 to 2010 at the sites monitoring wells.

3.7.6.5 Chevron Service Station #9-3417 (GeoTracker Global ID T0605902379)

The Chevron Service Station #9-3417 site is located at 32001 Camino Capistrano, on the southwest corner of the intersection of Del Obispo Street and Camino Capistrano in San Juan Capistrano, CA. The station began operating in 1972, and is still in operation. Investigation of onsite contamination began in 1988 following a gasoline release from onsite underground storage tanks (USTs). Between 1988 and 1993, four UST were removed, several soil borings were drilled, and cone penetration tests (CPTs) were performed to assess the extent of

contamination onsite. (Converse Environmental West, 1993). Between 1988 and 2010 over forty monitoring wells were drilled onsite and offsite to assess the extent of the groundwater contamination. Quarterly monitoring is performed at selected monitoring wells. From 1990 to 1996 soil excavations and soil vapor extractions were used to remove contamination from soils beneath the site. In 2010, an air sparging/soil vapor extraction system was used to remove constituents of concern from soil and groundwater in the source area (HFA, 2011a).

The contaminant plume is characterized by elevated concentrations of MTBE, TBA, benzene, and total petroleum hydrocarbon concentrations (TPH) including gasoline and diesel range organics. Concentrations of 1,2-dicloroethane (1,2-DCA), dibromo-3-chloropropane (DBCP), ethylbenzene, naphthalene, tetrachloroethane (PCE), toluene, and total xylenes were detected above the California or Federal, Primary or Secondary MCLs for drinking water. TPH ranged from 73,000 to 25,000 ug/L in 2010. At the sites monitoring wells MTBE concentrations have ranged from non-detect (<0.5 ug/L) to 370 ug/L, and TBA concentrations ranged from none-detect (<2 ug/L) to 170 ug/L during this time period. Benzene concentrations were as high as 6200 ug/L in 2003 and 2004, but have since declined, ranging from non-detect (<0.5 ug/L) to 890 ug/L between 2006 and 2010.

3.7.6.6 Mobil Station 18372 (GeoTracker Global ID T0605902502)

The Mobil Station 18372 site is located at 33571 Del Obispo Street in Dana Point, at the southwestern corner of Del Obispo Street and Stonehill Drive. There is one 15,000-gallon and one 20,000-gallon USTs, two dispenser islands and associated product piping. The site is located about 2100 feet northwest of SCWD's Stonehill well.

Thirty-two wells for monitoring, soil vapor extraction, air sparging, and nested fluid/vapor recovery. Light Nonaqueous Phase Liquids (LNAPLs) have been observed in on- and off-site monitoring wells from November 1991 through January 2004 (ERI, 2009).

TPH, benzene, MTBE, and TBA have been detected in groundwater at concentrations up to 170,000 ug/L, 4,100 ug/L, 50,000 ug/L, and 13,200 ug/L, respectively. In the most recent sampling event reported (December 14, 2009), these constituents were still detected at the following concentrations: 1,200 ug/L, <1.0 ug/L, 3.1 ug/L and 3.9J ug/L. Figures 3-41, 3-42, and 3-43 show the maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area.

3.7.6.7 Former Exxon Station 74816 (GeoTracker Global ID T0605902575)

The Former Exxon Station 74816 site is located at 34295 Doheny Park Road in Capistrano Beach, at the intersection of Las Vegas Avenue and Doheny Park Road. The site is now used as a U-Haul rental facility.

USTs and fuel dispensers from the Former Exxon Station were removed in 1972. Thirteen monitoring wells have been installed along with six triple nested extraction wells. Air sparging and soil vapor extraction to remove hydrocarbons has been conducted. LNAPLs were

observed in a monitoring well (off-site monitoring well MW8) for the first time on November 22, 2010 (Cardno ERI, 2011a). Bailing of the NAPL has commenced since February 2011 (Cardno ERI, 2011b).

TPH, benzene, MTBE, and TBA have been detected in groundwater at concentrations up to 19,200 ug/L, 1,480 ug/L, 50,000 ug/L, and 2,000 ug/L, respectively. In the most recent sampling events reported (November 30, 2010), these constituents were still detected at the following concentrations: 3400 ug/L, 93 ug/L, 7.5 ug/L, and 470 ug/L. Figures 3-41, 3-42, and 3-43 show the maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area.

3.7.6.8 76 Station #255385 (GeoTracker Global ID T0605902362)

The 76 Station #255385 site is located at 34131 Doheny Park Road in Capistrano Beach, on the northwest corner of the intersection of Doheny Park Road and Victoria Boulevard. The site is currently an active gasoline station.

USTs and fuel dispensers from the 76 station were removed in 1990. Twenty-three monitoring wells have been installed. Soil vapor extraction to remove hydrocarbons was begun in July 1995, but ceased in August 1996 due to low influent concentrations. In 1998, an oxygen releasing compound (ORC) was injected around monitoring well MW-14 to promote bioremediation of petroleum compounds.

In the most recent sampling events reported (August 23, 2010 and November 22, 2010), TPH, benzene, MTBE, and TBA were detected at the following concentrations: 15,000 ug/L, 7.5 ug/L, and 25 ug/L (Antea Group, 2011). Figures 3-41, 3-42, and 3-43 show the maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area.

3.7.6.9 76 Station 7329 (GeoTracker Global ID T0605902573)

The 76 Station 7329 site is located at 34306 Pacific Coast Highway in Dana Point, at the northern corner of Del Obispo Street and Pacific Coast Highway. The site is an active service station with two 15,000-gallon gasoline USTs and one 12,000-gallon diesel UST, along with associated product piping and dispensing equipment.

Twenty-eight monitoring wells have been installed to date, along with five double nested sets of wells. Remedial activities have included dual phase extraction, oxygen and ozone injection pilot testing.

In 2009, OCHCA requested an Interim Remedial Action Plan because of the possibility of the dissolved-phase petroleum compounds impacting the desalinization pump test proposed by MWDOC. In May and June of 2010 URS installed 20 dual-nested ozone injection points to form a "reactive barrier" and to prevent dissolved-phase petroleum compounds from reaching the desalination well.

URS (2011) reports the current maximum concentrations of TPH, benzene, MTBE, and TBA to be: 29,000 ug/L, 1,600 ug/L, 4,400 ug/L, and 52,000 ug/L. Figures 3-41, 3-42, and 3-43 show the maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area.

3.7.6.10 ARCO Facility #0447 (GeoTracker Global ID T0605902526)

The ARCO Facility #0447 site is located at 34342 Pacific Coast Highway in Dana Point. The site is an active service station with three 12,000-gallon gasoline USTs (replacing the previous three 12,000-gallon singled-walled fiberglass USTs) along with associated product piping and dispensing equipment.

Twenty single completion monitoring wells have been installed to date, along with five double nested sets of wells. Remedial activities have included dual phase extraction, oxygen and ozone injection pilot testing.

In 2009, OCHCA requested an Interim Remedial Action Plan because of the possibility of the dissolved-phase petroleum compounds impacting the desalinization pump test proposed by MWDOC. In May and June of 2010 URS installed 20 dual-nested ozone injection points to form a "reactive barrier" and to prevent dissolved-phase petroleum compounds from reaching the desalination well.

Arcadis (2011) reports the current maximum concentrations of Gasoline Range Organics (GRO), benzene, MTBE, and TBA to be: < 50 ug/L, <0.5 ug/L, 4.8 ug/L, and <25 ug/L. Figures 3-41, 3-42, and 3-43 show the maximum concentrations of MTBE, TBA, and benzene, respectively, over the past 5 years (2006 to 2010) in the San Juan Basin study area.

3.8 Water Supply and Distribution

Due to limited groundwater supplies, the SJBA members obtain most of its water supply (about 92 percent of potable and 78 percent of total demands) from imported water sources. The table below lists the estimated total water demand for each agency and the amount of water supplied from imported, recycled and native sources for fiscal 2010 (Section 4 presents a more rigorous discussion of water demands and supplies for the recent past and for the future through 2035).

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Water Demand and Supply within the SJBA Service Area in 2010[20]

Water Agency	Total Water Demand (acre-ft/yr)	Water Supply (acre-ft/yr)		
		Native Potable Water	Recycled/ Non-Potable Water	Imported Water
MNWD	36,593	-	6,858	29,735
CSJC	8,783	1,980	434	6,379
SMWD	34,169	65	6,027	28,077
SCWD	6,909	634	826	5,449
Total	86,454	2,679	14,145	69,640

3.8.1 Native Water Supply

The native groundwater supply in the SJBA service area is limited by availability and production capacity in the upper reaches of the basin, and by availability and water quality in the lower portions of the basin. SJBA member agencies produce potable native groundwater from two potable groundwater wells and two desalting facilities. Figure 3-45 shows the potable water infrastructure in the San Juan Basin Area. A summary of native water supply sources and their capacity is shown the table below.

Potable Native Groundwater Supply in the SJBA Service Area

Source	Water Agency	Production Capacity		Estimated Future Capacity	
		mgd	acre-ft/yr	mgd	acre-ft/yr
Potable Wells					
Rosenbaum No. 1	CSJC	0.58	650	0.58	650
North Open Space	CSJC	0.47	526	0.47	526
Desalters					
San Juan Basin Desalter	CSJC	5.1	5,713	5.1	5,713
Capistrano Beach Desalter	SCWD	0.71	795	1.3	1,456
Total Capacity		6.86	7,684	7.45	8,345

The CSJC has the capacity to deliver up 6,890 acre-ft/yr of native potable water. This capacity is greater than the 5,920 acre-ft/yr estimated supply shown in table above. With the capacity greater than the supply, there may be an opportunity to increase the supply of native potable water within the San Juan Basin

[20] Sources include SJBA members agencies and MWDOC. See Section 4 and more specifically Tabl3 4-1.

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3.8.1.1 Potable Groundwater Wells

The CSJC operates two potable groundwater wells, Rosenbaum Well No. 1 and the North Open Space Well. Several other groundwater wells were operated by CSJC in the past, but they have abandoned or converted to non-potable supply wells.

Rosenbaum Well No. 1. The Rosenbaum Well No. 1 was constructed in 1957 and is located in the upper reaches of the Lower Trabuco subbasin. It has a production capacity of 400 gpm (0.58 million gallons per day (mgd)) and the water quality from the well is similar to that of the imported water from MWDOC. The water is chlorinated at the wellhead and pumped directly into the distribution system.

North Open Space Well. The North Open Space Well was constructed in 2000 and is also located in the upper reaches of the Lower Trabuco subbasin. It has a maximum production capacity of 325 gpm (0.47 mgd) with actual capacity dependent on groundwater levels. The well is equipped with a variable frequency drive that allows the well to vary production based on the availability of groundwater. The water is chlorinated at the wellhead and pumped directly into the distribution system.

Additional Wells. The CSJC owns several other wells, as mentioned above, that have been abandoned or converted to non-potable wells due to declining production and water quality. These wells included Rosenbaum Well No. 2, Hollywood Well 2A, San Juan Basin Authority Well 2, Mission Street Well, and Well No. 5.

3.8.1.2 Groundwater Desalting Facilities

A portion of the potable water delivered service area is produced from local desalters that were constructed and operated by the SCWD and CSJC.

San Juan Basin Groundwater Recovery Plant. The San Juan Basin Groundwater Recovery Plant was constructed in 2005 and is operated by CSJC. The facility is located in the Lower San Juan subbasin and is fed by several groundwater wells surrounding the plant. The plant consists of iron and manganese removal followed by two reverse osmosis (RO) trains capable of producing 5.1 mgd of potable water. The facility provides half of the CSJC water needs in the summer and almost all of the demand in the winter.

Capistrano Beach Groundwater Recovery Facility. The Ground Water Recovery Facility was constructed in 2007 and is operated by the SCWD. The treatment facility is fed by a single groundwater well and consists of RO treatment and Iron and Manganese Removal. A portion of the influent groundwater is sent to RO treatment process to remove dissolved solids. Another portion bypasses the RO and is treated to remove iron and manganese. The RO permeate and bypass are recombined to produce 0.71 mgd of potable water.

3.8.2 Water Distribution

Each of the SJBA member agencies operate their own water distributions systems. The distributions systems consist of pipelines, pump stations, and reservoirs.

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Moulton Niguel Water District. The MNWD operates and maintains over 700 miles of distribution piping, 28 potable water reservoirs with a total capacity of 69.7 MG, and 27 booster pump stations. These separate systems are interconnected and can be used to exchange water among the agencies.

City of San Juan Capistrano. The CSJC operates approximately 180 miles of pipelines, 10 reservoirs ranging in size from 0.21 million gallons to 10.11 million gallons, and twelve booster pump stations.

Santa Margarita Water District. The SMWD operates and maintains over 1,200 miles of water and sewer lines, 29 potable water reservoirs, and 20 booster pump stations.

South Coast Water District. The SCWD operates approximately 150 miles of watermains, 14 potable water reservoirs with a total capacity of 21.9 million gallons, and 9 booster pump stations

3.8.2.1 Bradt Reservoir

The Bradt Reservoir is a large regulating and terminal reservoir, located at the end of the JTM. The reservoir serves several water agencies, including SCWD, MNWD, and CSJC.

3.8.2.2 Upper Chiquita Reservoir

The Upper Chiquita Reservoir was recently constructed and came on line in 2012. The Upper Chiquita Reservoir has the capacity to store 244 million gallons (750 acre-ft) of domestic water. The reservoir is designed to supply drinking water in the event of an emergency or service disruption and will provide water to approximately 500,000 residents for one week.

3.9 Wastewater Collection, Treatment and Disposal

Each of the individual agencies operate their own wastewater collection systems, but many of the treatment facilities are jointly owned. There are a total of seven wastewater treatment facilities within the SJBA service area and four of them are managed and operated by SOCWA. A few of these facilities treat water to Title 22 standards for irrigation water. The water that is not recycled is discharged to the ocean through two ocean outfalls operated by the SOCWA.

3.9.1 Wastewater Collection

Each of the SJBA member agencies operate their own wastewater collection systems. The collection systems consist of gravity sewer, forcemains, and lift stations.

Moulton Niguel Water District. The MNWD maintains approximately 530 miles of sewers ranging in size from 8 inches to 33 inches and nineteen lift stations.

City of San Juan Capistrano. The CSJC maintains 120 miles of collection piping ranging up to 27 inches in diameter and two lift stations.
Santa Margarita Water District. The SMWD maintains over 1,200 miles of water and sewer lines and nineteen lift stations.

South Coast Water District. The SCWD maintains 140 miles of sewer ranging in size from 6 – 24 inches, three miles of force mains, and fourteen lift stations. The SCWD's lift station #2 is designed for a capacity of 2,200 gpm and is used to pump wastewater to the Coastal Treatment Plant.

3.9.2 Wastewater Treatment

There are seven wastewater treatment facilities within the SJBA service area. A summary of wastewater treatment plants and their liquid and solids capacities are shown in the table below, and their locations are shown on Figure 3-46.

Wastewater Treatment Facilities within the SJBA

Treatment Facility	Water Agency	Operated By	Capacity (mgd)	
			Liquid	Solid
Jay B. Latham Regional Treatment Plant	MNWD, CSJC, SMWD, SCWD	SOCWA	13	18.5
Joint Regional Treatment Plant	MNWD	SOCWA	12	24
Coastal Treatment Plant	MNWD, SCWD	SOCWA	6.7	-[21]
Plant 3A Water Reclamation Plant	MNWD, SMWD	SOCWA	8.0	8.0
Oso Creek Water Reclamation Plant	SMWD	SMWD	3.0	-[22]
Chiquita Water Reclamation Plant	SMWD	SMWD	9.0	9.0
Nichols Institute Water Reclamation Plant	SMWD	SMWD	0.086	-[23]
Total Capacity			51.8	59.5

[21] Solids are sent to the Joint Regional Treatment Plant for Processing.

[22] Waste solids and filter backwash are sent to the Jay B. Latham Regional Treatment Plant for treatment.

[23] 3. Solids are trucked to the Chiquita Water Reclamation Plant for treatment and disposal.

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3.9.2.1 Jay B. Latham Regional Treatment Plant

The Jay B. Latham Regional Treatment Plant is a conventional activated sludge secondary treatment facility managed by SOCWA. The plant has a liquid treatment capacity of 13 mgd and a solids handling capacity of 18.5 mgd. The treatment plant processes include screening, grit removal, primary clarification, and activated sludge secondary treatment. The plant also has chlorination facilities that are used to manage microbial growth. All four SJBA member agencies own capacity in the Jay B. Latham Regional Treatment Plant. Currently, all treated effluent is discharged to the ocean through the San Juan Creek Outfall.

3.9.2.2 Joint Regional Treatment Plant

The Joint Regional Treatment Plant (JRTP) is located in Laguna Niguel and is designed for a liquid treatment capacity of 12.0 mgd and a solids handling capacity of 24.0 mgd. MNWD owns 12.0 mgd of liquid capacity and 14 mgd of solids capacity. The JRTP is a conventional activated sludge secondary treatment plant that include screening, aerated grit removal, primary sedimentation, and activated sludge secondary treatment and is managed by SOCWA. A portion of the secondary effluent is sent to an advanced water treatment facility where it is treated to Title 22 standards for irrigation water. The treated secondary effluent not used for irrigation is discharged to the Aliso Creek Ocean Outfall.

3.9.2.3 Coastal Treatment Plant

The Coastal Treatment Plant is a conventional activated sludge secondary treatment facility managed by SOCWA. The plant has a liquid treatment capacity of 6.7 mgd and pumps its solids to the JRTP through a force main for processing. The treatment plant processes include screening, aerated grit removal, primary sedimentation, and activated sludge secondary treatment. Secondary effluent can be sent to an advanced water treatment plant to be treated to Title 22 standards for irrigation or discharged to the ocean through the Aliso Creek Ocean Outfall.

3.9.2.4 Plant 3A Water Reclamation Plant

The Plant 3A Water Reclamation Plant is a conventional activated sludge secondary treatment facility managed by SOCWA. The plant has a liquid treatment capacity of 8.0 mgd and a solids treatment capacity of 8.0 mgd. Capacity in this plant is owned by the MNWD and SMWD and is located in Mission Viejo. The treatment plant processes include screening, aerated grit removal, primary sedimentation, and activated sludge secondary treatment. Secondary effluent can be sent to an advanced water treatment plant to be treated to Title 22 standards for irrigation or discharged to the ocean through the San Juan Creek Ocean Outfall

3.9.2.5 Oso Creek Water Reclamation Plant

The Oso Creek Water Reclamation Plant is located in Mission Viejo and is an activated sludge treatment facility. The treatment plant processes include microscreening and activated sludge secondary treatment.. The plant is owned and operated by SMWD. Secondary effluent can be

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sent to an advanced water treatment plant to be treated to Title 22 standards or to the Jay B. Latham Regional Treatment Plant for further treatment and discharge to the ocean. Waste solids and filter backwash are discharged to the sewer and transported to the Jay B. Latham Regional Treatment Plant for treatment.

3.9.2.6 Chiquita Water Reclamation Plant

The Chiquita Water Reclamation Plant is located east of San Juan Capistrano and treats 7.5 million gallons per day. The plant is owned and operated by SMWD and has a liquid treatment capacity of 9.0 mgd and a solids handling capacity of 9.0 mgd. The treatment plant processes include screening, grit removal, primary sedimentation, and conventional activated sludge secondary treatment. Of the 7.5 mgd treated, 5.0 mgd is sent to an advanced water treatment plant to be treated to Title 22 standards for irrigation. The treated secondary effluent not used for irrigation is discharged to the ocean through the San Juan Creek Ocean Outfall.

3.9.2.7 Nichols Institute Water Reclamation Plant

The SMWD owns and operates the Water Reclamation Plant (WRP) at the Nichols Institute. The existing plant has a design capacity of 86,000 gpd. The treatment plant processes include conventional activated sludge secondary treatment, tertiary filtration, and disinfection. Waste activated sludge (WAS) is trucked to the Chiquita Water Reclamation Plant for digestion and disposal. Disinfected effluent is stored in a holding pond and used for irrigation.

3.9.3 Effluent Disposal

Treated secondary effluent from the treatment plants within the SJBA service area is disposed of through two ocean outfalls: the Aliso Creek Ocean Outfall and the San Juan Creek Ocean Outfall. Both outfalls are owned and operated by the SOCWA.

3.9.3.1 NPDES Permits

Treated secondary effluent from the treatment plants within the SJBA service area are regulated by two NPDES permits, one for each outfall. The effluent limitations for major constituents and properties of wastewater are shown in Table 3.8.

Effluent Limitations for Major Constituents of Wastewater

Outfall	NPDES Permit No.	CBOD (mg/L)[24]	TSS (mg/L)	Oil & Grease (mg/L)	Settleable Solids (ml/L)	Turbidity (ntu)	pH	Acute Toxicity (TUa)
		Monthly Average (30 days)						
Aliso Creek and San Juan	Aliso Creek CA0107611	25	30	25	1.0	75	6.0-9.0	1.5

[24] For the JBLRTP the ratio of CBOD to BOD is approximately 0.6.

Outfall	NPDES Permit No.	CBOD (mg/L)[24]	TSS (mg/L)	Oil & Grease (mg/L)	Settleable Solids (ml/L)	Turbidity (ntu)	pH	Acute Toxicity (TUa)
Creek Ocean Outfalls	San Juan Creek CA0107417	Weekly Average (7 day)						
		40	45	40	1.5	100	6.0-9.0	2.0
		Maximum at Any Time						
		45	50	75	3.0	225	6.0-9.0	2.5

3.9.3.2 Ocean Outfalls

Aliso Creek Ocean Outfall. Both the Joint Regional Treatment Plant and the Coastal Treatment plant discharge treated effluent to the Aliso Creek Ocean Outfall. The outfall was built in 1979 and extends 7,900 feet southwesterly from the mouth of Aliso Creek. The diffuser which is collinear with the outfall is 1,200 feet long and extends to a depth of 195 feet. The Aliso Creek outfall has a design capacity of 50 mgd.

San Juan Creek Ocean Outfall. The San Juan Creek Ocean Outfall discharges effluent from the Jay B. Latham Regional Treatment Plant, Chiquita Reclamation Plant, Oso Creek Water Reclamation Plant, and the Plant 3A Water Reclamation Plant. The outfall was constructed in 1978 and extends 10,550 feet southwesterly from Doheny State Beach. The first 216 feet of the diffuser are collinear with the outfall then the remaining 1,272 feet of diffuser extends northwesterly. The depth of the diffuser is approximately 100 ft. The San Juan Creek Outfall has a design capacity of 107 mgd.

3.10 Non-Potable Water Supplies and Demand

The member agencies of the SJBA have been developing recycled water and non-potable water infrastructure to provide irrigation water and reduce their dependence on imported water. Irrigation water comes from three different sources within the SJBA: wastewater, non-potable groundwater, and runoff. The non-potable groundwater and runoff are considered to be native sources of irrigation water, while the tertiary treated wastewater is considered to be a supplemental source.

3.10.1 Recycled Water Supplies

Six of the seven wastewater treatment plants have advanced water treatment (AWT) facilities that are capable of producing Title 22 water for irrigation. A summary of the advanced water treatment plants and their Title 22 irrigation water capacities is shown in table below.

Advanced Water Treatment Facilities within the SJBA

Treatment Facility	Water Agency	Capacity	
		mgd	acre-ft/yr
Joint Regional Treatment Plant	MNWD	11.4	12,770
Coastal Treatment Plant	SCWD	2.6	2,912
Plant 3A Water Reclamation Plant	MNWD	2.4	2,688
Oso Creek Water Reclamation Plant	SMWD	3.0	3,360
Chiquita Water Reclamation Plant	SMWD	5.0	5,600
Nichols Institute Water Reclamation Plant	SMWD	0.086	96
Total Capacity		24.5	27,426

Title 22 irrigation water capacities within the San Juan Basin are about twice the current demand (14,145 acre-ft/yr) for non-potable demands. Some of this excess Title 22 capacity will be used to satisfy future increased non-potable demands and some could be used for indirect potable reuse thereby replacing imported water.

AWT Facility at the Joint Regional Treatment Plant. The AWT facility at the Joint Regional Treatment Plant is designed for a capacity of 11.4 mgd. The plant consists of chemical addition, coagulation, filtration, and chlorine disinfection and supplies Title 22 irrigation water to the MNWD service area.

AWT Facility at the Coastal Treatment Plant. The AWT facility at the Coastal Treatment Plant has a capacity of 2.6 mgd and supplies Title 22 irrigation water to the SCWD. The SCWD can also supply 1.4 mgd of reclaimed water to the MNWD from the AWT facility. The plant consists of chemical addition, coagulation, filtration, and chlorine disinfection.

AWT Facility at Plant 3A. The AWT facility at Plant 3A has a design capacity of 2.4 mgd and supplies Title 22 irrigation water to the MNWD. The plant consists of tertiary filtration and chlorine disinfection.

Oso Creek Water Reclamation Plant. The Oso Creek Water Reclamation Plant has the capacity to produce 3.0 mgd of Title 22 irrigation water for the SMWD. The plant consists of tertiary filtration and chlorine disinfection. The reclamation plant was designed to treat water needed for irrigation and does not have a direct connection to either of the ocean outfalls. Treated irrigation water is pumped to the Upper Oso Reservoir for storage and reuse.

Chiquita Water Reclamation Plant. The Chiquita Water Reclamation Plant currently treats 7.5 mgd of wastewater, of that, 5 mgd is treated to Title 22 standards for irrigation water and distributed throughout the SMWD. The plant consists of tertiary filtration and chlorine disinfection.

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Nichols Institute Water Reclamation Plant. The Nichols Institute Water Reclamation Plant is a small plant designed to serve the Nichols Institute. All wastewater is treated to Title 22 standard for irrigation and pumped to a storage pond for use as irrigation water.

3.10.2 Native Irrigation Water Supplies

Within the SJBA, native irrigation water is delivered from non-potable groundwater wells and urban runoff barriers. A summary of native groundwater sources and their capacities is shown in the table below.

Native Irrigation Water Sources within the SJBA

Source	Water Agency	Capacity	
		mgd	acre-ft/yr
Non-Potable Wells			
Mission Street Well	CSJC	0.29[25]	325
Hollywood Well No. 2A	CSJC	0.43	482
Well 5	CSJC	0.58[26]	650
Urban Runoff Barriers			
Oso Creek Barrier	SMWD	1.0	1,120
Dove Canyon Barrier	SMWD	0.18	200
Horno Creek Barrier	SMWD	0.29	322
Aliso Creek Barrier (future)	SCWD	0.5	560
Total		3.27	3,659

3.10.2.1 Non-Potable Wells

The CSJC operates three non-potable wells to supply irrigation water to fifteen customers: the Mission Street Well, Hollywood Well No. 2A, and Well 5. Currently, Well 5 is not used due to high iron and manganese levels.

3.10.2.2 Urban Runoff Barriers

There are currently three urban runoff barriers in operation and one under development within the SJBA service area. The barriers are designed to intercept and reuse urban runoff before entering and polluting sensitive environmental areas.

[25] The Mission Street Well can only produce 50 gpm when operating at the same time as Hollywood Well No. 2A.

[26] Well 5 is currently out of service due to high iron and manganese levels.

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Oso Creek Barrier. The Oso Creek Barrier was constructed in the late 1970s and is designed to collect dry-weather urban-runoff within Oso Creek. The barrier consists of a water diversion structure, pump station, pressure discharge pipeline, and a gravity pipeline.

Dove Canyon Barrier. The Dove Canyon Barrier is designed to collect urban runoff from the Dove Canyon community before entering the environmentally sensitive Starr Ranch Sanctuary. The collected runoff is used for irrigation of nearby golf courses and parks. The Trabuco Canyon Water District (TCWD) owns and operates the barrier and the reclaimed water is shared by TCWD and SMWD.

Horno Creek Barrier. Horno Creek Barrier treats urban runoff from the Ladera Ranch community in a constructed wetland. The barrier provides reclaimed water to the SMWD.

Aliso Creek Barrier. The SCWD is proposing to construct a barrier designed to collect and reuse urban runoff in Aliso Creek. It is estimated that the barrier will collect approximately 560 ACRE-FT/YR. The collected water will be combined with the irrigation water from the Advanced Wastewater Treatment System at the Costal Treatment Plant increasing the supply and quality of reclaimed water for the SCWD.

3.10.3 Non-Potable Water Storage and Distribution

Each agency in the SJBA owns and maintains its own recycled water distribution system. The distribution systems consist of pipeline, pump stations, and reservoirs. Figure 3-47 shows the location of major storage reservoirs and back bone irrigation infrastructure.

Moulton Niguel Water District. The MNWD has constructed approximately 140 miles of recycled water distribution pipeline, 11 reservoirs with a total capacity of 18.7 million gallons, and 12 recycled water pump stations.

City of San Juan Capistrano. The CSJC maintains 54,000 ft of recycled water pipeline and one 500,000-gallon reservoir.

Santa Margarita Water District. The SMWD has over 2,500 irrigation water connections and operates 7 irrigation water reservoirs. The SMWD owns the Upper Oso Reservoir, which is one of the largest recycled water reservoirs in Orange County. The reservoir has the capacity to hold 1.3 billion gallons (4,000 acre-ft) of non-potable water and helps to conserve over a billion gallons (3,100 acre-ft) of drinking water each year.

South Coast Water District. The SCWD maintains fifteen miles of recycled water pipeline, three pump stations, and three recycled water reservoirs with a total capacity of 7.0 million gallons.

3.10.4 Recycled Water Quality Requirements

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Section 4 – Historical and Projected Water Demands

This section describes the historical and projected water demands of SJBA member agencies. As described in Section 3.6, the primary water supply sources include groundwater from the San Juan Basin, imported water from Metropolitan, local surface water, and recycled water.

Table 4-1 summarizes the historical (2005 through 2010) and projected (2015 through 2035) water demands of the four SJBA member agencies. The SJBA agencies currently[27] (2010) have a combined service area population of about 406,200 and a total water demand of about 86,400 acre-feet per year (acre-ft/yr). Of this, 84 percent (about 72,300 acre-ft/yr) is potable water demand, and 16 percent (about 14,100 acre-ft/yr) is non-potable demand. Imported water satisfies the majority of the study area's potable water demand at about 69,600 acre-ft/yr, compared to the 2,700 acre-ft/yr produced from the San Juan Groundwater Basin. Non-potable demand is met with recycled water (about 11,700 acre-ft/yr), local surface water diversions (about 2,000 acre-ft/yr), and San Juan Basin Groundwater (400 acre-ft/yr).

By 2035, the SJBA service area population is projected to increase to about 486,500 with a total water demand of about 105,000 acre- ft/yr. Compared to current conditions, the ratio of potable to non-potable water demands is expected to decrease, primarily due to the planned increase in recycled water reuse by the SJBA member agencies: potable demands will account for about 76 percent (79,700 acre-ft/yr) of the total demand and will be met with a mix of imported water (about 72,200 acre-ft/yr) and groundwater from the San Juan Basin (7,500 acre-ft/yr), and on-potable demands will account for about 24 percent (25,300 acre-ft/yr) of the total demand and will be met with a mix of recycled water reuse (22,600 acre-ft/yr) and local surface water diversions (2,700 acre-ft/yr).

Table 4-2 shows the projected amount of wastewater that will be generated within the service areas of the SJBA member agencies from 2015 through 2035. In 2015, the demand for recycled water is projected to be about 16,700 acre-ft/yr, which is about 37 percent of the total recycled water that will be generated (44,800 acre-ft/yr). As indicated above, by 2035, the demand for recycled water is projected to increase to about 22,600 acre-ft/yr, which is about 45 percent of the total recycled water that will be generated (50,200 acre-ft/yr). This surplus recycled water provides an opportunity for indirect potable reuse in the San Juan Basin.

The following is a brief summary of the historical and projected demands of each of the SJBA member agencies.

City of San Juan Capistrano. The CSJC currently has a service area population of about 40,200 people that is expected to increase to about 44,100 by 2035. The CSJC's current water demand is about 8,800 acre-ft/yr: 8,400 acre-ft/yr of potable and 400 acre-ft/yr of non-potable water demands. Imported water has been the primary source of potable water for the past five years. The completion of the Groundwater Recovery Plant in December 2004 made up to 4,800 acre-ft of treated groundwater available for potable use. The CSJC has not been able to take full advantage of this capacity in recent years due to MTBE contamination in groundwater near several of the City's major production wells. The installation of MTBE treatment facilities and an increase in groundwater production capacity to the Groundwater

[27] The use of the modifier word "current" means 2010.

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Recovery Plant will allow up to 5,450 acre-ft/yr of San Juan Basin groundwater to be treated for future potable use. This will satisfy just over 50 percent of the City's total demands, which are expected to increase to 10,400 acre-ft/yr by 2035. The introduction of recycled water, in the amount of about 1,950 acre-ft/yr, will also reduce the City's demand for imported water.

Moulton Niguel Water District. The MNWD currently has a service area population of about 172,000 people that is expected to increase to about 183,400 by 2035. The MNWD's current water demand is about 36,600 acre-ft/yr: 29,700 acre-ft/yr of potable and 6,900 acre-ft/yr of non-potable water demands. The MNWD relies solely on imported water to meet potable water demands and recycled water to meet non-potable demands. The MNWD experienced a pre-drought demand high of about 41,700 acre-ft in fiscal year 2007, but conservation measures due to drought conditions brought total demand down to the current level. Demands are projected to rebound to about 40,600 acre-ft by 2015 as emergency conservation measures are lifted, but the introduction of additional demand management practices required by SBx7-7 will reduce overall demand to about 39,500 acre-ft/yr by 2035, despite the increase in population. By 2035, recycled water use will increase to about 9,100 acre-ft/yr.

Santa Margarita Water District. The SMWD currently has a service area population of about 155,000 people that is expected to increase to about 217,000 by 2035. The SMWD's current water demand is about 34,200 acre-ft/yr: 28,200 acre-ft/yr of potable and 6,000 acre-ft/yr of non-potable water demands. Potable demand is met almost entirely through the purchase of imported water from the MWDOC, with only a minimal amount of San Juan Basin groundwater produced each year (<100 acre-ft/yr). Currently, non-potable demands are met through the use of recycled water (about 4,000 acre-ft/yr) and the diversion of urban run-off surface flows in Oso Creek, Canada Gobernadora, and Arroyo Trabuco (about 2,000 acre-ft/yr). Total water demand is projected to increase to about 46,400 acre-ft/yr by 2035, of which 33,500 acre-ft/yr will be potable demands met with imported water and 12,900 acre-ft/yr will be non-potable demands met with recycled water (10,140 acre-ft/yr) and local surface water (2,700 acre-ft/yr).

South Coast Water District. The SCWD currently has a service area population of about 38,600 people that is expected to increase to about 41,500 by 2035. The SCWD's current water demand is about 6,900 acre-ft/yr: 6,100 acre-ft/yr of potable and 800 acre-ft/yr of non-potable water demands. Historically, imported water was the only source of potable water for the SCWD, but the demand for imported water has decreased in the last three years since the startup of the SCWD Groundwater Recovery Facility, which now produces about 1,000 acre-ft/yr of treated San Juan Basin groundwater. As groundwater production capacity increases, the SCWD will use up to 2,000 acre-ft/yr to meet increased future water demands. The total water demand is projected to increase to about 8,700 acre-ft/yr by 2035, of which 7,300 acre-ft/yr will be potable demands and 1,400 acre-ft/yr will be non-potable demands met with recycled water.

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Section 5 – Management Goals and Impediments

During the period of September 2010 through November 2010, the SJBA Technical Advisory Committee (TAC) met four times to develop the scope of the SJBGWMP. These meetings were held at the SMWD on September 21st, October 5th, November 2nd, and November 16th. As part of this SJBGMP scoping process, issues, needs, and interests were solicited from SJBA member agencies. These "issues, needs, and interests" are summarized in a tabular form in Tables 5-1 through 5-7. Each table refers to a class of issues, needs, and interests, including:

- safe yield
- native and imported water recharge
- quality and quantity
- reclaimed water
- conjunctive-use storage
- costs
- human resources and administration

Attribution for the source of each issue, need, and interest is listed in these tables. In some cases, a specific issue (need and interest) may show up in more than one class. These issues, needs, and interests were used to focus problem identification, SJBGMP goals, and the resulting SJBGWMP update.

The goal setting process involved the proposal of an initial set of goals, followed by group and individual discussions and group editing of the goals at those meetings. The TAC member's also articulated impediments to achieving the goals and the action items required to remove impediments. At the November 16, 2010 meeting, the TAC member's achieved consensus on goals, impediments to those goals, and the action items required to remove the impediments. The goals of the SJBGWMP are listed below.

- Goal No. 1 – Enhance Basin Water Supplies. In addition to local groundwater, this goal applies to all sources of water available for the enhancement of the San Juan Basin (Basin). The intent is to maximize the use of all available water in the Basin. This goal will be accomplished by increasing the recharge of all available waters, including storm water discharge, dry-weather discharge, and recycled water.
- Goal No. 2 – Protect and Enhance Water Quality. The intent of this goal is to improve surface and groundwater quality to ensure the maximum use and reuse of available supplies and to minimize the cost of groundwater treatment. This goal will be accomplished by implementing activities that capture and treat contaminated groundwater for direct high-priority beneficial uses, implementing the recharge of storm water discharge, and encouraging better management of waste discharges that impact groundwater.
- Goal No. 3 – Maximize the Use of Unused Storage Space. The intent of this goal is to maximize the use of the Basin's storage capacity to improve water supply availability.

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This goal will be accomplished by determining the temporal and spatial availability of unused storage space in the Basin and subsequently determining how best to use that space to increase operational flexibility and water supply reliability.

- Goal No. 4 – Satisfy State Requirements for a Groundwater Management Program. The intent of this goal is to integrate the SJBGWMP into the South Orange County regional water management plan and to improve the opportunity of obtaining outside funding for SJBGWMP implementation. This goal will be accomplished by ensuring that the SJBGWMP contains the minimum elements required for a groundwater management plan and by inclusion of the SJBGWMP in the MWDOC's Integrated Regional Water Management Plan.
- Goal No. 5 – Establish Equitable Share of the Funding, Benefits, and Costs of the SJBGWMP. The intent of this goal is to align the benefits of the SJBGWMP with individual SJBA member agencies and SJBGWMP implementation costs. This goal will be accomplished by clearly articulating the benefits of the SJBGWMP to each SJBA member agency and subsequently allocating the funding and costs in an equitable manner.

Table 5-8 lists these goals, impediments to the goals, and the action items required to remove the impediments. Some of the impediments listed in Table 5-8 were developed after the TAC completed its lists goals and impediments; these additional items were identified during the technical work documented in Sections 3 and 4.

The next section of this report expands on the action items listed in Table 5-8 specifically in the context of *Section 2Planning Area and its Resources*, *Section 3 Existing Water Resources*, and *Section 4 Historical and Projected Water Demands*, and describes management strategies that can be employed to remove impediments to the SJBGWMP goals.

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This section describes the groundwater management plan elements that can be applied to remove the impediments to achieving the management program goals discussed in Section 5 and to meet the water demands discussed in Section 4, using the resources described in Sections 2 and 3.

6.1 Management Alternatives for the Update of the San Juan Basin Groundwater Management and Facilities Plan

Four meetings were held with the SJBA Technical Advisory Committee (TAC) to review the impediments to the goals and the groundwater management plans that could be implemented to remove those impediments. The basic intent of the management alternatives is to manage production to the available yield: yield will vary from year to year based on hydrology, production will be managed consistent with the existing diversion permits and interagency agreements, modification to the diversion permits and interagency agreements will be made to maximize yield, and additional permits and interagency agreements will be required to incorporate novel groundwater management schemes. Furthermore, it has not been determined if the MWDOC SOCOD project will be implemented within the next few years or at all. Thus, management alternatives need to consider whether or not SOCOD will exist in the future. The SJBA TAC asked that the alternatives be structured for incremental expansion from the least resource intensive to the most resource intensive. This would allow the implementation of more resource intensive management elements as more information on their feasibility can be obtained and as future funding becomes available.

The alternatives that the SJBA TAC is considering are described below. The first set of alternatives assumes that the SOCOD project will either not be implemented or will be deferred by ten or more years. The second set of alternatives assumes that the SOCOD project will be implemented within the next ten years.

6.1.1 Recommended Alternatives Assuming SOCOD Is Not Implemented or that SOCOD Implementation Is Deferred for Ten or More Years

6.1.1.1 Alternative 1 – Adaptive Production Management within Existing Recharge and Production Facilities (the current plan or baseline alternative)

Alternative 1 is an attempt to refine the current status quo management plan to comply with the diversion permits held by the SJBA and SCWD and the interagency agreements. It involves the management of groundwater production by the CSJC and the SCWD to prevent or at least minimize seawater intrusion and to what is otherwise available on an annual basis. Alternative 1 is the future baseline. The average annual production or yield that can be developed from the basin is estimated to be about 9,200 acre-ft/yr, ranging from about 7,100 acre-ft/yr to 10,900 acre-ft/yr. About 71 percent of the time, the yield will be less than 11,000 acre-ft/yr, and about 14 percent of the time, production will meet the desired goal of 11,200 acre-ft/yr.

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6.1.1.1.1 Summary of Features[28]

1a. Set groundwater level based production thresholds and use monitoring to adjust production.

1b. Implement water exchanges and possibly an interconnection among SJBA members to ensure equitable sharing of groundwater when groundwater production is reduced per 1a above.

1.c Implement a groundwater level, quality, and production monitoring program to determine water in storage in the spring of each year, to assess ambient quality, to manage seawater intrusion, and to comply with specific recharge permit conditions.

6.1.1.1.2 Detailed Description

Alternative 1 is an attempt to refine the current status quo groundwater management and facilities plan to comply with the diversion permits held by the SJBA and SCWD and the interagency agreements. In Alternative 1, the SJBA would set annual groundwater production limits in the spring of each year, based on groundwater levels measured that spring and an estimate of groundwater storage that spring. These production limits would hold until the following spring. A storage-production relationship would be initially constructed based on groundwater model simulations and subsequently refined based on experience and future groundwater simulations. Figure 3-25 shows an example of such a relationship. This mode of operation is consistent with a provision in the SJBA and SCWD diversion permits issued from the State Board that limits production (diversion) when groundwater storage falls to less then half of the storage capacity (a provision included to protect other groundwater producers), which is predicted to occur about 71 percent of the time (see Figure 3-26). Groundwater monitoring would be done by the SJBA, and the SJBA would determine production limits related to basin storage.

This mode of operation will reduce the rate of seawater intrusion but not eliminate it. Groundwater monitoring is required seaward of the SCWD desalter wells to monitor the progress of seawater intrusion and to guide future production limitations at the SCWD wells. Groundwater monitoring would be done by the SJBA, and the SJBA would determine production limits related to seawater intrusion.

The existing interagency agreements require an equitable adjustment of production among the CSJC and SCWD based on the water available for production. This can be achieved through existing interconnections or exchange agreements and should not require the construction of new interconnections. The SJBA would determine when and how the adjustment of production would occur and how to equitably distribute production and exchange among the SJBA members.

6.1.1.2 Alternative 2 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Injection Barrier

Alternative 2 is identical to Alternative 1 except a seawater injection barrier would be constructed to prevent seawater intrusion, and groundwater production would be reduced to what is otherwise available on an annual basis. The goals of Alternative 2 are to increase the

[28] The number labels associated with the features indicate that they are common to other alternatives.

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yield of the basin during non-wet periods over the yield that would otherwise be developed in Alternative 1 and to prevent seawater intrusion as required in the SJBA and SCWD diversion permits. The minimum injection rate required to just replace the estimated seawater intrusion during dry periods is about 500 acre-ft/yr. The injection barrier is assumed herein to have an injection capacity of 1,000 acre-ft/yr, and the yield of the basin is expected to increase by the amount injected. The average yield of the Basin would be increased from about 9,200 acre-ft/yr to about 10,000 acre-ft/yr.

6.1.1.2.1 Summary of Features

1a. Set groundwater level based production thresholds and use monitoring to adjust production.

1b. May require water exchanges and possibly an interconnection among SJBA members to ensure equitable sharing of groundwater.

1.c Implement a groundwater level, quality, and production monitoring program to determine water in storage in the spring of each year, to assess ambient quality, to manage seawater intrusion, and to comply with specific recharge permit conditions.

2a. Construct injection wells seaward of the SCWD wells. Modulate injection rate to maintain barrier without surface discharge of groundwater or loss seaward of the barrier. Increase annual production from the San Juan Basin by the amount injected to recover the injected water. The source water for the injection barrier is based on least cost—assumed initially to come from MWDOC but could eventually be recycled water.

2b. Revise existing diversion permits, if necessary, to increase production rights at existing wells to ensure that injected water can be produced.

6.1.1.2.2 Detailed Description

Alternative 2 is an attempt to increase the yield of the basin during non-wet periods through the injection of supplemental water into the basin just seaward of the SCWD desalter wells. The supplemental water for injection would initially come from MWDOC but could be replaced in subsequent years by recycled water. Supplemental water would be injected at a rate to establish a pressure mound seaward of the SCWD extraction wells and would supplement the water available for production by SCWD and the CSJC on a one-for-one basis. None of the injected water would be lost. This will allow for the operation of the basin at slightly lower levels inland of the barrier and allow greater production during dry periods relative to Alternative 1. Figure 6-1 shows the conceptual location of up to four injection wells located seaward of the SCWD desalter wells. Two of these wells would be constructed initially, and up to two additional wells would be added later if necessary. The precise number of wells would be determined after the first two wells are constructed and operational.

The cost and yield of the injection project would be allocated to SJBA members under a cost sharing agreement based on their financial participation and benefit. There could be adjustments in the cost allocation to account for reductions in treatment costs experienced by the SCWD due to the SCWD desalter wells intercepting higher quality injected water. If the CSJC and SCWD are the only SJBA members producing groundwater from the San Juan

Basin, the cost of the seawater injection project could be allocated on their annual production or a similar scheme that distributes costs based on benefit or potential benefit.

6.1.1.3 Alternative 3 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Extraction Barrier

Alternative 3 is identical to Alternative 1 except a seawater extraction barrier would be constructed to prevent seawater intrusion. The goals of Alternative 3 are identical to those of Alternative 2: to increase the yield of the basin during non-wet periods over the yield that would otherwise be developed in Alternative 1 and to prevent seawater intrusion as required in the SJBA and SCWD diversion permits. The yield developed by this alternative would be greater than that developed by the seawater injection barrier in Alternative 2 because the extraction barrier can function independent of the amount of storage in the basin landward of the SCWD desalter wells; whereas, the injection barrier approach will have variable injection rates with lesser injection during high storage periods and more injection during dry periods when storage in the basin is low. The average yield of the Basin would be increased from about 9,200 acre-ft/yr to about 12,200 acre-ft/yr.

6.1.1.3.1 Summary of Features

1a. Set groundwater level based production thresholds and use monitoring to adjust production.

1b. May require water exchanges and possibly an interconnection among SJBA members to ensure equitable sharing of groundwater.

1c. Implement a groundwater level, quality, and production monitoring program to determine water in storage in the spring of each year, to assess ambient quality, to manage seawater intrusion, and to comply with specific recharge permit conditions.

3a. Revise existing diversion permits to include new expanded production at the new extraction barrier wells.

3b. Construct and operate a seawater extraction barrier.

6.1.1.3.2 Detailed Description

Alternative 3 is an attempt to increase the yield of the basin throughout the year and to eliminate seawater intrusion into the basin landward of the seawater extraction barrier. This can be done through the creation of an extraction barrier seaward of the SCWD desalter wells and could include the SCWD wells. Figure 6-1 shows the potential extraction barrier well field area and its spatial relationship to the SCWD and CSJC wells. The source of water to the extraction barrier would initially be brackish groundwater and would eventually be seawater induced to flow inland due to production at the extraction barrier wells. The extraction barrier wells would be located between the Pacific Coast highway and the SCWD desalter wells and, unlike the proposed SOCOD wells, would be conventional vertically aligned wells. The treatment facilities for this project would be collocated with the SCWD desalter facility. The ultimate capacity of this project is unclear at this time, but it initially appears that about 2,000 to 3,000 acre-ft/yr of new supply could be developed long term through the production of 4,000 to 6,000 acre-ft/yr, respectively, of groundwater seaward of the SCWD desalter wells.

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The initial yield would be greater as the groundwater salinity will be significantly less than the salinity of seawater for a substantial period of time.

In contrast to Alternative 2, which uses a seawater injection barrier to inject imported water into the basin, the extraction barrier described herein will generate a new supply of water and reduce the use imported water.

The cost and yield of the extraction barrier project would be allocated to the SJBA members under a cost sharing agreement based on their financial participation and benefit.

6.1.1.4 Alternative 4 – Adaptive Production Management with Seawater Barrier and Construction of Ranney-Style Collector Well(s)

Alternatives 4A and 4B are identical to Alternatives 2 and 3, respectively, except that one or two Ranney-style collector wells would be constructed to increase production capacity during dry periods. The goals of Alternative 4 are to increase the production capacity of the basin during non-wet periods, to prevent seawater intrusion, and to increase the yield of the Basin through the inducement of more stormwater recharge. Replacement supplies would be provided to non-SJBA overlying groundwater producers, as necessary, to replace lost groundwater production at their wells when the basin is operated at lower groundwater levels. The average yield of the Basin would be increased from about 9,200 acre-ft/yr to about 11,200 acre-ft/yr and 13,400 acre-ft/yr for Alternatives 4a and 4b, respectively.

6.1.1.4.1 Summary of Features

1a. Set groundwater level-based production thresholds and use monitoring to adjust production.

1b. May require water exchanges and possibly an interconnection among SJBA members to ensure equitable sharing of groundwater.

1c. Implement a groundwater level, quality, and production monitoring program to determine water in storage in the spring of each year, to assess ambient quality, to manage seawater intrusion, and to comply with specific recharge permit conditions.

2a or 3b. Construct injection wells seaward of the SCWD wells (2a) or construct an extraction barrier seaward of the CVWD wells (3b). In either case, revise existing diversion permits, as necessary, to include new additional production at the injection or extraction wells.

4a. Revise existing diversion permits to include new additional production at the Ranney wells, the approval to provide alternative water supplies to existing overlier producers in lieu of them producing groundwater, and potentially to increase production rights to recover new stormwater recharge created by operating the basin at lower levels.

4b. Construct and operate Ranney-style collector well(s).

4c. Construct and operate interconnections with overlying water right holders to provide them with replacement water when groundwater levels are too low for them to operate their wells.

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6.1.1.4.2 Detailed Description

Alternative 4 is an attempt to increase the production capacity of the basin during non-wet periods through the construction of one or two Ranney-style collector wells and potentially to increase the yield of the basin. Figure 6-2 is a schematic of a typical Ranney-style collector well. These collector wells would allow for increased groundwater production during non-wet periods, allow the production to be maintained at lower basin storage levels, and increase stormwater recharge by generally maintaining lower levels in the basin. Moreover, an increase in stormwater recharge would occur because the basin could be operated at lower storage levels and minimize the lost recharge during wet years. It is unclear as to how much additional stormwater recharge could be induced due to operating the basin at lower groundwater storage. Additional surface water and groundwater modeling work will be required to assess the expected increase in stormwater recharge. For planning purposes, 1,000 acre-ft/yr of new stormwater recharge was assumed.

The capacity of each Ranney-style collector well would range from about 2,900 to 5,800 acre-ft/yr, depending on groundwater levels. The benefit achieved by inducing more stormwater recharge is not currently knowable. Groundwater modeling will be required to estimate new induced recharge.

The cost of the Ranney-style collector wells and the additional yield would be allocated the SJBA members under a cost sharing agreement based on their financial participation and benefit.

6.1.1.5 Alternative 5 – Adaptive Production Management, with Seawater Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge

Alternatives 5A and 5B are identical to Alternatives 4A and 4B, respectively, except that a reach of San Juan Creek and the Arroyo Trabuco would be operated as stormwater recharge facilities. These recharge facilities would increase stormwater recharge and thus the yield of the basin. The goals of Alternative 5 are to increase the production capacity of the basin during non-wet periods, to improve water quality (principally reduce salt and nutrient concentrations in groundwater), to prevent seawater intrusion, and to increase the yield of the Basin through the inducement of more stormwater recharge. The average yield of the Basin would be increased from about 9,200 acre-ft/yr to about 12,000 acre-ft/yr and 14,200 acre-ft/yr for Alternatives 5a and 5b, respectively.

6.1.1.5.1 Summary of Features

1a. Set groundwater level based production thresholds and use monitoring to adjust production.

1b. May require water exchanges and possibly an interconnection among SJBA members to ensure equitable sharing of groundwater.

1c. Implement a groundwater level, quality, and production monitoring program to determine water in storage in the spring of each year, to assess ambient quality, to manage seawater intrusion, and to comply with specific recharge permit conditions.

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2a or 3b. Construct injection wells seaward of the SCWD wells (2a) or construct an extraction barrier seaward of the CVWD wells (3b). In either case, revise existing diversion permits, as necessary, to include new additional production at the injection or extraction wells.

4a. Revise existing diversion permits to include new additional production at the Ranney wells, the approval to provide alternative water supplies to existing overlier producers in lieu of them producing groundwater, and potentially to increase production rights to recover new stormwater recharge created by operating the basin at lower levels.

4b. Construct and operate Ranney-style collector wells.

5a. Revise diversion permit to include the right to divert, recharge, and store new stormwater recharge, and subsequently recover this water.

5b. Construct and operate in-stream recharge facilities.

6.1.1.5.2 Detailed Description

Alternative 5 is an attempt to increase the yield of the basin through the recharge of stormwater. In-stream recharge is the only viable large-scale recharge method for the San Juan Basin due to the lack of suitable off-stream sites for recharge and the inability of the basin to accept large amounts of recharge at a specific site. Off-stream sites are not practical either because they do not overly the San Juan Basin proper and will not provide enough regulatory storage to divert and store a significant amount of stormwater for subsequent infiltration into the basin. There is also a limitation in the ability of the basin to take in significant amounts of stormwater at conventional recharge basins located over the San Juan Basin. The in-stream facilities proposed herein would provide for a significant amount of diffuse stormwater recharge with the recharge distributed over a large area, similar to what happens currently with stormwater recharge in the Arroyo Trabuco and San Juan Creek. The proposed in-stream recharge facilities would simply increase the magnitude of stormwater recharge.

Figure 6-1 shows the potential location of the stream reaches where this recharge could be accomplished. Temporary berms would be constructed in these reaches, making discharge in the channel flow "bank to bank" whenever stormwater is available and thereby maximizing the wetted area and recharge. The OCWD has been successfully conducting this type of recharge in the Santa Ana River since the mid 1900s. Figure 6-3 illustrates the berm configurations used by the OCWD. These berms would be damaged or washed out during some storms and would need to be reconstructed periodically throughout the year with the number of reconstructions dependent on the number and magnitude of storms during the year. Temporary "T" and "L" berms would be constructed in the reach illustrated in Figure 6-1 that would make the discharge in the channel flow "bank to bank" for smaller stormwater events, thereby maximizing the wetted area and recharge. The berms would washout completely during the onset of significant flood events and would not interfere with the flood control function of the channel. All the dry-weather discharge that currently reaches the ocean could be intercepted and recharged providing water quality benefits at Doheny Beach. Detailed hydraulic modeling would have to be done to precisely estimate the expected new recharge from these proposed in-stream recharge facilities.

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For planning purposes, it is reasonable to assume that the annual increase in stormwater recharge could range from 500 to 2,000 acre-ft/yr and that to achieve this recharge, the basin would have to be operated such that there is always storage space available to accept recharge.

The cost and yield from the implementation of in-stream recharge would be allocated to the SJBA members under a cost sharing agreement based on their financial participation and benefit.

6.1.1.6 Alternative 6 – Adaptive Production Management, Creation of a Seawater Barrier, In-stream Recharge, and Recycled Water Recharge

The goals of Alternative 6 are to increase the production capacity of the basin during non-wet periods, to prevent seawater intrusion, to increase the yield of the Basin through the inducement of more stormwater recharge, and to increase the yield through the recharge of large amounts of recycled water. The in-stream recharge facilities used for stormwater recharge in Alternative 5 would be modified to create a corridor for small summer storms to pass through the basin, and most of the channel would be bermed-off into discrete cells to receive and recharge recycled water. Recycled water would be recharged from May through September. Approximately 27 acres of streambed would be used for recharge. This would provide the SJBA with about 10,000 acre-ft/yr of supplemental water recharge capacity. Groundwater production and treatment would be increased to recover this recharge. The yield of the Basin would be increased from about 9,200 acre-ft/yr to about 21,400 acre-ft/yr—an increase of about 12,000 acre-ft/yr.

6.1.1.6.1 Summary of Features

1a. Set groundwater level based production thresholds, based on spring groundwater levels, and use monitoring to adjust production.

1b. Water exchanges and interconnections among the SJBA members to ensure equitable sharing of groundwater consistent with prior agreements and financial participation.

1c. Implement a groundwater level, quality, and production monitoring program to determine water in storage in the spring of each year, to assess ambient quality, to manage seawater intrusion, and to comply with specific recharge permit conditions.

3a. Construct extraction barrier seaward of the SCWD wells to increase basin yield by 4,000 acre-ft/yr and eliminate seawater intrusion.

4a. Revise existing diversion permits to include the approval to provide alternative water supplies to existing overlying producers in lieu of them producing groundwater.

4b. Site[29] and construct new wells to increase production capacity.

5a. Revise the existing diversion permit to include the right to divert, recharge, and store new stormwater recharge; subsequently recover this water; and allow production in the seawater extraction barrier.

[29] At higher levels of recycled water recharge, the Ranney collector wells may not be necessary.

5b. Construct and operate in-stream recharge facilities to enhance the recharge of stormwater from October through April. Reconstruct as necessary during the year. Yield increase will be about 2,000 acre-ft/yr.

6a. Complete Title 22 Engineering Report for a recycled water recharge project (Groundwater Recharge Reuse Project or GRRP in Title 22 vernacular) and subsequent permitting process with the Regional Board and DPH to obtain a recharge permit.

6b. Revise diversion permit to include the right to recharge and store recycled water recharge and subsequently recover this water.[30]

6c. Construct and operate recycled water recharge facilities. Yield increase will be 10,000 acre-ft/yr.

6d. Expand existing or construct new desalting facilities to enable the recovery of recycled water recharge.

6.1.1.6.2 Detailed Description

Alternative 6 is an attempt to increase the sustainable yield of the basin through the recharge of storm and recycled waters, the creation of a seawater extraction barrier that will desalt seawater and generate a new supply of water, the recharge of large amounts of recycled water, and the recovery of the new recharge by expanding groundwater production facilities and treatment. Figure 6-1 shows the potential location of the stream reaches where storm and recycled water recharge could be accomplished. Temporary "T" and "L" berms would be constructed in the reaches illustrated in Figure 6-1, making discharge in the channel flow "bank to bank" for smaller stormwater events, thereby maximizing the wetted area and recharge. During the dry-weather period of May through September (a period of 123 days), the SBJA would modify the berms to create a corridor along the north side of the channel for passage of small storm discharge and a series of cascading recharge cells along the southeast side of the channel for use in the recharge of recycled water. Inundation depths in the recycled water recharge cells would be one foot or less to ensure that the ponds can be dewatered by infiltration in advance of storms. Approximately 27 acres of ponds could be created providing the SJBA with up to 10,000 acre-ft of recycled water recharge capacity. Tertiary-treated Title 22 effluent from SOCWA would be used for recharge. The amount of recycled water recharged each year would be based on spring groundwater levels and storage. New groundwater wells will be required to recover the increased recharge, and the existing desalters would have to either be expanded or new desalters would have to be built.

In implementation, the recycled water recharge part of Alternative 6 would be ramped up slowly, allowing the SJBA to conduct monitoring to develop data on soil-aquifer treatment and recycled water contribution at each production well. These data and their interpretations would be reported to the Regional Board and the State DPH in compliance with a recharge permit and to demonstrate to the regulatory agencies that the project can be operated pursuant to the recharge permit. The amount of recycled water recharge would be ratcheted up each year based on these demonstrations to the ultimate design recharge capacity.

[30] This is done to protect the recycled water recharge from other producers and to update the permit to include monitoring for the same.

Production would also have to ratcheted up to recover the recycled water. The recycled water sources for this project could include the J. B. Latham plant, the 3A plant, the Chiquita plant, and recycled water from storage.

The cost and yield from the implementation of recharge would be allocated to the SJBA members under a cost sharing agreement based on their financial participation and benefit.

6.1.2 Recommended Alternatives Assuming SOCOD Is Implemented in the Next Ten Years

6.1.2.1 Alternative 7– Adaptive Production Management within Existing Recharge and Production Facilities (Alternative 1 with SOCOD)

This alternative is identical to Alternative 1 with SOCOD and with the expectation that the average yield of the basin will be lowered by about 1,600 to 2,000 acre-ft/yr with greater losses in yield occurring in dry years. There will be no need for a seawater intrusion barrier as the SOCOD project will eliminate seawater intrusion.

6.1.2.2 Alternative 8 – Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), Construction of Ranney-Style Collector Wells

This alternative is identical to Alternative 7 with the addition of one or more Ranney-style collector wells (as described in Alternative 4). The average yield of the Basin would be increased from about 7,500 acre-ft/yr to about 8,700 acre-ft/yr.

6.1.2.3 Alternative 9 – Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), Construction of Ranney-Style Collector Wells, and In-stream Recharge

This alternative is identical to Alternative 8 with the addition of in-stream recharge facilities (as described in Alternative 5). The average yield of the Basin would be increased from about 7,500 acre-ft/yr to about 9,500 acre-ft/yr.

6.1.2.4 Alternative 10 – Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), In-stream Recharge, and Recycled Water Recharge

This alternative is identical to Alternative 9 with the utilization in-stream recycled water recharge (as described in Alternative 6). The average yield of the Basin would be increased from about 7,500 acre-ft/yr to about 16,700 acre-ft/yr.

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Section 7 – Evaluation of Groundwater Management Alternatives

This section documents the reconnaissance-level evaluation of the groundwater management alternatives described in the previous section. The evaluation criteria include consistency with the goals described in Section 5, reliability of supply, cost, and implementation difficulty.

7.1 Consistency with SJBGMFP Goals

The management goals of the SJBGMFP were developed by the SJBA TAC, and impediments to achieving those goals and a list of actions that could be implemented to overcome the impediments were identified. The goals, impediments, and action items are listed in detail in Table 5-8. The goals include:

- Goal No. 1 – Enhance Basin Water Supplies. In addition to local groundwater, this goal applies to all sources of water available for the enhancement of the San Juan Basin (Basin). The intent is to maximize the use of all available water in the Basin. This goal will be accomplished by increasing the recharge of all available waters, including storm water discharge, dry-weather discharge, and recycled water.

- Goal No. 2 – Protect and Enhance Water Quality. The intent of this goal is to improve surface and groundwater quality to ensure the maximum use and reuse of available supplies and to minimize the cost of groundwater treatment. This goal will be accomplished by implementing activities that capture and treat contaminated groundwater for direct high-priority beneficial uses, implementing the recharge of storm water discharge, and encouraging better management of waste discharges that impact groundwater.

- Goal No. 3 – Maximize the Use of Unused Storage Space. The intent of this goal is to maximize the use of the Basin's storage capacity to improve water supply availability. This goal will be accomplished by determining the temporal and spatial availability of unused storage space in the Basin and subsequently determining how best to use that space to increase operational flexibility and water supply reliability.

- Goal No. 4 – Satisfy State Requirements for a Groundwater Management Program. The intent of this goal is to integrate the SJBGWMP into the South Orange County regional water management plan and to improve the opportunity of obtaining outside funding for SJBGWMP implementation. This goal will be accomplished by ensuring that the SJBGWMP contains the minimum elements required for a groundwater management plan and by inclusion of the SJBGWMP in the MWDOC's Integrated Regional Water Management Plan.

- Goal No. 5 – Establish Equitable Share of the Funding, Benefits, and Costs of the SJBGWMP. The intent of this goal is to align the benefits of the SJBGWMP with individual SJBA member agencies and SJBGWMP implementation costs. This goal will be accomplished by clearly articulating the benefits of the SJBGWMP to each

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SJBA member agency and subsequently allocating the funding and costs in an equitable manner.

Table 7-1 shows the alignment of the alternatives to the management goals. The management alternatives were crafted to remove impediments to the goals and to exploit available resources. Thus, all but the baseline alternatives (Alternatives 1 and 7) have some or complete consistency with the goals. Alternative 1 is a refined version of the current status quo, and Alternative 7 is identical to Alternative 1 except it includes the SOCOD project. In these two alternatives, current producers do the best they can, given available resources and management, with the CSJC and SCWD managing their production pursuant to existing diversion permits and the interagency agreements. The other alternatives have varying amounts of new resources and management overlays that increase the yield overall and improve the reliability of the groundwater supply.

7.2 Yield and Costs of the Management Alternatives

Yield as used herein refers to the maximum production that can be developed from the basin in a year, given the location of wells, the hydrology, and management activities. Because the basin is small, the yield will be variable and highly responsive to stormwater recharge, activities that increase recharge, and pumping. Table 7-2 summarizes the yield of each alternative and the increments of new yield by management component. Tables 7-3a, b and c describe the cost opinions for a seawater injection barrier, a seawater extraction barrier, and a Ranney collector well, respectively. The cost to construct in-stream recharge facilities for storm and recycled water are $400,000 per year and $500,000 per year, respectively, based on information provided by OCWD.[31] The cost of recovering any water recharged in the basin was assumed to be $900 per acre-ft, based on the unit cost (all in capital and operations and maintenance costs, reduced by grant funding) projected for the Chino Basin desalter expansion.[32] An economic analysis of the recycled water recharge project was not completed in this SJBGMFP update as it was created late in the planning process and will require a substantial effort to complete. Table 7-4 summarizes the new yield and the volume weighted unit cost of new yield.

The average yield developed from the basin under Alternatives 1 and 7 (baseline alternatives) are about 9,200 acre-ft/yr and 7,500 acre-ft/yr, respectively; the decrease in Alternative 7 is attributable to the SOCOD project. The various management components added in the other alternatives increase yield during primarily dry periods, and some increase yield irrespective of the hydrology.

Alternatives 2 and 3 were designed to prevent seawater intrusion (Goals 2 and 4 and a requirement of the SJBA and SCWD diversion permits) and enhance yield (Goal 1). Alternative 2 does this through strategically located injection wells using supplemental water, and Alternative 3 accomplishes this through a seawater extraction barrier. Alternative 3 will produce a new supply that can benefit all members of the SJBA, in particular those SJBA members that are considering participation in the SOCOD project. The new yield from

[31] Personal communication with Adam Hutchinson of OCWD, January 2013.

[32] Personal communication with Jack Safely of Western Municipal Water District, May 2013.

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Alternative 3 will range from 2,000 to 4,000 acre-ft/yr—3,000 acre-ft/yr was assumed in Tables 7-2 and 7-4. Alternative 2 will require supplemental water that could otherwise be put to use without treatment and will produce a relatively small increment to the groundwater yield compared to Alternative 3. 800 acre-ft/yr[33] was assumed in Tables 7-2 and 7-4. The final groundwater management plan must contain either an injection or extraction barrier to ensure that the SJBA member agencies can fully develop their diversion permits. The cost to construct four injection wells capable of injecting up to 1,000 acre-ft yr and connect them to the imported water system is about $3.0 million with an annual cost of about $1.2 million.[34] The unit cost to inject and recover water in Alternative 2 would be about $2,439 per acre-ft. The cost to construct the extraction barrier, treatment plant, and conveyance facilities capable of producing 3,000 acre-ft/yr long-term would be about $42 million with an annual cost of about $4.0 million. The unit cost to produce water would be about $1,326 per acre-ft.

Alternative 4 incorporates one or two Ranney-style collector wells that will enable the SJBA members to produce groundwater when levels are low due to drought and will increase the yield by creating space for new stormwater recharge (consistent with Goals 1, 2, and 3). Also included in Alternative 4 are adaptive production management and a seawater intrusion barrier. Recall from Section 3 that groundwater yield is predicted to be less than hoped for due to the small basin storage and relatively large production. Operating the basin at lower groundwater levels will increase storm water recharge. However, operating at lower levels may make it difficult or impossible for overlying producers to produce groundwater pursuant to their water rights. The SJBA and SCWD diversion permits currently limit the producers from lowering storage and impacting the overlying producers. Therefore, the SJBA would have to provide an alternative water supply for overlying producers if Ranney-style collector wells were used. The increase in groundwater production due to the construction of a Ranney-style collector well and the replacement of the overlying producers' groundwater supply are about 1,000 acre-ft/yr and 500 acre-ft/yr, respectively. It is anticipated that this new yield will be recovered within the existing capacity of the CSJC and SCWD treatment plants with a net yield of 1,200 acre-ft/yr.[35] The total yield for Alternatives 4a and 4b, with all components in, will be about 11,100 or 13,400 acre-ft/yr, respectively. The cost to construct a Ranney collector well is estimated to be about $5.5 million with an annual cost of about $651,000. The new yield is estimated to be about 2,000 acre-ft/yr at $1,841 per acre-ft for Alternative 4a and about 4,200 acre-ft at $1,445 per acre-ft for Alternative 4b.

Alternative 5 incorporates in-stream storm and dry-weather flow recharge facilities identical to what the OCWD does in the Santa Ana River (consistent with Goals 1, 2, and 3). Also included in Alternative 5 are adaptive production management, a seawater intrusion barrier, and Ranney-style collector wells. The increase in recharge for this alternative is estimated to range from 500 to 2,000 acre-ft/yr and was assumed to be 1,000 acre-ft/yr. It is anticipated that this new yield will be recovered within the existing capacity of the CSJC and SCWD

[33] 1,000 acre-ft/yr would be injected. About 800 acre-ft/yr of the water would be recovered at the SCWD desalter, and the remaining 200 acre-ft/yr would discharged as brine to the SOCWA ocean outfall.

[34] Annualized capital cost (5 percent and 30 years) plus other operations and maintenance costs. These assumptions apply for all annualized costs.

[35] 20 percent of the new yield was assumed to be discharged as brine to the SOCWA ocean outfall.

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treatment plants with a net yield of 800 acre-ft/yr. The total yield for Alternatives 5a and 5b with all components in will be 12,000 or 14,200 acre-ft/yr, respectively. There is no capital cost assumed herein with the in-stream recharge facilities. The new yield is estimated to be about 2,800 acre-ft/yr at $1,715 per acre-ft for Alternative 5a and about 5,000 acre-ft at $1,438 per acre-ft for Alternative 5b.

Alternative 6 incorporates large-scale recycled water recharge and subsequent indirect potable reuse to develop a new source of potable water for the SJBA area. Also included in Alternative 6 are adaptive production management, a seawater intrusion barrier, and in-stream stormwater recharge facilities. In this alternative, natural and recycled water recharge would comingle in the groundwater basin, be recovered at wells, and be treated prior to use. This type of reuse project has been recently developed and successfully implemented in the Chino Basin by the Inland Empire Utilities Agency. Up to 10,000 acre-ft/yr of recycled water could be recharged in this alternative, starting at 1,000 acre-ft/yr and gradually increasing to full capacity. The additional stormwater recharge from in-stream recharge facilities will dilute and partially offset the salt load from the recycled water. The existing groundwater treatment facilities will have to be expanded or new facilities built to treat the additional 10,000 acre-ft/yr of new recharge created in this alternative. The type of treatment anticipated in this alternative is a combination of iron and manganese removal and reverse osmosis with an overall recovery of 80 percent. Therefore, the yield will be about 8,000 acre-ft/yr. The total yield for Alternative 6 with all components in will be about 21,400 acre-ft/yr, an increase of 12,200 acre-ft/yr over baseline conditions. There is no capital cost assumed herein with the in-stream recharge facilities. There will be a construction cost associated with the recycled water conveyance system required to distribute recycled water to in-stream recharge facilities and an annual cost for the treatment of recycled water—these costs have been excluded herein. The new yield is estimated to be about 12,200 acre-ft/yr at $1,042 per acre-ft.

Alternatives 8, 9, and 10 are identical to Alternatives 4, 5, and 6, respectively, except they do not include a seawater barrier component—the seawater barrier component is provided by the operation of SOCOD. The differences in yield are caused by SOCOD (-1,700 acre-ft/yr) and the seawater barrier projects. The new yield and unit cost estimates are listed in Table 7-4.

7.3 Implementation Difficulty

Implementation difficulty is best characterized by the features of the individual management components and then by Alternative. Table 7-5 summarizes the implementation difficulty by management component and management alternative.

7.3.1 Adaptive Production

Adaptive production is featured in all management alternatives. The implementation difficulty is not significant.

Adaptive production is required to comply with the diversion permits held by the SJBA and SCWD and with the interagency agreements. The SJBA would set annual groundwater production limits in the spring of each year based on groundwater levels measured that spring

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and an estimate of the groundwater storage that spring. These production limits would hold until the following spring. Since the permits and agreements are in place, the only obstacle to implementing adaptive production is the SJBA's decision to implement it.

7.3.2 Seawater Injection Barrier

The construction and operation of a seawater injection barrier is featured in Alternatives 2, 4a, and 5a. The implementation difficulty is not significant.

Environmental impacts will be insignificant if wells and conveyance facilities are sited properly. Imported water lines are close and future access to recycled water is also close. The injection wells will protect water quality in the San Juan Basin.

7.3.3 Seawater Extraction Barrier

The construction and operation of a seawater extraction barrier is featured in Alternatives 3, 4b, and 5b. The implementation difficulty is potentially significant.

There may be significant environmental impacts from the construction of wells, conveyance facilities, and treatment facilities. Some wells will be located close to the coast and have a greater level of regulatory scrutiny. There may be concerns regarding hydraulic impacts on the near shore lagoon from the operation of the barrier wells. These concerns can be technically addressed through careful siting of the facilities.

7.3.4 Ranney Collector Wells

The construction and operation of one or two Ranney collector wells is featured in Alternatives 4, 5, 8, and 9. The implementation difficulty is potentially significant.

Environmental impacts will be insignificant if wells and conveyance facilities are sited properly. There may be potentially significant environmental impacts from the cumulative drawdown caused by these and other wells that could limit the ability of overlying producers, such as the San Juan Hills golf course. This concern can be technically addressed by providing the overlying producers with alternative water supplies.

7.3.5 Enhanced Stormwater Recharge and Recycled Water Recharge

The construction of in-stream recharge facilities for stormwater recharge is featured in Alternatives 5, 6, 9, and 10, and for the recharge of recycled water in Alternatives 6 and 10.

The construction and reconstruction of berms in San Juan Creek may be problematic. Berms used for stormwater recharge would be constructed in October each year and reconstructed during the October through April period as necessary to maximize recharge. The upper reaches of San Juan Creek and the Arroyo Trabuco are Steelhead Trout habitat, and the berm construction and reconstruction process would have to include consideration of fish passage. There may be other sensitive habitat in San Juan Creek that would need to considered and mitigated. It is not clear at this time that these concerns can be addressed.

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The process to obtain a permit to recharge recycled water is complex and time-consuming. The locations of recharge and recovery need to be thoroughly studied, and some wells may have to be relocated. These concerns can be technically addressed.

7.4 Recommended Alternative

The alternatives were reviewed and evaluated by the SJBA TAC members using the evaluation criteria described above and considerations of their individual agencies. The features of the alternatives were described at two SJBA Board meetings in late 2012. Based on the management goals of the SJBGMFP articulated in Section 5 and the ability of these alternatives to attain these goals, the SJBA TAC has recommended the phased implementation of Alternative 6. The implementation plan for Alternative 6 will be discussed in Section 8.

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This section describes the proposed implementation plan, the monitoring required under the continuation of the existing SJBGFMP, and the implementation of the recommended alternative—either Alternative 6 or Alternative 10. These alternatives are identical except that Alternative 6 contains an extraction barrier to control seawater intrusion and to generate a new water supply and assumes the SOCOD project is not constructed. Alternative 10 assumes the SOCOD project is built and excludes the extraction barrier.

8.1 Implementation of the Recommended San Juan Basin Groundwater Management and Facilities Plan

Table 8-1 lists the implementation steps for the recommended alternatives, a proposed ten-year implementation plan, and a reconnaissance-level cost estimate up to and excluding construction cost. The intent of Table 8-1 is to characterize the schedule, scope, and cost of activities required to implement the recommended alternatives. This characterization is provided below.

8.1.1 Adaptive Production Management

Adaptive production management will refine the current status quo management plan to comply with the diversion permits held by the CSJC, the SJBA, and the SCWD, and related interagency agreements. It involves the management of groundwater production by the CSJC and the SCWD to prevent or at least minimize seawater intrusion and to what is otherwise available on an annual basis. The SJBA, in its role as the Basin Manager, will set an Annual Safe Yield based on groundwater in storage in the spring of each year and the spring assessment of seawater intrusion. The SJBA will depend on groundwater level and chemistry monitoring and the interpretation of the monitoring data to make its determination. The implementation time frame illustrated in Table 8-1 shows the monitoring occurring each year and the SJBA, acting as the Basin Manager, setting the Annual Safe Yield each year. The time frame also shows the occurrence of a triennial update of the criteria that the SJBA will use to set the Annual Safe Yield. The annual cost, shown in Table 8-1, would be about $140,000 (current cost of monitoring and reporting) for two out of three years and about $160,000 in years when the Annual Safe Yield assessment criteria are reviewed and updated (current cost of monitoring and reporting plus cost to review and update tool used by the SJBA to set the Annual Safe Yield).

In the implementation of the recommended alternative, it is proposed to include the groundwater substitution program element within the adaptive production management program element. By replacing the water supplied by private wells with an alternative supply, the SJBA and SCWD will have greater flexibility in complying with their diversion permits in the near term and when the more aggressive program elements are implemented. The implementation steps include:

- Preliminary engineering to identify all of the private wells and the water demands placed on those wells
- Determine the facilities and operations required to provide those water users a substitute supply

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- Assess feasibility
- Complete CEQA documentation
- Finalize agreements with private well owners
- Obtain permits
- Prepare final designs
- Construct conveyance facilities to enable substitute supplies

The implementation of the groundwater substitution program element is proposed to start in year 1 (2013-14) and be completed in year 3 (2015-16). The implementation cost, excluding construction, is estimated to be about $190,000.

8.1.2 Planning and CEQA Process for the Recommended Alternative

The recommend alternatives contain very complex water management program elements that will require extensive additional investigations to determine their feasibility, their integration into the existing water resource management plans, and their impacts on the environment. This information will evolve in the early engineering and feasibility investigations required for implementation. Some of the program elements in the recommended plan may end up not being feasible as described herein. All of the program elements in the recommended alternatives are controversial. For planning purposes, it was assumed that a programmatic environmental impact report (PEIR) will be completed. The implementation steps include:

- Conduct CEQA process through the preparation of a draft PEIR for the SJBGFMP
- Prepare application/change petitions for new points of diversion, revised diversion amounts, surface water diversion for recharge, storage and subsequent recovery
- Conduct engineering investigations to develop alternative preliminary designs, determine feasibility, and identify fatal flaws for:
    - Groundwater extraction barrier
    - In-stream stormwater recharge
    - In-stream recycled water recharge and groundwater recycled water reuse
- Finalize and certify programmatic EIR
- Finalize SWRCB application/change petitions

The planning and CEQA process are proposed to occur in years 2 (2014-15) to 4 (2016-17). This phase of the work is estimated to cost about $1,800,000.

8.1.3 Complete Agreements for SJBA Members Participation, Construction, and Operation

The prior implementation efforts will provide detailed estimates of new yield and associated costs. Agreements will be drafted to define participation by individual SJBA members, their responsibilities in the construction and operations of facilities, their yield allocations, financing arrangements, their cost share, and other arrangements as required to implement the SJBGFMP. The effort to prepare implementation agreements is proposed to occur in years 3 (2015-16) to 4 (2016-17). The cost to negotiate and prepare these agreements is projected to be about $200,000.

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8.1.4 Design and Construction

By the end of year 4 (2016-17), all of the planning for the program elements and implementation agreements will have been completed. The time frames and costs (through design) for each program element are summarized below:

- Groundwater extraction barrier
  - The design will take about two years to complete and is assumed to start in year 5 (2017-18)
  - Design and permit acquisition costs are projected to be about $4,000,000
  - Construction will take about two years
- In-stream stormwater recharge
  - The design will take about a year to complete and is assumed to start in year 5 (2017-18)
  - Design and permit acquisition costs are projected to be about $150,000
  - Operation of the temporary in-stream recharge facilities will start in year 6 (2018-19)
- In-stream recycled water recharge and groundwater recycled reuse
  - The design will take about two years to complete and is assumed to start in year 5 (2017-18)
  - Design and permit acquisition costs are projected to be about $4,000,000
  - Construction will take about three years

The permits referred to in this implementation step include all of the permits related to construction and operation exclusive of the SWRCB and the Regional Board. The cost to implement Alternative 6 up to and excluding construction is about $12 million. The cost to implement Alternative 10 through and excluding construction is about $8 million.

8.2 Minimum Monitoring Program Required for Implementation of the Recommended San Juan Basin Groundwater Management and Facilities Plan

8.2.1 Background

In early 2003, the SJBA implemented a groundwater, surface water, and vegetation field monitoring program to comply with the conditions outlined in its Permit for Diversion and Use of Water, No. 21074 (Permit 21074), issued by the SWRCB Division of Water Rights in October 2000. The original monitoring program, which was developed in 2001, focused primarily on collecting the data needed to satisfy the monitoring requirements enumerated in Permit 21074. In October 2011, the SWRCB amended Permit 21074 to reflect the results of monitoring performed by the SJBA.

In 2012, WEI was retained to prepare an updated Basin Management Monitoring and Reporting Program to comply with the amended conditions of Permit 21074 and to develop the SJBGFMP. In developing the 2013 SJBGFMP, WEI identified basin management issues requiring specific monitoring activities to be included in 2013 Basin Management Monitoring and Reporting Program in addition to the explicit requirements of Permit 21074. These additional activities required to implement the 2013 SJBGFMP include monitoring and

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interpretation activities to investigate (1) groundwater storage and net recharge, (2) seawater intrusion, and (3) point-source groundwater contamination from leaking underground storage tanks (LUSTs). Additional monitoring components can be added to the monitoring plan in subsequent years to address any management issues that arise as the SJBGFMP is implemented and potentially from the Salt and Nutrient Management Plan that is currently being prepared by SOCWA, which will be complete in 2014. The SJBA should anticipate a significant but as yet undefined increase in monitoring associated with the recharge of recycled water when that program element is implemented.

The following is a description of each regulatory and basin management issues that should be addressed as part of the Basin Management Monitoring and Reporting Program.

8.2.1.1 Permit 21074 Monitoring and Reporting

Amended Permit 21074 describes, among other things, the groundwater, surface water, and vegetation monitoring requirements that must be satisfied to evaluate the impacts to groundwater-level elevation, groundwater quality, and riparian vegetation that result from groundwater extractions related to the operation of the SJBA desalter facility at two levels of production: groundwater extractions less than 4,800 acre-feet per year (acre-ft/yr) and groundwater extractions in excess of 4,800 acre-ft/yr. The SJBA anticipated groundwater extractions will exceed 4,800 acre-ft/yr in 2013. Thus, the monitoring program for extractions in excess of 4,800 acre-ft/yr was implemented in 2013. The explicit monitoring requirements include: (1) quarterly groundwater level monitoring at eight monitoring wells to comply with the Department of Water Resources' (DWR) California Statewide Groundwater Elevation (CASGEM) program, (2) quarterly groundwater quality monitoring for Electrical Conductivity (EC) at eight monitoring wells, and (3) monthly monitoring of riparian vegetation health at five monitoring sites along San Juan Creek.

In addition to the explicit monitoring requirements listed in the permit, additional data is needed to satisfy other permit conditions, such as reporting total groundwater extractions from the basin and computing water in storage. The additional data needed to address the permit conditions include groundwater production, total water use, precipitation, groundwater elevation data across the basin, and total dissolved solids (TDS) and chloride concentrations at wells. A GIS-based storage model was built for the SJBGFMP, and it will be used to estimate groundwater in storage. An annual progress report documenting permit compliance must be submitted each year to the SWRCB by June 30th.

8.2.1.2 Groundwater Storage and Production Management

Through the work performed for the 2013 SJBGFMP, WEI determined that the storage capacity and groundwater in storage were significantly less than has long been reported by the DWR and others studying the basin. The groundwater "yield" estimates developed from the most recent groundwater model developed by the MWDOC for the SOCOD planning work is of limited value because it is based on limited useful groundwater production and groundwater level data. Additional high quality groundwater production and groundwater

level data are necessary to calibrate a groundwater model in the near future to improve groundwater yield estimates and thereby improve decision making.

The recommended SJBGFMP includes a program element called Adaptive Production Management. This program element requires an estimate of groundwater storage in the spring of each year. The SJBA, in its role as the Basin Manager, will use the spring storage estimate and spring groundwater level data to establish an Annual Safe Yield from which the CSJC and SCWD will be allocated an annual production allocation for that year until next spring.

WEI recommends that the SJBA conduct a regional, comprehensive groundwater-level survey and analysis of the San Juan Basin in the spring and the fall of each year to compute the volume of water in storage and the change in storage between each period (spring to fall, fall to spring, and so on). The spring levels and storage change calculations can be used by the SJBA to determine an appropriate level of pumping until the next spring storage determination. Additionally, the period change in storage and period pumping can be used to estimate the net period inflow to the San Juan Basin. The net period inflow can then be correlated to precipitation and stream discharge measurements to characterize near-term and long-term recharge. This would be invaluable for future groundwater model calibration.

8.2.1.3 Seawater Intrusion

Preliminary planning simulations done by the MWDOC for the proposed SOCOD project suggest that seawater intrusion is an imminent threat to the basin with the projected groundwater production plans of the SJBA member agencies. To track seawater intrusion into the San Juan Basin, it is critical to begin collecting groundwater level and specific groundwater chemistry data that will help the SJBA to understand the current extent of seawater intrusion.

This monitoring includes sampling groundwater and surface water in the Basin, from the coast to the forebay areas, for intrinsic seawater tracers, including boron, bromide, iodide, and strontium. The CSJC and the SCWD will need to sample their production wells for the same intrinsic seawater tracers. These constituents will need to be monitored in the future until it is determined from both groundwater level and chemistry data that seawater intrusion will likely not occur or the seawater extraction barrier is implemented and working as designed.

The intrinsic tracers will be monitored across the basin to initially characterize the spatial baseline distribution of these constituents and to identify the most promising set of constituents. This initial period will last two years after which the sampling for intrinsic constituents will be limited to monitoring and production wells from the SCWD Desalter to the coast.

8.2.1.4 Point-Source Groundwater Contamination

Seven point-sources of groundwater contamination from LUST sites have been identified in the San Juan Basin. Contamination by methyl-tert-butyl-ether, or MTBE, has already required the CSJC to incorporate high-cost treatment systems into their municipal water system. As the pumpers in the San Juan Basin continue to increase production over time, there is a concern

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that the contaminants associated with the various LUST sites could be mobilized and further impact municipal water supplies.

We recommend that the SJBA include an annual groundwater-sampling event for volatile organic compounds (VOCs), including MTBE, as part of the monitoring program.

8.2.2 Scope of Work

The following is the scope of work required to implement the recommended monitoring and reporting program described above. The scope of work is designed to rely on groundwater and surface water data collected by others in the basin to the extent possible, supplementing that data with data collected in a field-monitoring program to fill in data gaps. The Basin Management Monitoring and Reporting Program is divided into three tasks: Field Monitoring Program, Data Acquisition and Management, and Reporting. The scope of work that follows is paraphrased from the current monitoring contract issued to WEI for 2013 and includes the monitoring required for the implementation of the SJBGFMP. The objectives, sub-tasks, schedule of implementation, and deliverables for each task are described below.

8.2.2.1 Task 1 –Field Monitoring Program

The objective of the field-monitoring program is to collect data in the field that is not available from the other agencies that monitor the Basin. This task is broken down into four subtasks based on data type and monitoring frequency.

8.2.2.1.1 Task 1.1 Quarterly Groundwater Level Monitoring

Currently, the SJBA has pressure transducers and data loggers installed in eight monitoring wells across the San Juan Basin to continuously record groundwater-level elevations. The data loggers are also equipped to record electrical conductivity (EC). Groundwater elevation and EC data collected from these wells are used for water rights permit compliance reporting, CASGEM reporting, storage management, and seawater intrusion monitoring. Each quarter, the groundwater-level elevation and EC data will be downloaded from the data loggers, manual measurements of depth to groundwater will be made to calibrate the pressure transducers, EC probes will be calibrated, and routine transducer maintenance will be done. The field data will be processed, checked for quality assurance/quality control (QA/QC) and loaded into a relational database.

8.2.2.1.2 Task 1.2 – Quarterly Groundwater Quality Monitoring

To establish the baseline condition for monitoring seawater intrusion into the Basin, WEI will sample 14 monitoring wells in the San Juan Basin on a quarterly basis in 2013. The quarterly groundwater quality sampling events consist of purging each well, measuring field water quality parameters (e.g. temperature, pH, and EC), and collecting groundwater quality samples for laboratory analysis. Note that groundwater samples will only be tested for VOCs during one of the four quarterly sampling events. Data collected for this task can also be used for the analysis and reporting required by Permit 21074. All field and laboratory data will be processed, checked for QA/QC, and loaded into a relational database.

8.2.2.1.3 Task 1.3 – Surface Water Quality Monitoring

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To establish the baseline condition for monitoring seawater intrusion, WEI will sample up to five surface water sites in the Basin. The sites will be sampled twice in 2013 during dry-weather conditions. The field and laboratory data will be processed, checked for QA/QC, and loaded into a relational database.

8.2.2.1.4 Task 1.4 – Vegetation Monitoring

The SJBA's water rights permit requires monthly vegetation monitoring at five sites along San Juan Creek. Monthly vegetation monitoring consists of a biologist visiting five monitoring stations to collect written and photographic records of vegetation health and current climate conditions. The field data will be checked for QA/QC and the photographs will be stored in a project file.

8.2.2.2 Task 2 – Data Acquisition and Management

The objective of this task is to coordinate with and collect data from all public and private entities that collect groundwater, surface water, or climate data in the San Juan Basin. This data will supplement the data generated by the SJBA to satisfy the regulatory reporting requirements and basin management issues identified herein. At the end of this task, the SJBA will have an updated database through the end of the calendar year.

8.2.2.2.1 Task 2.1 – Data Acquisition from Collecting Agencies

Each public and private entity that participates in the monitoring plan will be contacted on a quarterly basis to collect the relevant data sets (April, July, October, and January). The SCWD, CSJC, and MWDOC will be sent a request, asking that they sample their wells for the intrinsic seawater tracers that are not included as part of their standard analytical testing programs.

8.2.2.2.2 Task 2.2 – Data QA/QC, Processing, and Upload to Relational Database

After each quarterly data collection event, all groundwater, surface water, and climate data will be processed, checked for QA/QC, and loaded into a relational database.

8.2.2.3 Task 3 – Reporting

The objective of this task is to prepare reports and presentations that summarize the data collected in the San Juan Basin during each year.

8.2.2.3.1 Task 3.1 – Water Rights Permit Reporting

A letter report will be prepared and submitted to the SWRCB, summarizing the status of compliance with the requirements of Permit No. 21074. This report will be formatted as a letter report that directly answers the questions posed in the permit.

8.2.2.3.2 Task 3.2 – CASGEM Reporting

The quarterly groundwater level data collected in Task 1.1 will be uploaded to the DWR through the CASGEM online reporting system. Data will be uploaded in April, July, October, and January.

8.2.2.3.3 Task 3.3 – Spring and Fall Storage Estimate and Annual Safe Yield Reports

Two letter reports will be prepared and submitted to the SJBA, summarizing the analysis of storage change, the estimation of net inflow to the San Juan Basin, and a preliminary estimate of the Annual Safe Yield. The first letter report will document the change in storage in the San Juan Basin from fall to spring and will be submitted to the SJBA by May 31. This report will contain an estimate of the Annual Safe Yield, based on the estimated storage in the spring of the current year. The second letter report will document the change in storage in the San Juan Basin from spring to fall and will be submitted to the SJBA by November 30. Both reports will contain an estimate of the net inflow in the prior period.

8.2.2.3.4 Task 3.4 – Seawater Intrusion Monitoring Report

WEI will prepare an annual seawater intrusion monitoring report at the conclusion of the four quarterly groundwater quality sampling events. The report will describe the monitoring program, analyze historical and current year data to establish the baseline condition of the basin as it relates to seawater intrusion, and describe the questions, analytical methods, and ongoing monitoring needed to track seawater intrusion in subsequent years. A draft monitoring report will be submitted to the SJBA for review and comment by December 31, and a final report incorporating comments on the draft will be submitted by February 28.

8.2.2.3.5 Task 3.5 – Presentations to the SJBA Board of Directors

Oral status reports will be presented to the SJBA Board at regular Board meetings.

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Appendix A

Initial Study Checklist

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Appendix B

Comments and Responses to Comments

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Table 2-1
CNDDB List of Sensitive Wildlife Species

	Common Name	*Scientific Name*	Federal Status	State Status
1	Least Bell's vireo	*Vireo belliipusillus*	Endangered	Endangered
2	Southwestern willow flycatcher	*Empidonaxtrailliiextimus*	Endangered	Endangered
3	Pacific pocket mouse	*Perognathuslongimembrispacificus*	Endangered	CSC
4	Arroyo toad	*Anaxyruscalifornicus*	Endangered	CSC
5	Riverside fairy shrimp	*Streptocephaluswoottoni*	Endangered	
6	San Diego fairy shrimp	*Branchinectasandiegonensis*	Endangered	
7	Tidewater goby	*Eucyclogobiusnewberryi*	Endangered	
8	Coastal California gnatcatcher	*Polioptilacalifornicacalifornica*	Threatened	CSC
9	American badger	*Taxideataxus*		CSC
10	Coast Range newt	*Tarichatorosa*		CSC
11	Dulzura pocket mouse	*Chaetodipuscalifornicusfemoralis*		CSC
12	San Diego desert woodrat	*Neotomalepidaintermedia*		CSC
13	Arroyo chub	*Gila orcuttii*		CSC
14	Burrowing owl	*Athenecunicularia*		CSC
15	Coast horned lizard	*Phrynosomablainvillii*		CSC
16	Coastal cactus wren	*Campylorhynchusbrunneicapillus-sandiegensis*		CSC
17	Long-eared owl	*Asiootus*		CSC
18	Northern harrier	*Circus cyaneus*		CSC
19	Orange throat whiptail	*Aspidoscelishyperythra*		CSC
20	Pallid bat	*Antrozouspallidus*		CSC
21	Red-diamond rattlesnake	*Crotalusruber*		CSC
22	Tricolored blackbird	*Agelaius tricolor*		CSC
23	Two-striped garter snake	*Thamnophishammondii*		CSC
24	Western mastiff bat	*Eumopsperotiscalifornicus*		CSC
25	Western pond turtle	*Emysmarmorata*		CSC
26	Western red bat	*Lasiurusblossevillii*		CSC
27	Western spadefoot	*Speahammondii*		CSC

Notes:
CSC = California Species of Special Concern
Source: California Department of Fish and Game, Natural Diversity Database, February 2011.

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Table 2-2
CNDDB Special-Status Species

	Common Name	*Scientific Name*	Federal Status	State Status	CNPS
1	Thread-leaved brodiaea	*Brodiaeafilifolia*	Threatened	Endangered	1B.1
2	Laguna Beachdudleya	*Dudleyastolonifera*	Threatened	Threatened	1B.1
3	Big-leaved crownbeard	*Verbesinadissita*	Threatened	Threatened	1B.1
4	Allen's pentachaeta	*Pentachaetaaurea* ssp.*allenii*			1B.1
5	Blochman's dudleya	*Dudleyablochmaniae* ssp.*blochmaniae*			1B.1
6	Nuttall's scrub oak	*Quercusdumosa*			1B.1
7	Orcutt's pincushion	*Chaenactisglabriuscula* var.*orcuttiana*			1B.1
8	Southern tarplant	*Centromadiaparryi* ssp.*australis*			1B.1
9	Coulter's saltbush	*Atriplexcoulteri*			1B.2
10	Peninsular nolina	*Nolina cismontane*			1B.2
11	Aphanisma	*Aphanismablitoides*			1B.2
12	Intermediate mariposa-lily	*Calochortusweedii* var.*intermedius*			1B.2
13	Many-stemmed dudleya	*Dudleyamulticaulis*			1B.2
14	Sticky dudleya	*Dudleyaviscida*			1B.2
15	Summer holly	*Comarostaphylisdiversifolia* ssp.*diversifolia*			1B.2

Notes:

CNPS = California Native Plant Society

1B.1 = Seriously Endangered in California

1B.2 = Fairly Endangered in California

Source: California Department of Fish and Game, Natural Diversity Database, February 2011.

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Table 2-3
Critical Habitat in Acres

	Species	Acres of Critical Habitat
1	Arroyo Toad	3,532
2	Coastal California Gnatcatcher	50,007
3	San Diego Fairy Shrimp	140
4	Steelhead[1]	—
5	Thread-leaved Brodiaea	1,039

Notes:

[1] Refer to Exhibit 2-9 for occurrences.

Source: USFWS Critical Habitat Data.

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Table 2-4
Soil Types within San Juan Basin Authority

Soil Series	Permeability	Degree of Limitation - Shallow Excavation Depth
Alo	Slow	Severe
Anaheim	Slow	Severe
Balcom	Slow	Severe
Blasingame	Slow	Severe
Bolsa	Slow	Moderate
Bosanko	Slow	Severe
Botella	Slow	Slight
Calleguas	Moderate	Moderate
Capistrano	Moderate	Slight
Chesterton	Slow	Severe
Chino	Slow	Moderate
Cieneba	Moderate	Severe
Corralitos	Rapid	Severe
Cropley	Slow	Severe
Exchequer	Moderate	Severe
Gabino	Slow	Severe
Hanford	Moderate	Slight
Marina	Moderate	Severe
Metz	Moderate	Severe
Mocho	Moderate	Slight
Modjeska	Moderate	Severe
Myford	Slow	Moderate
Ramona	Slow	Slight
San Andreas	Moderate	Severe
Soboba	Rapid	Severe
Soper	Slow	Severe
Sorrento	Moderate	Moderate
Yorba	Slow	Severe

Source: USDA, Soil Survey of Orange County and Western Part of Riverside County, California, September 1978.

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Table 2-5
Cities within San Juan Basin Authority

	Cities	Area within SJBA [acres]
1	Aliso Viejo	6,377
2	Dana Point	4,475
3	Laguna Beach	1,213
4	Laguna Hills	2,923
5	Laguna Niguel	9,381
6	Mission Viejo	11,577
7	Rancho Santa Margarita	5,665
8	San Clemente	2,057
9	San Juan Capistrano	9,381
10	Unincorporated	47,154

Source: Orange County Data, February 2011.

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Table 2-6
Water Districts within San Juan Basin Authority

	Water District	Acreages
1	Moulton Niguel	23,361
2	South Coast	3,828
3	San Juan Capistrano	9,031
4	Santa Margarita	62,515

Source: San Juan Basin Authority, 2011.

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Table 2-7
Land Use Acreages

	Land Use	Acres
1	Single Family Residential	19,000
2	Multi-Family Residential	3,800
3	Commercial	5,300
4	Industrial	1,200
5	Educational Facilities	1,400
6	Agricultural	324
7	Recreation and Open Space	22,300
8	Transportation, Communication, and Utilities	3,600
9	Vacant	35,400

Source: SCAG, 2008.

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Table 2-8
Arterial Highway Daily Carrying Capacities

MPAH Classification	Number of Lanes	ADT**	Right-of-Way/ Roadway Width***
Principal	8 Lanes Divided	60,000	144 ft/126 ft
Major	6 Lanes Divided	45,000	120 ft/102 ft
Primary	4 Lanes Divided	30,000	100 ft/84 ft
Secondary	4 Lanes Undivided	20,000	80 ft/64 ft
Collector	2 Lanes Undivided	10,000	56 ft/40 ft
N/A	Residential Street*	1,200	varies

Notes:

MPAH = Master Plan of Arterial Highways

ADT = Average Daily Traffic

ft = feet

* Residential roadway ADT based upon ITE data.

** Maximum recommended number of average daily trips at level of service (LOS) "C."

*** Typical widths

Source: Orange County General Plan, April 2004.

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Table 3-1 Precipitation Gauging Stations In and Around the San Juan Creek Basin

Station Number	Station Name	Location				Period of Record		Operator	Annual Precipitation		
		Latitude (dms)	Longitude (dms)	Elevation (feet)	San Juan Basin	Start Year	End Year		Minimum	Maximum	Average
									(inches/yr)		
Inactive Precipitation Stations											
50	El Toro - Moulton Ranch	33-36-26	117-42-08	375	Outside	1877	1972	Private Observer			
56	Irvine - Baudino Ranch	33-38-56	117-42-35	355	Outside	1911	1975	The Irvine Co.			
81	Trabuco Canyon - Robinson	33-39-12	117-34-14	1,150	Inside	1926	1967	Private Observer			
82	Bell Canyon - Hare and Starr Ranch	33-38-00	117-34-00	1,250	Inside	1930	1946	Private Observer			
86	San Juan Capistrano - Hankey	33-30-45	117-38-16	150	Inside	1905	1977	Private Observer			
92	San Juan Substation	33-30-44	117-39-56	160	Inside	1923	1976	Private Observer			
104	Trabuco Canyon - Refractory	33-40-24	117-34-48	1,500	Inside	1932	1941	Private Observer			
130	El Toro - Alios Ranch	33-39-50	117-40-05	640	Outside	1929	1977	Private Observer			
133	Trabuco Canyon (Trabuco Canyon)	33-39-26	117-36-00	970	Inside	1939		NWS/OCRDMD			
134	San Juan Guard Station	33-35-30	117-30-47	728	Inside	1939		NWS/OCRDMD			
151	Aliso Canyon - Cook's Corner	33-40-59	117-37-12	1,080	Outside	1945	1975	Private Observer			
164	Capistrano Beach	33-28-03	117-41-02	20	Inside	1955	1988	OCRDMD			
181	Modjeska Canyon - McArthur	33-42-28	117-37-39	1,300	Outside	1963	1993	Private Observer			
182	Hincky Canyon - Joplin Boys Ranch	33-40-43	117-34-23	1,720	Inside	1963	1974	Private Observer			
192	El Cariso Guard Station	33-39-00	117-24-43	2,660	Inside	1965	1997	NSFS/RCFCWCD			
201	Mission Viejo Cow Camp	33-31-21	117-35-31	300	Inside	1969	1989	Private Observer			
203	Moulton Niguel Water District	33-34-41	117-40-23	300	Inside	1969	1985	Water District Personnel			
207	Coto de Caza	33-35-14	117-35-05	970	Inside	1971	1988	Private Observer			
211	Laguna Niguel-South County Garage	33-31-29	117-42-58	350	Outside	1973	1988	O.C. Garage Personnel			
221	San Juan Capistrano - Lacouague	33-30-33	117-37-55	140	Inside	1979	1988	OCRDMD/Priv Observer			
Active Precipitation Stations											
100	Laguna Beach Treatment Plant (Laguna)	33-32-49	117-46-53	50	Outside	1928	Present	NWS/City of Laguna Beach	4.05	35.11	12.42
206	Trabuco Forestry (Trabuco Canyon)	33-39-15	117-35-34	970	Inside	1971	Present	O.C. Fire Authority	4.87	43.58	19.61
216	Sulphur Creek Dam (Laguna Niguel)	33-32-59	117-42-20	200	Outside	1974	Present	OCRDMD	3.54	35.32	14.21
176	El Toro (Lake Forest)	33-37-39	117-41-26	445	Outside	1964	Present	OCRDMD	2.58	38.58	14.79
208	Santiago Peak	33-42-06	117-32-01	5,638	Inside	1949	Present	OCPW	8.04	106.15	33.37
186	Palisades Reservoir (San Clemente)	33-27-46	117-39-02	360	Outside	1965	Present	Private Observer	4.13	28.70	12.99

Source: County of Orange, Resources and Development Management Department

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Table 3-2 USGS Stream Flow Gauges in the San Juan Basin

Site Number	Site Name	Location					Record	
		Latitide (dms)	Longigude (dms)	Altitude (ft)	Dranage (sq mile)	San Juan Basin	Begin	End
11046400	SAN JUAN C A CASPER REG PRK NR SAN JUAN CAPISTRANO	33-34-25	117-32-29	515	42.1	Inside	10/6/00	9/25/01
11046500	SAN JUAN C NR SAN JUAN CAPISTRANO CA	33-31-08	117-37-30	150	106	Inside	10/1/28	9/30/69
11046501	SAN JUAN C AND CWC CANAL NR SAN JUAN CAPISTRANO CA	33-29-30	117-39-47		117	Inside	10/1/54	9/30/69
11046530	SAN JUAN C AT LA NOVIA ST BR AT SAN JUAN CAPIS CA	33-30-09	117-38-53		109	Inside	10/1/85	Present
11046550	SAN JUAN C AT SAN JUAN CAPISTRANO CA	33-29-30	117-39-47		117	Inside	10/1/69	9/30/85
11047000	ARROYO TRABUCO NR SAN JUAN CAPISTRANO CA	33-31-36	117-40-11	180	35.7	Inside	10/1/30	9/30/81
11047200	OSO C A CROWN VALLEY PKWY NR MISSION VIEJO CA	33-33-29	117-40-36		14	Inside	12/1/69	9/30/81
11047300	ARROYO TRABUCO A SAN JUAN CAPISTRANO CA	33-29-54	117-39-57	80	54.1	Inside	10/1/72	Present
11047350	SAN JUAN C A STONEHILL DRIVE NR DANA POINT CA	33-28-26	117-40-43	20	174	Inside	10/6/98	9/26/03
11047500	ALISO C A EL TORO CA	33-37-34	117-41-06	440	7.91	Outside	10/1/30	9/30/80
11047700	ALISO C A SOUTH LAGUNA CA	33-30-43	117-44-52		34.4	Outside	10/1/82	9/30/87
11046310	SAN MATEO C NR SAN ONOFRE CA	33-25-10	117-31-53		91.9	Outside	10/1/50	9/30/52
11046350	CRISTIANITOS C NR SAN CLEMENTE CA	33-26-57	117-34-16	165	29	Outside	10/1/50	9/30/67
11046358	S CH CRISTIANITOS C AB SAN MATEO C NR SN CLMNTE CA	33-25-35	117-34-13	90		Outside	10/1/93	2/6/98
11046359	N CH CRISTIANITOS C AB SAN MATEO C NR SN CLMNTE CA	33-25-35	117-34-13	90		Outside	10/1/93	2/24/98
11046360	CRISTIANITOS C AB SAN MATEO C NR SAN CLEMENTE CA	33-25-35	117-34-13	90	31.6	Outside	10/1/93	Present
11046370	SAN MATEO C A SAN ONOFRE CA	33-23-28	117-35-26	20	132	Outside	10/1/46	6/6/02

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Table 3-3 Annual Groundwater Production within San Juan Basin Authority

Well Name	Kinoshita	Tirador	SJBA-4	SJBA-2	CVWD-1	Dance Hall	Stonehill	CVWD # 5	SJHGC-Small	SJHGC-Large	The Oaks	La Couague	Arroyo Trabucco Golf Course	Schuller	Sycamore Stables	Egan Tract-3	Rosenbaum 1	Rosenbaum 2	North Open Space(NOS)	Hollywood 2A	Mission Street	Total Groundwater Production [acre-ft]		
Basin	Lower Basin [acre-ft]							Middle Basin [acre-ft]					Arroyo Trabuco Basin [acre-ft]									Lower Basin	Middle Basin	Arroyo Trabuco Basin
1979	0	0	0	0	0	0	0	0	19	29	54	81	0	55	54	41	292	310	0	0	0	0	183	752
1980	0	0	0	0	0	0	0	0	78	116	81	122	0	83	81	62	506	660	0	0	0	0	397	1,393
1981	0	0	0	0	0	0	0	0	78	116	81	122	0	83	81	62	364	584	0	0	0	0	397	1,174
1982	0	0	0	0	0	0	0	0	80	121	81	122	0	83	81	62	550	550	0	0	0	0	404	1,325
1983	0	0	0	0	0	0	0	0	78	116	81	122	0	83	81	62	517	546	0	136	0	0	397	1,425
1984	0	0	0	0	0	0	0	0	80	121	81	122	0	83	81	62	377	549	0	377	0	0	404	1,528
1985	0	0	0	0	0	0	0	0	78	116	81	122	0	83	81	62	499	476	0	447	0	0	397	1,648
1986	0	0	0	0	0	0	0	0	79	118	81	122	0	83	81	62	637	699	0	418	0	0	400	1,980
1987	0	0	0	25	0	0	0	0	78	116	81	122	0	83	81	62	586	435	0	133	0	25	397	1,379
1988	0	0	0	163	0	0	0	0	122	184	81	122	0	83	81	62	583	384	0	657	0	163	509	1,850
1989	0	0	0	383	0	0	0	0	122	184	81	122	0	83	81	62	539	327	0	470	0	383	509	1,562
1990	0	0	0	292	0	0	0	0	122	184	81	122	0	83	81	62	501	339	0	429	0	292	509	1,495
1991	0	0	0	251	0	0	0	87	122	184	81	122	0	83	81	62	591	469	0	332	0	251	596	1,619
1992	0	0	0	144	0	0	0	159	122	184	81	122	0	83	81	62	593	633	0	312	0	144	668	1,763
1993	0	0	0	94	0	0	0	105	122	184	81	122	0	83	81	62	577	717	0	266	0	94	615	1,786
1994	0	0	0	70	0	0	0	76	122	184	81	122	0	83	81	62	588	312	0	324	0	70	585	1,449
1995	0	0	0	50	0	0	0	0	122	184	81	122	0	83	81	62	706	336	0	331	7	50	509	1,606
1996	0	0	0	55	0	0	0	0	122	184	81	122	0	83	81	62	697	27	0	379	236	55	509	1,566
1997	0	0	0	84	0	0	0	0	122	184	81	122	0	83	81	62	686	31	0	459	289	84	509	1,691
1998	0	0	0	12	0	0	0	0	122	184	81	122	0	83	81	62	375	226	0	88	118	12	509	1,033
1999	0	0	0	58	0	0	0	0	122	184	81	122	0	83	81	62	612	0	263	364	117	58	509	1,581
2000	0	0	0	58	0	0	0	0	122	184	81	122	0	83	81	62	612	0	263	364	117	58	509	1,581
2001	0	0	0	3	0	0	0	0	122	184	81	122	0	83	81	62	677	0	136	304	0	3	509	1,343
2002	0	0	0	4	0	0	0	0	122	184	81	122	405	83	81	62	223	0	0	342	0	4	509	790
2003	0	0	0	4	0	0	0	0	122	184	81	122	405	83	81	62	416	0	384	123	4	4	509	1,153
2004	12	17	66	6	62	3	0	0	122	182	81	122	405	83	81	62	1,323	0	978	1,263	0	166	507	3,789
2005	261	617	1,005	1,179	1,242	505	0	0	135	203	81	122	405	83	81	62	555	0	446	329	0	4,809	541	1,556
2006	81	796	924	1,082	1,102	860	0	0	142	113	81	122	405	83	81	62	417	0	323	260	0	4,846	458	1,227
2007	466	407	616	666	41	552	132	0	108	308	81	122	405	83	81	62	366	0	207	79	0	2,880	619	877
2008	57	71	479	424	390	29	822	0	79	268	68	102	338	69	68	52	377	0	344	291	0	2,271	516	1,199
2009	57	258	695	780	797	40	961	0	79	265							21	0	266	190	0	3,589	345	477
2010	1	24	748	717	261	1	854															2,606	0	0

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Figure 3-4 Monthly Precipitation Variability in Laguna Beach Station from 1928 to 2010

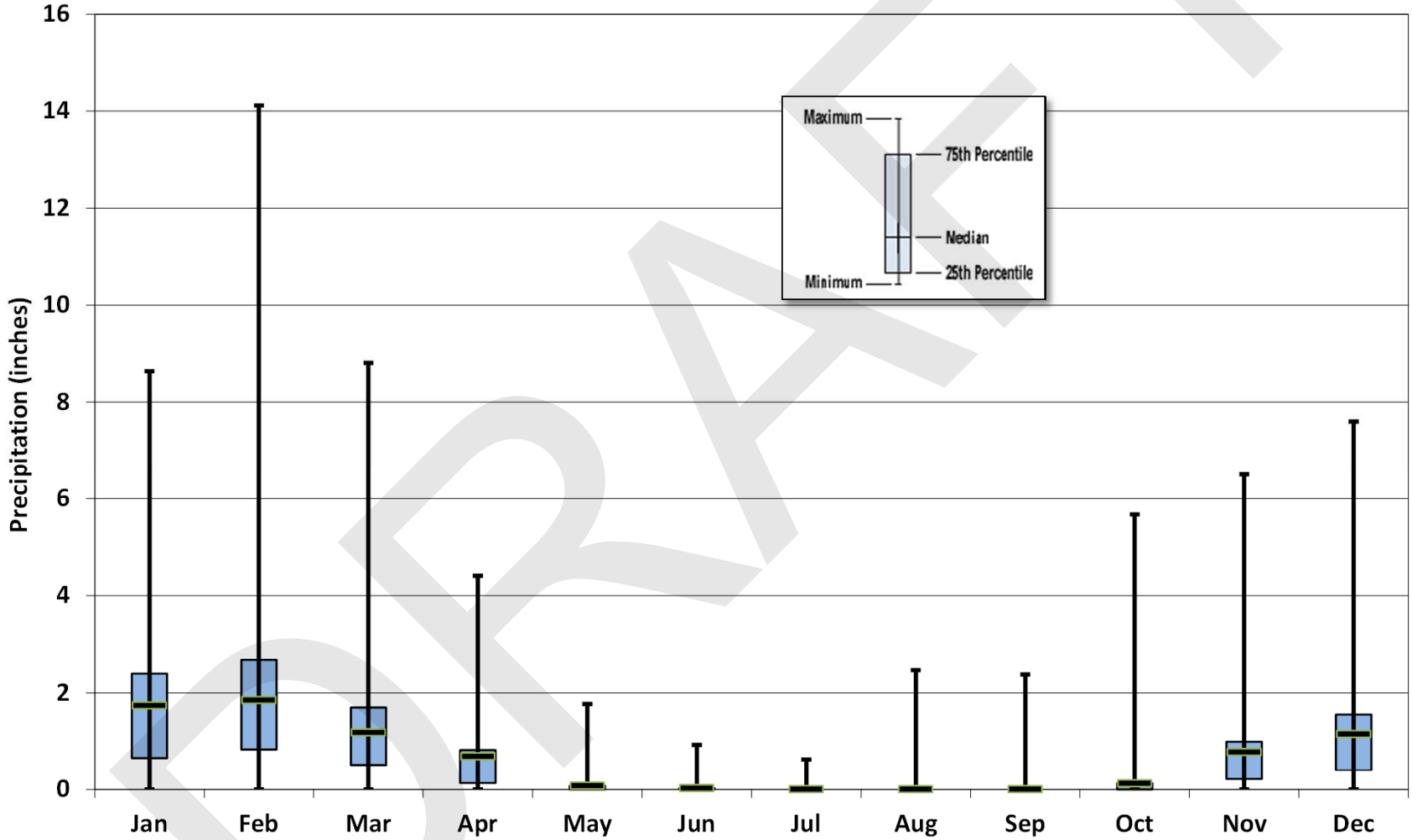

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Table 3-5
Surface Water Quality Sampling Sites in the San Juan Basin Watershed

Monitoring Entity	Surface Water Body	Station Name	Station Abbreviation	Station Alias	Monitoring Program	Sampling Time Period	Analytes
County	Bell Creek	Bell Creek	Bell Creek	REF-BC	Bioassessment Program	2003 - 2009	General Physical, Metals, Pesticides
County	San Juan Creek	San Juan Creek at Cold Spring	SJC @ Cold Spring	REF-CS	Bioassessment Program	2002 - 2009	General Physical, Metals, Pesticides
County	San Juan Creek	San Juan Creek at Ortega Highway	SJC @ Ortega	SJC-74	Bioassessment Program	2003 - 2009	General Physical, Metals, Pesticides
County	San Juan Creek	San Juan Creek at Caspers Park	SJC @ Caspers Park	SJOL01	Mass Emissions Monitoring Program	1993 - 2001	General Physical, Metals, Pesticides
County	San Juan Creek	San Juan Creek at Camino Capistrano	SJC @ Camino Capistrano	SJC-CC	Bioassessment Program	2002 - 2009	General Physical, Metals, Pesticides
County	Trabuco Creek	Trabuco Creek alder Spring	TC @ Alder Spring	REF-TCAS	Bioassessment Program	2003 - 2009	General Physical, Metals, Pesticides
County	Trabuco Creek	Trabuco Creek at Avery Parkway	TC @ Avery	TC-AP	Bioassessment Program	2002 - 2008	General Physical, Metals, Pesticides
County/CDM	Oso Creek	Oso Creek at Crown Valley Parkway	OC @ Crown Valley	OSOLO3/CDM-SW-9	Bioassessment Program	1986 - 1999	General Physical, Metals, Pesticides
County/CDM/RWQCB	San Juan Creek	San Juan Creek at La Novia	SJC @ La Novia	SJNL01/CDM-SW-4	Mass Emissions Monitoring Program	1987 - 2009	General Physical, Metals, Pesticides
County/CDM	Trabuco Creek	Trabuco Creek at Del Obispo	TC @ Del Obispo	TCOL02/CDM-SW-6	Mass Emissions Monitoring Program	1986 - 2009	General Physical, Metals, Pesticides
CDM	Oso Creek	CDM-SW-8	CDM-8	CDM-8	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	San Juan Creek at Treatment Plant	SJC @ Treatment Plant	CDM-1	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	CDM_SW-10 (Tributary to San Juan Creek)	CDM-10	CDM-10	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	CDM_SW-11	CDM-11	CDM-11	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	CDM_SW-11A (Tributary to San Juan Creek)	CDM-11A	CDM-11A	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	CDM_SW-16	CDM-16	CDM-16	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	San Juan Creek below Trabuco Creek	SJC below Trabuco	CDM-2	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	San Juan Creek	San Juan Creek at Oda Nursery	CDM-5	CDM-5	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
CDM	Trabuco Creek	Trabuco Creek At Camino Capistrano	CDM-7	TC @ Camino Cap	Monitoring Program	1986 - 1987	General Physical, Fe, Mn
RWCQB	San Juan Creek	San Juan Creek ~1mi above Lion Cyn. Cr.	SJC above Lion Cyn	901S00313	Ambient SW Monitoring Program	2009 - 2010	General Physical, Metals, Pesticides
RWCQB	San Juan Creek	San Juan Creek above Arroyo Trabuco	SJC above Trabuco	901S39498	Ambient SW Monitoring Program	2009 - 2010	General Physical, Metals, Pesticides
RWCQB	San Juan Creek	San Juan Creek ~0.3mi below Hwy 74	SJC below Ortega	901S45253	Ambient SW Monitoring Program	2009 - 2010	General Physical, Metals, Pesticides
RWCQB	Trabuco Creek	Trabuco Creek 2	TC -2	901SJATC2	Ambient SW Monitoring Program	2002 - 2003	General Physical, Metals, Pesticides
RWCQB	Trabuco Creek	Trabuco Creek 5	TC - 5	901SJATC5	Ambient SW Monitoring Program	2002 - 2003	General Physical, Metals, Pesticides
RWCQB	Bell Creek	Bell Canyon Creek 2	Bell Canyon Creek 2	901SJBEL2	Ambient SW Monitoring Program	2002 - 2003	General Physical, Metals, Pesticides
RWCQB	Oso Creek	Oso Creek 3	OC - 3	901SJOSO3	Ambient SW Monitoring Program	2002 - 2003	General Physical, Metals, Pesticides
RWCQB	San Juan Creek	San Juan Creek 5	SJC - 5	901SJSJC5	Ambient SW Monitoring Program	2002 - 2003	General Physical, Metals, Pesticides
RWCQB	San Juan Creek	San Juan Creek 9	SJC - 9	901SJSJC9	Ambient SW Monitoring Program	2002 - 2003	General Physical, Metals, Pesticides
SJBA	San Juan Creek	PMS-Control	PMS-Control	PMS-Control	Integrated Environmental Sampling	2009 - 2010	General Mineral, Physical, and Metals
SJBA	San Juan Creek	PMS-01	PMS-01	PMS-01	Integrated Environmental Sampling	2009 - 2010	General Mineral, Physical, and Metals
SJBA	San Juan Creek	PMS-02	PMS-02	PMS-02	Integrated Environmental Sampling	2009 - 2010	General Mineral, Physical, and Metals
SJBA	San Juan Creek	PMS-03	PMS-03	PMS-03	Integrated Environmental Sampling	2009 - 2010	General Mineral, Physical, and Metals
SJBA	San Juan Creek	PMS-04	PMS-04	PMS-04	Integrated Environmental Sampling	2009 - 2010	General Mineral, Physical, and Metals
SMWD	Oso Creek	Oso Creek at Oso Barrier	OC @ Barrier	Oso Barrier	Surface Water Diversion Monitoring	2009 - 2010	General Mineral, Physical, and Metals
SMWD	Horno Creek	Horno Creek at Horno Barrier	Horno Creek @ Barrier	Horno Barrier	Surface Water Diversion Monitoring	2009 - 2010	General Mineral, Physical, and Metals
WEI	Trabuco Creek	Trabuco Creek-8	TC - 8	TC-8	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Drainage Tributary from RSM Development	TC @ RSMD	D-SM	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek at Rising Groundwater	TC @ Rising Groundwater	TC-RG	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek-7	TC-7	TC-7	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Tin Mine Adit (SN-1A)	TC @ Mine Adit	SN-1A	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek Below Tin Mine Adit (SN-1)	TC below Mine Adit	SN-1	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Holy Jim Creek-1	Holy Jim	HJC-1	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek-2A	TC-2A	TC-2A	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek at Oso Parkway	TC @ Oso	TC-OSO	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek-3	TC-3	TC-3	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents
WEI	Trabuco Creek	Trabuco Creek at Crown Valley Parkway	TC @ Crown Valley	TC-CV	Arroyo Trabuco Study	1998	General Mineral, Physical, Metals, Trace Constituents

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Table 3-6
Groundwater Quality Data Sources for Wells in the San Juan Basin

WQ Data Source	Time Period	# of Wells	Description
DWR, 1972	1952 - 1969	19	Private and Public Wells in San Juan Basin
NBS Lowry, 1994	1970 - 1992	10	Private and Public Wells in San Juan Basin
CDM, 1987	1986 - 1987	15	Private and Public Wells in San Juan Basin
CA DPH Database - RMV	1986 - 1999	1	Non Private RMV Wells (RMV 7)
GTC, 2001	1988 - 2001	15	Private and Public Wells in San Juan Basin
CA DPH Database - City of San Juan	1991 - 2010	10	City of San Juan Production Wells
CA State GeoTracker Website	2001 - 2010	272	Monitoring Wells for 10 Point Source Contamination Sites
SJBA	2003 - 2010	9	SJBA Monitoring Wells
City of San Juan Capistrano	2005 - 2008	6	City of San Juan Desalter Production Wells
CA DPH Database - SJBA	2005 - 2010	6	City of San Juan Desalter Production Wells
CA DPH Database - SCWD	2006 - 2010	1	Stonehill Well
Santa Margarita Water District	2006 - 2010	1	Nichols Well

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Table 3-7
Surface Water Quality Data in Exceedance of Drinking Water Maximum Contaminant Levels

Analyte Group/ Constituent	Maximum Contaminant Levels[1]					1987 - 2005								Last Five Years (2006-2010)							
						Exceedance				Non-Exceedance				Exceedance				Non-Exceedance			
	Primary	Secondary	Notification Level	Units	Notes	# of Sites	% of Sites Exceeding MCLs	Count	% of Samples Exceeding MCLs	# of Sites	% of Sites Not Exceeding MCLs	Count	% of Samples Not Exceeding MCLs	# of Sites	% of Sites Exceeding MCLs	Count	% of Samples Exceeding MCLs	# of Sites	% of Sites Not Exceeding MCLs	Count	% of Samples Not Exceeding MCLs
Inorganic Constituents																					
Total Dissolved Solids		500		mg/L		19	66%	192	88%	10	34%	27	12%	10	91%	90	99%	1	9%	1	1%
Sulfate		250		mg/L		16	38%	143	62%	26	62%	88	38%	9	82%	89	98%	2	18%	2	2%
Chloride		250		mg/L		6	20%	115	53%	24	80%	102	47%	6	38%	57	66%	10	63%	30	34%
Manganese		0.05	0.5	mg/L		15	38%	67	44%	24	62%	87	56%	8	50%	40	62%	8	50%	25	38%
Iron		300		mg/L		10	31%	26	19%	22	69%	109	81%	7	41%	30	46%	10	59%	35	54%
Aluminum	1	0.2		mg/L	2	1	6%	1	2%	17	94%	51	98%	1	14%	1	2%	6	86%	46	98%
Arsenic	10			ug/L		0	0%	0	0%	17	100%	51	100%	2	25%	22	45%	6	75%	27	55%
Boron			1000	ug/L		0	0%	0	0%	12	100%	115	100%	1	33%	7	10%	2	67%	60	90%
Cadmium	5			ug/L		4	13%	26	5%	27	87%	537	95%	4	24%	12	5%	13	76%	233	95%
Lead	15			ug/L		4	20%	34	6%	16	80%	498	94%	3	19%	5	2%	13	81%	240	98%
Chromium	50			ug/L	3	2	7%	7	1%	27	93%	556	99%	2	13%	2	1%	13	87%	243	99%
Nickel	100			ug/L		3	10%	6	1%	26	90%	557	99%	1	8%	1	0%	11	92%	203	100%
Nitrate-N	10			mg/L		10	25%	32	16%	30	75%	165	84%	0	0%	0	0%	6	100%	60	100%
General Physical																					
Specific Conductance		900		umhos/cm		8	26%	86	19%	23	74%	367	81%	11	52%	68	49%	10	48%	71	51%
Turbidity	1			NTU		8	44%	262	66%	10	56%	138	35%	8	35%	60	39%	15	65%	92	61%
Color		15		Units		0	NA	0	NA	0	NA	0	NA	5	83%	13	81%	1	17%	3	19%
Odor		3		Threshold Units		0	NA	0	NA	0	NA	0	NA	5	50%	7	44%	5	50%	9	56%
pH		6.5<pH<8.5		Units		3	12%	13	3%	23	88%	442	97%	0	0%	0	0%	13	100%	111	100%

1 The California MCL was used for exceedance analysis unless otherwise noted.
2 The Primary California MCL is used for this analysis because the lower Secondary limit of 0.2 mg/L is the same as the US EPA Threshold 2 limit.
3 MCL is for total chromium.

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Table 3-8
Surface Water Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Surface Water Quality Objectives

Station	Analyte	Unit	Objective	Time Period	# of Years in Time Period	# of Years not Sampled	# of Years Above	# of Years Below
Bell Creek - Upstream to Downstream								
Bell Creek	Turbidity	NTU	20	2003-2009	7	0	0	7
Bell Canyon Creek 2	SO4	mg/L	250	2003-2003	1	0	0	1
Bell Canyon Creek 2	Mn	mg/L	0.05	2003-2003	1	0	0	1
San Juan Creek - Upstream to Downstream								
SJC above Lion Cyn.	TDS	mg/L	500	2009-2009	1	0	0	1
SJC above Lion Cyn.	SO4	mg/L	250	2009-2009	1	0	1	0
SJC above Lion Cyn.	Cl	mg/L	250	2009-2009	1	0	0	1
SJC above Lion Cyn.	Fe	mg/L	0.3	2009-2009	1	0	0	1
SJC above Lion Cyn.	Mn	mg/L	0.05	2009-2009	1	0	0	1
SJC above Lion Cyn.	%Na	%	60	2009-2009	1	1	0	0
SJC - 5	SO4	mg/L	250	2002-2003	2	0	0	2
SJC - 5	Mn	mg/L	0.05	2002-2003	2	0	0	2
SJC @ Cold Spring	Turbidity	NTU	20	2002-2009	8	0	1	7
SJC @ Caspers Park	Turbidity	NTU	20	1993-2001	9	0	4	5
CDM-16	TDS	mg/L	500	1987-1987	1	0	0	1
CDM-16	SO4	mg/L	250	1987-1987	1	0	0	1
CDM-16	Cl	mg/L	250	1987-1987	1	0	0	1
CDM-16	Fe	mg/L	0.3	1987-1987	1	0	0	1
CDM-16	Mn	mg/L	0.05	1987-1987	1	0	1	0
CDM-11A	TDS	mg/L	500	1987-1987	1	0	1	0
CDM-11A	SO4	mg/L	250	1987-1987	1	0	1	0
CDM-11A	Cl	mg/L	250	1987-1987	1	0	0	1
CDM-11A	Fe	mg/L	0.3	1987-1987	1	0	0	1
CDM-11A	Mn	mg/L	0.05	1987-1987	1	0	0	1
CDM-11	TDS	mg/L	500	1986-1987	2	0	2	0
CDM-11	SO4	mg/L	250	1986-1987	2	0	0	2
CDM-11	Cl	mg/L	250	1986-1987	2	0	0	2
CDM-11	Fe	mg/L	0.3	1986-1987	2	0	2	0
CDM-11	Mn	mg/L	0.05	1986-1987	2	0	1	1
CDM-10	TDS	mg/L	500	1986-1987	2	0	2	0
CDM-10	SO4	mg/L	250	1986-1987	2	0	0	2
CDM-10	Cl	mg/L	250	1986-1987	2	0	0	2
CDM-10	Fe	mg/L	0.3	1986-1987	2	0	1	1
CDM-10	Mn	mg/L	0.05	1986-1987	2	0	0	2
SJC @ Oda Nursery	TDS	mg/L	500	1986-1987	2	0	2	0
SJC @ Oda Nursery	SO4	mg/L	250	1986-1987	2	0	1	1
SJC @ Oda Nursery	Cl	mg/L	250	1986-1987	2	0	0	2
SJC @ Oda Nursery	Fe	mg/L	0.3	1986-1987	2	0	0	2
SJC @ Oda Nursery	Mn	mg/L	0.05	1986-1987	2	0	1	1
PMS-Control	TDS	mg/L	500	2009-2011	3	0	3	0
PMS-Control	SO4	mg/L	250	2009-2011	3	0	2	1
PMS-Control	Cl	mg/L	250	2009-2011	3	0	1	2
PMS-Control	Fe	mg/L	0.3	2009-2011	3	0	2	1
PMS-Control	Mn	mg/L	0.05	2009-2011	3	0	2	1
PMS-Control	Turbidity	NTU	20	2009-2011	3	0	0	3
PMS-Control	Color	units	20	2009-2011	3	0	0	3
PMS-Control	MBAS	mg/L	0.5	2009-2011	3	0	0	3
PMS-Control	%Na	%	60	2009-2011	3	0	0	3
SJC @ Ortega	Turbidity	NTU	20	2003-2009	7	0	1	6
SJC Below Ortega	TDS	mg/L	500	2010-2010	1	0	1	0
SJC Below Ortega	SO4	mg/L	250	2010-2010	1	0	0	1
SJC Below Ortega	Cl	mg/L	250	2010-2010	1	0	0	1

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Table 3-8
Surface Water Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Surface Water Quality Objectives

Station	Analyte	Unit	Objective	Time Period	# of Years in Time Period	# of Years not Sampled	# of Years Above	# of Years Below
SJC Below Ortega	Fe	mg/L	0.3	2010-2010	1	0	0	1
SJC Below Ortega	Mn	mg/L	0.05	2010-2010	1	0	0	1
SJC Below Ortega	%Na	%	60	2010-2010	1	1	0	0
PMS-04	TDS	mg/L	500	2010-2011	2	0	2	0
PMS-04	SO4	mg/L	250	2010-2011	2	0	1	1
PMS-04	Cl	mg/L	250	2010-2011	2	0	0	2
PMS-04	Fe	mg/L	0.3	2010-2011	2	0	0	2
PMS-04	Mn	mg/L	0.05	2010-2011	2	0	1	1
PMS-04	Turbidity	NTU	20	2010-2011	2	0	0	2
PMS-04	Color	units	20	2010-2011	2	0	1	1
PMS-04	MBAS	mg/L	0.5	2010-2011	2	0	0	2
PMS-04	%Na	%	60	2010-2011	2	0	0	2
PMS-03	TDS	mg/L	500	2010-2011	2	0	2	0
PMS-03	SO4	mg/L	250	2010-2011	2	0	1	1
PMS-03	Cl	mg/L	250	2010-2011	2	0	0	2
PMS-03	Fe	mg/L	0.3	2010-2011	2	0	0	2
PMS-03	Mn	mg/L	0.05	2010-2011	2	0	1	1
PMS-03	Turbidity	NTU	20	2010-2011	2	0	0	2
PMS-03	Color	units	20	2010-2011	2	0	0	2
PMS-03	MBAS	mg/L	0.5	2010-2011	2	0	0	2
PMS-03	%Na	%	60	2010-2011	2	0	0	2
SJC @ La Novia	TDS	mg/L	500	1987-2009	23	18	5	0
SJC @ La Novia	SO4	mg/L	250	1987-1992	6	2	4	0
SJC @ La Novia	Cl	mg/L	250	1987-2009	23	19	0	4
SJC @ La Novia	Fe	mg/L	0.3	1987-2009	23	18	2	3
SJC @ La Novia	Mn	mg/L	0.05	1987-2009	23	18	3	2
SJC @ La Novia	Turbidity	NTU	20	1992-2009	18	0	15	3
SJC @ La Novia	%Na	%	60	2009-2009	1	1	0	0
PMS-02	TDS	mg/L	500	2009-2011	3	0	3	0
PMS-02	SO4	mg/L	250	2009-2011	3	0	2	1
PMS-02	Cl	mg/L	250	2009-2011	3	0	2	1
PMS-02	Fe	mg/L	0.3	2009-2011	3	0	1	2
PMS-02	Mn	mg/L	0.05	2009-2011	3	0	1	2
PMS-02	Turbidity	NTU	20	2009-2011	3	0	0	3
PMS-02	Color	units	20	2009-2011	3	0	2	1
PMS-02	MBAS	mg/L	0.5	2009-2011	3	0	0	3
PMS-02	%Na	%	60	2009-2011	3	0	0	3
PMS-01	TDS	mg/L	500	2009-2011	3	0	3	0
PMS-01	SO4	mg/L	250	2009-2011	3	0	3	0
PMS-01	Cl	mg/L	250	2009-2011	3	0	2	1
PMS-01	Fe	mg/L	0.3	2009-2011	3	0	1	2
PMS-01	Mn	mg/L	0.05	2009-2011	3	0	2	1
PMS-01	Turbidity	NTU	20	2009-2011	3	0	1	2
PMS-01	Color	units	20	2009-2011	3	0	2	1
PMS-01	MBAS	mg/L	0.5	2009-2011	3	0	0	3
PMS-01	%Na	%	60	2009-2011	3	0	0	3
SJC above Trabuco Creek	TDS	mg/L	500	2010-2010	1	0	1	0
SJC above Trabuco Creek	SO4	mg/L	250	2010-2010	1	0	0	1
SJC above Trabuco Creek	Cl	mg/L	250	2010-2010	1	0	1	0
SJC above Trabuco Creek	Fe	mg/L	0.3	2010-2010	1	0	1	0
SJC above Trabuco Creek	Mn	mg/L	0.05	2010-2010	1	0	0	1
SJC above Trabuco Creek	%Na	%	60	2010-2010	1	1	0	0
SJC below Trabuco Creek	TDS	mg/L	500	1986-1987	2	0	2	0
SJC below Trabuco Creek	SO4	mg/L	250	1986-1987	2	0	2	0

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Table 3-8
Surface Water Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Surface Water Quality Objectives

Station	Analyte	Unit	Objective	Time Period	# of Years in Time Period	# of Years not Sampled	# of Years Above	# of Years Below
SJC below Trabuco Creek	Cl	mg/L	250	1986-1987	2	0	2	0
SJC below Trabuco Creek	Fe	mg/L	0.3	1986-1987	2	0	0	2
SJC below Trabuco Creek	Mn		0.05	1986-1987	2	0	2	0
SJC - 9	SO4	mg/L	250	2002-2008	7	4	3	0
SJC - 9	Mn	mg/L	0.05	2002-2003	2	0	1	1
SJC @ Treatment Plant	TDS	mg/L	500	1986-1987	2	0	2	0
SJC @ Treatment Plant	SO4	mg/L	250	1986-1987	2	0	2	0
SJC @ Treatment Plant	Cl	mg/L	250	1986-1987	2	0	2	0
SJC @ Treatment Plant	Fe	mg/L	0.3	1986-1987	2	0	1	1
SJC @ Treatment Plant	Mn	mg/L	0.05	1986-1987	2	0	2	0
SJC @ Camino Capistrano	Turbidity	NTU	20	2002-2009	8	1	1	6
Horno Creek - Upstream to Downstream								
Horno Creek @ Barrier	TDS	mg/L	500	1997-2010	14	0	14	0
Horno Creek @ Barrier	SO4	mg/L	250	1997-2010	14	0	14	0
Horno Creek @ Barrier	Cl	mg/L	250	1997-2010	14	0	14	0
Horno Creek @ Barrier	Fe	mg/L	0.3	2009-2010	2	0	2	0
Horno Creek @ Barrier	Mn	mg/L	0.05	2009-2010	2	0	1	1
Horno Creek @ Barrier	B	mg/L	0.75	1997-2010	14	0	0	14
Horno Creek @ Barrier	F	mg/L	1	1997-2010	14	0	1	13
Horno Creek @ Barrier	Turbidity	NTU	20	2009-2010	2	0	0	2
Horno Creek @ Barrier	MBAS	mg/L	0.5	2009-2010	2	0	0	2
Horno Creek @ Barrier	%Na	%	60	1997-2010	14	14	0	0
Trabuco Creek - Upstream to Downstream								
TC - 8	TDS	mg/L	500	1998-1998	1	0	0	1
TC - 8	SO4	mg/L	250	1998-1998	1	0	0	1
TC - 8	Cl	mg/L	250	1998-1998	1	0	0	1
TC - 8	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC - 8	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC - 8	B	mg/L	0.75	1998-1998	1	0	0	1
TC - 8	F	mg/L	1	1998-1998	1	0	0	1
TC - 8	%Na	%	60	1998-1998	1	0	0	1
Holy Jim	TDS	mg/L	500	1998-1998	1	0	0	1
Holy Jim	SO4	mg/L	250	1998-1998	1	0	0	1
Holy Jim	Cl	mg/L	250	1998-1998	1	0	0	1
Holy Jim	Fe	mg/L	0.3	1998-1998	1	0	0	1
Holy Jim	Mn	mg/L	0.05	1998-1998	1	0	0	1
Holy Jim	B	mg/L	0.75	1998-1998	1	0	0	1
Holy Jim	F	mg/L	1	1998-1998	1	0	0	1
Holy Jim	%Na	%	60	1998-1998	1	0	0	1
TC - 7	TDS	mg/L	500	1998-1998	1	0	0	1
TC - 7	SO4	mg/L	250	1998-1998	1	0	0	1
TC - 7	Cl	mg/L	250	1998-1998	1	0	0	1
TC - 7	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC - 7	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC - 7	B	mg/L	0.75	1998-1998	1	0	0	1
TC - 7	F	mg/L	1	1998-1998	1	0	0	1
TC - 7	%Na	%	60	1998-1998	1	0	0	1
TC @ Mine Adit	TDS	mg/L	500	1998-1998	1	0	1	0
TC @ Mine Adit	SO4	mg/L	250	1998-1998	1	0	1	0
TC @ Mine Adit	Cl	mg/L	250	1998-1998	1	0	0	1
TC @ Mine Adit	Fe	mg/L	0.3	1998-1998	1	0	1	0
TC @ Mine Adit	Mn	mg/L	0.05	1998-1998	1	0	1	0
TC @ Mine Adit	B	mg/L	0.75	1998-1998	1	0	0	1

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Table 3-8
Surface Water Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Surface Water Quality Objectives

Station	Analyte	Unit	Objective	Time Period	# of Years in Time Period	# of Years not Sampled	# of Years Above	# of Years Below
TC @ Mine Adit	F	mg/L	1	1998-1998	1	0	1	0
TC @ Mine Adit	%Na	%	60	1998-1998	1	0	0	1
TC Below Mine Adit	TDS	mg/L	500	1998-1998	1	0	0	1
TC Below Mine Adit	SO4	mg/L	250	1998-1998	1	0	0	1
TC Below Mine Adit	Cl	mg/L	250	1998-1998	1	0	0	1
TC Below Mine Adit	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC Below Mine Adit	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC Below Mine Adit	B	mg/L	0.75	1998-1998	1	0	0	1
TC Below Mine Adit	F	mg/L	1	1998-1998	1	0	0	1
TC Below Mine Adit	%Na	%	60	1998-1998	1	0	0	1
TC @ Alder Spring	Turbidity	NTU	20	2003-2009	7	0	0	7
TC - 2	SO4	mg/L	250	2003-2003	1	0	0	1
TC - 2	Mn	mg/L	0.05	2003-2003	1	0	0	1
TC @ RSMD	TDS	mg/L	500	1998-1998	1	0	1	0
TC @ RSMD	SO4	mg/L	250	1998-1998	1	0	1	0
TC @ RSMD	Cl	mg/L	250	1998-1998	1	0	0	1
TC @ RSMD	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC @ RSMD	Mn	mg/L	0.05	1998-1998	1	0	1	0
TC @ RSMD	B	mg/L	0.75	1998-1998	1	0	0	1
TC @ RSMD	F	mg/L	1	1998-1998	1	0	0	1
TC @ RSMD	%Na	%	60	1998-1998	1	0	0	1
TC @ Rising Groundwater	TDS	mg/L	500	1998-1998	1	0	1	0
TC @ Rising Groundwater	SO4	mg/L	250	1998-1998	1	0	1	0
TC @ Rising Groundwater	Cl	mg/L	250	1998-1998	1	0	0	1
TC @ Rising Groundwater	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC @ Rising Groundwater	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC @ Rising Groundwater	B	mg/L	0.75	1998-1998	1	0	0	1
TC @ Rising Groundwater	F	mg/L	1	1998-1998	1	0	1	0
TC @ Rising Groundwater	%Na	%	60	1998-1998	1	0	0	1
TC - 3	TDS	mg/L	500	1998-1998	1	0	1	0
TC - 3	SO4	mg/L	250	1998-1998	1	0	1	0
TC - 3	Cl	mg/L	250	1998-1998	1	0	0	1
TC - 3	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC - 3	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC - 3	B	mg/L	0.75	1998-1998	1	0	0	1
TC - 3	F	mg/L	1	1998-1998	1	0	0	1
TC - 3	%Na	%	60	1998-1998	1	0	0	1
TC @ Oso	TDS	mg/L	500	1998-1998	1	0	1	0
TC @ Oso	SO4	mg/L	250	1998-1998	1	0	0	1
TC @ Oso	Cl	mg/L	250	1998-1998	1	0	0	1
TC @ Oso	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC @ Oso	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC @ Oso	B	mg/L	0.75	1998-1998	1	0	0	1
TC @ Oso	F	mg/L	1	1998-1998	1	0	0	1
TC @ Oso	%Na	%	60	1998-1998	1	0	0	1
TC @ Crown Valley	TDS	mg/L	500	1998-1998	1	0	1	0
TC @ Crown Valley	SO4	mg/L	250	1998-1998	1	0	0	1
TC @ Crown Valley	Cl	mg/L	250	1998-1998	1	0	0	1
TC @ Crown Valley	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC @ Crown Valley	Mn	mg/L	0.05	1998-1998	1	0	0	1
TC @ Crown Valley	B	mg/L	0.75	1998-1998	1	0	0	1
TC @ Crown Valley	F	mg/L	1	1998-1998	1	0	0	1
TC @ Crown Valley	%Na	%	60	1998-1998	1	0	0	1
TC @ Avery	Turbidity	NTU	20	2002-2008	7	0	0	7

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Table 3-8
Surface Water Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Surface Water Quality Objectives

Station	Analyte	Unit	Objective	Time Period	# of Years in Time Period	# of Years not Sampled	# of Years Above	# of Years Below
TC - 2A	TDS	mg/L	500	1998-1998	1	0	1	0
TC - 2A	SO4	mg/L	250	1998-1998	1	0	0	1
TC - 2A	Cl	mg/L	250	1998-1998	1	0	0	1
TC - 2A	Fe	mg/L	0.3	1998-1998	1	0	0	1
TC - 2A	Mn	mg/L	0.05	1998-1998	1	0	1	0
TC - 2A	B	mg/L	0.75	1998-1998	1	0	0	1
TC - 2A	F	mg/L	1	1998-1998	1	0	0	1
TC - 2A	%Na	%	60	1998-1998	1	0	0	1
TC @ Camino Cap	TDS	mg/L	500	1986-1992	7	2	3	2
TC @ Camino Cap	SO4	mg/L	250	1986-1992	7	2	1	4
TC @ Camino Cap	Cl	mg/L	250	1986-1992	7	2	0	5
TC @ Camino Cap	Fe	mg/L	0.3	1986-1992	7	2	4	1
TC @ Camino Cap	Mn	mg/L	0.05	1986-1992	7	2	5	0
TC - 5	SO4	mg/L	250	2002-2003	2	0	0	2
TC - 5	Mn	mg/L	0.05	2002-2003	2	0	0	2
TC @ Del Obispo	TDS	mg/L	500	1986-1991	6	2	4	0
TC @ Del Obispo	SO4	mg/L	250	1986-1991	6	2	4	0
TC @ Del Obispo	Cl	mg/L	250	1986-1991	6	2	3	1
TC @ Del Obispo	Fe	mg/L	0.3	1986-1991	6	2	2	2
TC @ Del Obispo	Mn	mg/L	0.05	1986-1991	6	2	2	2
TC @ Del Obispo	Turbidity	NTU	20	1994-2009	16	5	10	1
Oso Creek - Upstream to Downstream								
OC @ Barrier	TDS	mg/L	500	1997-2010	14	0	14	0
OC @ Barrier	SO4	mg/L	250	1997-2010	14	0	14	0
OC @ Barrier	Cl	mg/L	250	1997-2010	14	0	14	0
OC @ Barrier	Fe	mg/L	0.3	2009-2010	2	0	2	0
OC @ Barrier	Mn	mg/L	0.05	2009-2010	2	0	2	0
OC @ Barrier	B	mg/L	0.75	1997-2010	14	0	0	14
OC @ Barrier	F	mg/L	1	1997-2010	14	0	1	13
OC @ Barrier	Turbidity	NTU	20	2009-2010	2	0	0	2
OC @ Barrier	MBAS	mg/L	0.5	2009-2010	2	0	0	2
OC @ Barrier	%Na	%	60	1997-2010	14	14	0	0
OC @ Crown Valley	TDS	mg/L	500	1986-1987	2	0	2	0
OC @ Crown Valley	SO4	mg/L	250	1986-1987	2	0	2	0
OC @ Crown Valley	Cl	mg/L	250	1986-1987	2	0	2	0
OC @ Crown Valley	Fe	mg/L	0.3	1986-1987	2	0	1	1
OC @ Crown Valley	Mn	mg/L	0.05	1986-1987	2	0	2	0
OC @ Crown Valley	Turbidity	NTU	20	1991-1999	9	1	7	1
CDM-8	TDS	mg/L	500	1986-1992	7	2	5	0
CDM-8	SO4	mg/L	250	1986-1992	7	2	5	0
CDM-8	Cl	mg/L	250	1986-1992	7	2	5	0
CDM-8	Fe	mg/L	0.3	1986-1992	7	2	3	2
CDM-8	Mn	mg/L	0.05	1986-1992	7	2	4	1
OC - 3	SO4	mg/L	250	2002-2003	2	0	2	0
OC - 3	Mn	mg/L	0.05	2002-2003	2	0	2	0

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Table 3-9
Groundwater Quality Data in Exceedance of Drinking Water Maximum Contaminant Levels
2006 to 2010

Analyte Group/Constituent	Maximum Contaminant Levels[1]					Exceedance				Non-Exceedance			
	Primary	Secondary	Notification Level	Units	Notes	# of Wells	% of Wells Exceeding MCL	Count	% of Samples Exceeding MCL	# of Wells	% of Wells Not Exceeding MCL	Count	% of Samples Not Exceeding MCL
Inorganic Constituents													
Total Dissolved Solids		500		mg/L		22	100%	424	100%	0	0%	0	0%
Manganese		0.05	0.5	mg/L		20	77%	422	95%	6	23%	21	5%
Iron		300		mg/L		28	51%	398	73%	27	49%	144	27%
Sulfate		250		mg/L		98	89%	375	88%	12	11%	52	12%
Chloride		250		mg/L		64	75%	162	55%	21	25%	132	45%
Arsenic	10			ug/L		35	40%	64	20%	52	60%	249	80%
Chromium	50			ug/L	2	8	13%	14	6%	54	87%	223	94%
Aluminum		0.05		mg/L	3,4	1	8%	1	2%	11	92%	48	98%
Nitrate-Nitrogen	10			mg/L		3	3%	5	1%	86	97%	439	99%
Lead	0.015			mg/L		2	10%	2	7%	19	90%	26	93%
Vanadium			0.05	mg/L		2	9%	2	8%	20	91%	24	92%
Barium	1			mg/L		1	4%	1	2%	26	96%	63	98%
Cadmium	5			ug/L		1	2%	1	1%	46	98%	167	99%
Copper	1.3	1		mg/L		1	2%	1	0%	55	98%	349	100%
Foaming Agents		0.5		mg/L		1	5%	1	1%	20	95%	183	99%
Mercury	0.002			mg/L		1	4%	1	2%	26	96%	63	98%
Nitrite-Nitrogen	1			mg/L		1	2%	1	1%	65	98%	82	99%
Silver		0.1		mg/L		1	1%	1	4%	72	99%	26	96%
Mercury	0.002			mg/L		1	4%	1	2%	26	96%	63	98%
Nickel	0.1			mg/L		1	2%	1	1%	45	98%	167	99%
Zinc		5		mg/L		1	2%	1	0.3%	55	98%	348	99.7%
General Physical													
Specific Conductance		900		umhos/cm		18	58%	344	87%	13	42%	52	13%
Turbidity		5		NTU		15	52%	145	59%	14	48%	100	41%
Color		15		Units		13	41%	73	29%	19	59%	178	71%
Odor		3		Threshold Units		11	35%	38	18%	20	65%	179	82%
pH		6.5<pH<8.5		Units		2	8%	2	1%	22	92%	342	99%
Chlorinated VOCs													
Methyl Tert-Butyl Ether	13	5		ug/L		106	29%	632	21%	260	71%	2349	79%
Tert-Butyl Alcohol			12	ug/L		111	30%	567	20%	256	70%	2263	80%
Benzene	1			ug/L		59	17%	386	13%	283	83%	2495	87%
Ethylbenzene	300			ug/L		15	5%	121	4.2%	290	95%	2760	96%
Naphthalene			17	ug/L		16	6%	96	6%	241	94%	1426	94%
1,2-Dichloroethane	0.5			ug/L		27	10%	85	6%	238	90%	1456	94%
Toluene	150			ug/L		12	4%	82	3%	292	96%	2798	97%
1,2,4-Trimethylbenzene	5			ug/L		12	5%	66	4%	245	95%	1465	96%
Total Xylene	1750			ug/L		12	4%	61	2%	267	96%	2573	98%
1,3,5-Trimethylbenzene			330	ug/L		9	4%	32	2%	247	96%	1499	98%
n-Propylbenzene			260	ug/L		6	2%	24	2%	247	98%	1507	98%

Table 3-9
Groundwater Quality Data in Exceedance of Drinking Water Maximum Contaminant Levels
2006 to 2010

Analyte Group/Constituent	Maximum Contaminant Levels[1]					Exceedance				Non-Exceedance			
	Primary	Secondary	Notification Level	Units	Notes	# of Wells	% of Wells Exceeding MCL	Count	% of Samples Exceeding MCL	# of Wells	% of Wells Not Exceeding MCL	Count	% of Samples Not Exceeding MCL
1,2-Dibromo-3-chloropropane	0.2			ug/L		16	6%	23	2%	246	94%	1488	98%
Chlorinated VOCs - continued													
Ethylene Dibromide	0.05			ug/L		13	5%	21	1%	246	95%	1491	99%
1,2,3-Trichloropropane			0.005	ug/L		13	5%	20	1%	248	95%	1508	99%
Dichloromethane	5			ug/L		13	5%	20	1%	248	95%	1520	99%
Tetrachloroethene	5			ug/L		6	2%	14	1%	247	98%	1522	99%
1,2-Dichloropropane	5			ug/L		4	2%	10	1%	248	98%	1530	99%
Methyl Isobutyl Ketone			120	ug/L		4	2%	10	1%	225	98%	1045	99%
Trichloroethene	5			ug/L		3	1%	10	1%	248	99%	1530	99%
1,1,2,2-Tetrachloroethane	1			ug/L		3	1%	6	0%	248	99%	1534	100%
1,1,2-Trichloroethane	5			ug/L		4	2%	6	0%	248	98%	1534	100%
Carbon Tetrachloride	0.5			ug/L		3	1%	6	0%	248	99%	1534	100%
Vinyl Chloride				ug/L		3	1%	6	0%	248	99%	1534	100%
1,1-Dichloroethane	5			ug/L		3	1%	5	0%	248	99%	1535	100%
1,1-Dichloroethene	6			ug/L		3	1%	5	0%	248	99%	1535	100%
1,2,4-Trichlorobenzene	5			ug/L		3	1%	5	0%	248	99%	1535	100%
1,4-Dichlorobenzene	5			ug/L		3	1%	5	0%	248	99%	1535	100%
Cis-1,2-Dichloroethene	6			ug/L		3	1%	5	0%	248	99%	1535	100%
Styrene	100			ug/L		3	1%	3	0%	248	99%	1537	100%
Trans-1,2-Dichloroethene	10			ug/L		2	1%	3	0%	248	99%	1537	100%
Trichlorofluoromethane	150			ug/L		2	1%	3	0%	248	99%	1537	100%
Chlorobenzene	70			ug/L		2	1%	2	0%	248	99%	1538	100%
n-Butylbenzene			260	ug/L		1	0%	1	0%	247	100%	1530	100%
Sec-Butylbenzene			260	ug/L		1	0%	1	0%	248	100%	1530	100%
Tert-Butylbenzene			260	ug/L		1	0%	1	0%	248	100%	1530	100%

1 The California MCL was used for exceedance analysis unless otherwise noted.
2 MCL is for total chromium
3 US EPA Secondary MCL Threshold 1
4 The US EPA Secondary MCL was used to compute counts and percentages of exceedances because it is a lower than the California MCL. The counts and percentages of exceedances were calculated for the US EPA Secondary MCL Threshold 2 (0.2 mg/L),California Secondary MCL (0.2 mg/L), and California Primary MCL (1 mg/L) and were determined to be zero.

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Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Lower San Juan Sub Area	**TDS**			**Cl**			**SO4**			**%Na**			**NO3-N**			**Fe**			**Mn**			**MBAS**			**B**			**Turbidity**			**Color**			**F**		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
08S08W01F001	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W01K003	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W01Q005	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W01Q01	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W12A001	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W12B002	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W12C002	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W14H003	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W14Q001 (Rancho SJ)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W23A007	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S08W23A05	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
AMW-01(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
Capistrano Beach CWD-4	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7-1 (T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7-1R(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7-2(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7-3(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7-4(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-7-5(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8-1(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8-2(t0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8-3(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8-4(t0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8-5(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-8-6(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-1(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-2(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-3(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-4(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-5(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-6(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-7	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMT-9-7(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CMW-09(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
CMW-11(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
Crean Well	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CVWD #2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CVWD-1	1	4	0	2	0	3	2	3	0	2	0	3	1	0	4	1	1	3	1	4	0	3	0	2	3	0	2	1	0	4	1	0	4	2	0	3
Dance Hall	0	5	0	1	0	4	1	4	0	1	0	4	0	0	5	0	5	0	0	5	0	3	0	3	4	0	1	0	5	0	0	3	2	1	0	4
Hollywood 2A	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Kinoshita	0	5	0	1	0	4	1	3	1	1	0	4	0	0	5	0	5	0	0	5	0	3	0	2	4	0	1	1	4	0	1	2	2	1	0	4
Mission Street	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-01(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-02(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-02A(T0605902510)	5	0	0	4	0	1	4	0	1	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-02B(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-03(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Lower San Juan Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
MW-03(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-03R(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-04(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-04(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-05(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-05(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-06(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW07 (T0605902573)	5	0	0	5	0	0	3	0	2	5	0	0	3	0	2	3	1	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-07(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW08 (T0605902573)	5	0	0	5	0	0	4	1	0	5	0	0	4	0	1	3	0	2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-08(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-08A(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-08B(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW09 (T0605902573)	5	0	0	5	0	0	3	2	0	5	0	0	3	0	2	3	0	2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-09A(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-09B(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW1 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW10 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902573)	5	0	0	5	0	0	3	0	2	5	0	0	4	0	1	3	0	2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10A(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-10B(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW11 (T0605902573)	5	0	0	5	0	0	4	1	0	5	0	0	4	0	1	3	2	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11A(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-11B(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-12(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-12A(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-12A(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	1	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-12B(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-12B(T0605902510)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-12C(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-12D(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-13(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-13A(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-13A(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-13B(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-13B(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-13C(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-14(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-14A(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-14A(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-14B(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-14B(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-14C(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Lower San Juan Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
MW-15(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-15A(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-15A(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-15B(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-15B(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-15C(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-15D(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-16(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-16(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-16A(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-16B(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-16C(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-16D(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-17(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-18(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-19A(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-19B(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-19C(T0605902379)	5	0	0	4	0	1	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW2 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-20A(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	1	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	1	0
MW-20B(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	1	0
MW-20C(T0605902379)	5	0	0	4	1	0	4	1	0	4	1	0	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	1	0
MW-20D(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	1	0
MW-21(T0605902379)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-21A(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-21B(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-22A(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-22B(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-23A(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-23B(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-24(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-24A(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-24B(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-25(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-25A(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-25B(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-26(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-27(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-28(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW3 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-30(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-31(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-32(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-34(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-35(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-36(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Lower San Juan Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
MW37(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW38(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW4 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW5 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW6 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902362)	5	0	0	5	0	0	4	1	0	5	0	0	5	0	0	5	0	0	4	1	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW7 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605902362)	5	0	0	5	0	0	4	1	0	5	0	0	5	0	0	5	0	0	4	1	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7A(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-7B(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW-7C(T0605902379)	5	0	0	4	1	0	4	1	0	4	0	1	4	0	1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1
MW8 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW9 (T0605902575)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-12(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-13(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-14(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-15(T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-22/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-22/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-23/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-23/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-24/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-24/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-25/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-25/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-26/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-26/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-27/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-27/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-28/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-28/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-29/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-29/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Lower San Juan Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
OZ-30/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-30/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-31/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-31/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-32/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-32/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-33/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-33/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-34/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-34/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-35/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-35/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-36/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-36/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-37/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-37/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-38/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-38/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-39/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-39/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-40/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-40/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-41/A (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
OZ-41/B (T0605902573)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Rosan Ranch-1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Rosan Ranch-2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RP-1(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RP-2(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RP-3(T0605902526)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RW-15(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RW-16(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RW-2(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
RW-3(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Schuller	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SJBA #1	5	0	0	5	0	0	5	0	0	5	0	2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SJBA MW-01N	0	2	3	0	0	5	0	2	3	0	4	1	5	0	0	0	5	0	0	5	0	0	0	5	5	0	0	0	4	1	0	1	4	5	0	0
SJBA MW-01S	0	2	3	0	0	5	0	1	4	0	0	5	5	0	0	0	5	0	0	5	0	0	0	5	5	0	0	0	5	0	0	3	2	5	0	0
SJBA MW-02	0	5	0	0	0	5	0	5	0	0	0	5	5	0	0	0	5	0	0	5	0	0	1	4	5	0	0	0	5	0	0	3	2	5	0	0
SJBA MW-03	0	2	3	0	1	4	0	2	3	0	0	5	5	0	0	0	5	0	0	5	0	0	0	5	5	0	0	0	5	0	0	4	1	5	0	0
SJBA MW-07	0	5	0	0	0	5	0	5	0	0	0	5	5	0	0	0	5	0	0	5	0	0	0	5	5	0	0	0	5	0	0	3	2	5	0	0
SJBA MW-08	0	5	0	0	0	5	0	5	0	0	0	5	5	0	0	0	5	0	0	4	1	0	0	5	5	0	0	0	5	0	0	2	3	5	0	0
SJBA-2	0	5	0	1	0	4	1	4	0	1	0	4	0	0	5	0	5	0	0	5	0	3	0	2	4	0	1	0	0	5	0	0	5	1	0	4
SJBA-4	0	5	0	1	0	4	1	4	0	1	0	4	0	0	5	0	5	0	0	5	0	3	0	2	4	0	1	0	4	1	0	0	5	1	0	4
SP-1(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SP-2(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SP-3(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SP-4(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SP-5(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SP-6(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SP-7(T0605902362)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Lower San Juan Sub Area	**TDS**			**Cl**			**SO4**			**%Na**			**NO3-N**			**Fe**			**Mn**			**MBAS**			**B**			**Turbidity**			**Color**			**F**		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
Stonehill	1	4	0	2	3	0	2	3	0	2	0	3	1	3	1	1	4	0	1	4	0	2	0	3	3	0	2	4	1	0	2	3	0	4	0	1
SW-16A(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Sycamore Stables	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
TCW-1(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
TCW-2(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
TW-1 (SJC)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Vermulean Well	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-12(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-13(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-14(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-15(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-16(T0605902502)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VW-2(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VW-3(T0605902524)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Middle San Juan Sub Area	**TDS**			**Cl**			**SO4**			**%Na**			**NO3-N**			**Fe**			**Mn**			**MBAS**			**B**			**Turbidity**			**Color**			**F**		
Objective:	750 mg/L			375 mg/L			375 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
RMV 7	4	0	1	4	0	1	4	0	1	4	0	1	0	0	5	4	0	1	4	0	1	4	0	1	5	0	0	4	0	1	4	0	1	4	0	1

Middle Trabuco Sub Area	**TDS**			**Cl**			**SO4**			**%Na**			**NO3-N**			**Fe**			**Mn**			**MBAS**			**B**			**Turbidity**			**Color**			**F**		
Objective:	750 mg/L			375 mg/L			375 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
07S08W25B004	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
07S08W25K002	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
07S08W25L001	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
07S08W36L01	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Christmas Tree Farm 1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Egan Tract-2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
IW-1	0	5	0	5	0	0	0	0	5	5	0	0	0	0	5	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-01(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-02(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-04(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-05(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-06(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-07(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-08(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-09(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902366)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW1(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW10(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW11(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Middle Trabuco Sub Area	**TDS**			**Cl**			**SO4**			**%Na**			**NO3-N**			**Fe**			**Mn**			**MBAS**			**B**			**Turbidity**			**Color**			**F**		
Objective:	750 mg/L			375 mg/L			375 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
MW12(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-12(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW13(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW14(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-15(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902366)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW2(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW2U(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902366)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW3(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605933373)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW3U(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902366)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW4(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW4U(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902366)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW5(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW5U(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW6(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW7(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW8(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW9(T0605902555)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605952809)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
North Open Space(NOS)	2	3	0	2	0	3	2	2	1	2	0	3	2	0	3	2	0	3	2	0	3	2	0	3	4	0	1	2	1	2	2	0	3	2	0	3
P-6	0	5	0	5	0	0	0	0	5	5	0	0	0	0	5	5	0	0	5	0	0	5	0	0	5	0	0	4	0	1	5	0	0	5	0	0
Rosenbaum 2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Ortega Sub Area	**TDS**			**Cl**			**SO4**			**%Na**			**NO3-N**			**Fe**			**Mn**			**MBAS**			**B**			**Turbidity**			**Color**			**F**		
Objective:	1,100 mg/L			375 mg/L			450 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
07S07W33B01	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S07W06K001	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S07W06K03	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S07W06P001	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
08S07W07C03	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Cerritos Ranch 3	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CVWD # 5	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CVWD #4	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
CVWD #5A	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
La Couague	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-03R(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Ortega Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,100 mg/L			375 mg/L			450 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
MW-1(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-12(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-13(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-14(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-15(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-16(T0605902510)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-16(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902561)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Orange County Water Works #4	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SJBA MW-04	0	5	0	0	0	5	0	3	2	0	0	5	5	0	0	0	5	0	0	5	0	0	0	5	5	0	0	0	5	0	0	3	2	5	0	0
SJBA MW-05	0	5	0	0	0	5	0	5	0	0	0	5	5	0	0	0	5	0	0	4	1	0	0	5	5	0	0	0	5	0	0	3	2	5	0	0
SJBA MW-06	0	2	3	0	0	5	0	1	4	0	0	5	5	0	0	0	5	0	0	5	0	0	0	5	5	0	0	0	5	0	0	3	2	5	0	0
SJHGC-Large	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
SJHGC-Small	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
South Cooks	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
The Oaks	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Tirador	0	5	0	1	0	4	1	4	0	1	0	4	0	0	5	0	5	0	0	5	0	3	0	3	4	0	1	0	5	0	0	5	0	1	2	2
TW-2 (SJC)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
W-2(T0605902592)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Oso Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
07S08W25L001	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	0	0	5	0	0	5	0	0	5
B-11(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-12(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-13(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-13(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-14(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	2	1	2	2	0	3	2	0	3
B-15(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-16(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-17(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Oso Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
B-20(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-28(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-30(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-31(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-36(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
B-37(T0605902620)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Christmas Tree Farm 1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Christmas Tree Farm 2	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-1(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-11(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-13(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-14(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-16(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-17(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-18(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-19(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-20(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-21(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-22(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-4(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-5(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
E-7(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Egan Tract-1	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Egan Tract-3	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
GW-1(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902475)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1(T0605940201)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW1(T0605991301)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902568)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-10(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-11(T0605902568)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-12(T0605902568)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-1A(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW1C(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-2(T0605940201)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW2(T0605991301)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-24(T0605902454)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-25(T0605902454)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-26(T0605902454)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-27(T0605902454)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-28(T0605902454)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-10
Groundwater Quality Data in Exceedance of San Diego Regional Water Quality Control Board Basin Plan Groundwater Quality Objectives - 2006 to 2010

Oso Sub Area	TDS			Cl			SO4			%Na			NO3-N			Fe			Mn			MBAS			B			Turbidity			Color			F		
Objective:	1,200 mg/L			400 mg/L			500 mg/L			60%			10 mg/L			0.3 mg/L			0.05 mg/L			0.5 mg/L			0.75 mg/L			5 NTU			15 units			1 mg/L		
	# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years			# of Years		
Well Name	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below	Not Samp	Above	Below
MW-3(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-3(T0605940201)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW3(T0605991301)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-4(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-5(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-6(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-7(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW7A(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW7B(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-8(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW8A(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW8B(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902381)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902472)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902568)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
MW-9(T0605902574)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
Rosenbaum 1	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	1	0	4	5	0	0	5	0	0	5	0	0	5	0	0
Shaw	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
TCW(T0605902580)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-1(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-2(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-3(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-4(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-5(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-6(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0
VEW-7(T0605902455)	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0	5	0	0

Table 3-11
Annual Groundwater Water Budget for San Juan Basin Model Area with Analytics - Model Scenario 2h[1,2]
(acre-ft)

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
						=[1]+[2]+[3]+[4]+[5]					=[7]+[8]+[9]+[10]	=[6]-[11]		=If(S_{min}>[13], S_{min}-[13],0), 0)	=P_{req}-[7]
Hydrologic Year	Recharge Components						Discharge Components					Change in Groundwater Storage	End of Period Storage	Deviation from Minimum Storage to Maintain Production	Unmet Production Demand
	Underflow Inflow from Up-Gradient of San Juan, Horno, Trabuco and Oso Creeks	Streambed Infiltration Including Natural Water and Return Flow	Deep Infiltration of Return Flow	Areal Recharge and Mountain Front Runoff Recharge	Underflow Inflow from Ocean	Total Recharge	Groundwater Production	Evapotrans-piration	Rising Water Discharge to Streamflow	Underflow to Ocean	Total Discharge				
	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	25,000	27,000	11,214
1947	2,700	1,436	134	7	0	4,277	10,919	520	38	163	11,640	-7,363	17,637	-9,363	295
1948	2,700	2,392	134	21	93	5,340	10,589	520	3	8	11,121	-5,781	11,857	-15,143	625
1949	2,700	3,908	134	65	266	7,074	9,237	520	17	2	9,777	-2,703	9,154	-17,846	1,977
1950	2,700	3,542	134	154	452	6,982	8,036	520	6	0	8,562	-1,580	7,574	-19,426	3,178
1951	2,700	4,325	134	149	527	7,836	7,355	520	16	0	7,891	-55	7,519	-19,481	3,859
1952	2,700	11,097	134	891	280	15,102	9,123	520	278	5	9,926	5,177	12,695	-14,305	2,091
1953	2,700	2,740	134	52	474	6,101	8,250	520	1	0	8,771	-2,671	10,025	-16,975	2,964
1954	2,700	5,021	134	233	484	8,572	7,988	520	33	0	8,541	31	10,056	-16,944	3,226
1955	2,700	3,461	134	83	511	6,889	7,724	520	7	0	8,252	-1,362	8,693	-18,307	3,490
1956	2,700	5,435	134	320	470	9,060	8,009	520	63	0	8,593	467	9,160	-17,840	3,205
1957	2,700	5,559	134	118	470	8,982	7,760	520	13	0	8,293	688	9,849	-17,151	3,454
1958	2,700	10,928	134	835	274	14,871	9,707	520	326	7	10,560	4,311	14,160	-12,840	1,507
1959	2,700	3,255	134	95	508	6,693	8,507	520	8	0	9,034	-2,341	11,819	-15,181	2,707
1960	2,700	3,896	134	54	489	7,273	8,000	520	10	0	8,530	-1,257	10,561	-16,439	3,214
1961	2,700	2,052	134	24	608	5,518	7,405	520	0	0	7,925	-2,407	8,155	-18,845	3,809
1962	2,700	8,033	134	479	399	11,744	8,561	520	222	2	9,306	2,439	10,593	-16,407	2,653
1963	2,700	3,996	134	140	498	7,468	7,809	520	1	0	8,330	-862	9,731	-17,269	3,405
1964	2,700	2,983	134	55	557	6,429	7,553	520	0	0	8,073	-1,645	8,086	-18,914	3,661
1965	2,700	9,435	134	735	456	13,460	7,775	520	210	2	8,506	4,954	13,040	-13,960	3,439
1966	2,700	7,435	134	284	362	10,915	8,851	520	160	3	9,534	1,381	14,421	-12,579	2,363
1967	2,700	7,347	134	383	280	10,843	10,078	520	79	3	10,681	163	14,583	-12,417	1,136
1968	2,700	2,977	134	49	496	6,356	8,605	520	0	0	9,125	-2,769	11,814	-15,186	2,609
1969	2,700	13,718	134	1,200	199	17,951	10,863	520	504	17	11,904	6,048	17,862	-9,138	351
1970	2,700	4,661	134	86	385	7,967	9,873	520	16	0	10,410	-2,443	15,419	-11,581	1,341
1971	2,700	3,312	134	49	508	6,703	8,544	520	7	0	9,070	-2,367	13,052	-13,948	2,670
1972	2,700	2,463	134	18	570	5,884	7,819	520	0	0	8,339	-2,454	10,597	-16,403	3,395
1973	2,700	4,508	134	138	472	7,952	8,046	520	32	0	8,599	-647	9,950	-17,050	3,168
1974	2,700	4,702	134	144	495	8,175	7,883	520	16	0	8,419	-244	9,707	-17,293	3,331
1975	2,700	5,346	134	164	455	8,799	8,068	520	53	1	8,642	157	9,864	-17,136	3,146
1976	2,700	4,640	134	104	487	8,065	7,862	520	8	0	8,390	-325	9,539	-17,461	3,352
1977	2,700	4,261	134	88	486	7,670	7,723	520	2	0	8,245	-575	8,963	-18,037	3,491
1978	2,700	16,862	134	1,121	158	20,975	10,308	520	592	19	11,438	9,536	18,500	-8,500	906
1979	2,700	10,897	134	523	150	14,405	10,969	520	347	22	11,858	2,547	21,047	-5,953	245
1980	2,700	14,742	134	1,279	98	18,954	11,228	520	643	48	12,439	6,514	27,561	0	-14
1981	2,700	3,763	134	103	263	6,962	11,056	520	12	1	11,590	-4,627	22,934	-4,066	158
1982	2,700	8,434	134	286	244	11,798	10,934	520	115	3	11,572	226	23,160	-3,840	280
1983	2,700	15,983	134	916	74	19,807	11,139	520	489	32	12,180	7,628	30,787	0	75
1984	2,700	4,495	134	102	257	7,689	11,008	520	55	3	11,587	-3,898	26,890	-110	206
1985	2,700	4,917	134	103	314	8,168	10,772	520	26	2	11,320	-3,151	23,738	-3,262	442
1986	2,700	6,866	134	221	331	10,252	10,496	520	88	2	11,106	-854	22,885	-4,115	718
1987	2,700	4,561	134	82	431	7,908	9,664	520	10	0	10,194	-2,285	20,599	-6,401	1,550
1988	2,700	5,034	134	165	480	8,512	9,072	520	25	0	9,617	-1,105	19,494	-7,506	2,142
1989	2,700	3,707	134	82	478	7,101	9,047	520	7	0	9,573	-2,472	17,022	-9,978	2,167
1990	2,700	3,684	134	85	512	7,115	8,631	520	14	0	9,165	-2,051	14,972	-12,028	2,583
1991	2,700	7,251	134	289	430	10,804	9,314	520	152	1	9,988	816	15,788	-11,212	1,900
1992	2,700	10,638	134	768	289	14,530	10,443	520	299	5	11,267	3,263	19,050	-7,950	771
1993	2,700	15,578	134	1,719	97	20,228	11,208	520	697	47	12,472	7,756	26,806	-194	6
1994	2,700	4,208	134	104	283	7,429	11,049	520	31	2	11,602	-4,173	22,634	-4,366	165
1995	2,700	15,353	134	1,143	93	19,423	11,214	520	578	42	12,354	7,070	29,703	0	0
1996	2,700	10,018	134	536	152	13,541	11,232	520	256	12	12,020	1,520	31,224	0	-18
1997	2,700	10,340	134	782	98	14,053	11,214	520	373	37	12,145	1,909	33,132	0	0
1998	2,700	19,130	134	1,617	2	23,584	11,214	520	922	188	12,845	10,739	43,871	0	0
1999	2,700	2,422	134	33	62	5,351	11,214	520	16	41	11,791	-6,440	37,431	0	0
2000	2,700	5,982	134	159	108	9,083	11,232	520	100	14	11,866	-2,783	34,648	0	-18
2001	2,700	6,793	134	167	137	9,932	11,214	520	112	12	11,858	-1,926	32,722	0	0
2002	2,700	2,462	134	29	340	5,665	11,084	520	0	0	11,605	-5,940	26,782	-218	130
2003	2,700	7,411	134	264	269	10,778	10,981	520	122	3	11,627	-849	25,933	-1,067	233
2004	2,700	7,648	134	237	305	11,025	10,657	520	102	2	11,281	-256	25,677	-1,323	557
2005	2,700	13,104	134	955	125	17,019	11,206	520	509	31	12,266	4,753	30,430	0	8
2006	2,700	3,989	134	123	277	7,223	11,010	520	29	1	11,560	-4,337	26,093	-907	204
2007	2,700	1,413	134	4	518	4,769	10,014	520	0	0	10,534	-5,765	20,328	-6,672	1,200
2008	2,700	5,251	134	244	507	8,835	9,304	520	36	0	9,860	-1,024	19,304	-7,696	1,910
2009	2,700	4,736	134	203	465	8,238	9,518	520	87	1	10,125	-1,887	17,417	-9,583	1,696
2010	2,700	12,002	134	1,007	341	16,184	10,247	520	341	3	11,112	5,072	22,489	-4,511	967
Entire Investigation Period (1947-2010)															
Average	2,700	6,696	134	354	339	10,223	9,585	520	146	12	10,263	-39	18,394	-9,568	1,629
Median	2,700	4,969	134	156	352	8,375	9,686	520	34	2	10,302	-851	17,220	-9,780	1,528
Standard Deviation	0	4,270	0	421	165	4,575	1,369	0	210	32	1,501	3,944	8,699	6,987	1,369
Coef of Variation	0%	64%	0%	119%	49%	45%	14%	0%	145%	262%	15%	-10054%	47%	-73%	84%
Max	2,700	19,130	134	1,719	608	23,584	11,232	520	922	188	12,845	10,739	43,871	0	3,859
Min	2,700	1,413	134	4	0	4,277	7,355	520	0	0	7,891	-7,363	7,519	-19,481	-18
Dry Period Hydrology (1947-1976)															
Average	2,700	5,153	134	238	417	8,643	8,560	520	71	7	9,158	-515	11,239	-15,761	2,654
Median	2,700	4,416	134	128	473	7,894	8,041	520	14	0	8,596	-611	10,040	-16,960	3,173
Standard Deviation	0	3,512	0	334	112	3,744	919	0	154	5	1,038	3,028	2,860	2,860	919
Coef of Variation	0%	68%	0%	141%	27%	43%	11%	0%	216%	64%	11%	-587%	25%	-18%	35%
Max	2,700	16,862	134	1,279	608	20,975	11,228	520	643	48	12,439	9,536	27,561	0	3,859
Min	2,700	2,052	134	18	98	5,518	7,405	520	0	0	7,925	-4,627	8,086	-18,914	-14
Average Period Hydrology (1963-1992)															
Average	2,700	6,787	134	325	374	10,321	9,381	520	132	5	10,039	282	16,702	-10,443	1,833
Median	2,700	4,975	134	154	407	8,344	9,489	520	43	1	10,091	-450	16,405	-10,595	1,725
Standard Deviation	0	4,298	0	449	145	4,605	1,283	0	216	14	1,421	3,865	6,159	5,885	1,283
Coef of Variation	0%	63%	0%	138%	39%	45%	14%	0%	163%	247%	14%	1371%	37%	-56%	70%
Max	2,700	16,862	134	1,719	570	20,975	11,232	520	697	48	12,472	9,536	31,224	0	3,491
Min	2,700	2,463	134	18	74	5,884	7,723	520	0	0	8,245	-4,627	8,963	-18,037	-18
Wet Period Hydrology (1978-1983)															
Average	2,700	11,780	134	705	164	15,484	10,939	520	366	21	11,846	3,637	23,998	-3,727	275
Median	2,700	12,820	134	720	154	16,679	11,013	520	418	21	11,724	4,531	23,047	-3,953	201
Standard Deviation	0	5,070	0	473	76	5,445	328	0	257	18	392	5,294	4,462	3,336	328
Coef of Variation	0%	43%	0%	67%	46%	35%	3%	0%	70%	86%	3%	146%	19%	-90%	119%
Max	2,700	16,862	134	1,279	263	20,975	11,228	520	643	48	12,439	9,536	30,787	0	906
Min	2,700	3,763	134	103	74	6,962	10,308	520	12	1	11,438	-4,627	18,500	-8,500	-14

Notes

[1] Water budget as shown in columns 1 through 12 based on unpublished modeling results provided MWDOC January 2013 representing 2014 requested pumping and 2014 landuse and water management conditions.

[2] Minimum storage (S_{min}) assumed to be 27,000 acre-ft; Pumping request in 2014 (P_{req}) is 11,216; Initial sotrage is 25,000 acre-ft.

Table 4-1

Historical and Projected (Normal Year) Water Demands and Supplies for Agencies in the San Juan Basin Authority[1]

Agency Water Supply and Demand	Historical (Fiscal Years- July 1 through June 30)					Projection				
	05-06	06-07	07-08	08-09	09-10	2015	2020	2025	2030	2035
City of San Juan Capistrano[2]										
Service Area Population	38,909	39,136	39,580	39,835	40,262	41,039	41,816	42,593	43,370	44,147
Total Water Demand	8,856	9,974	9,887	9,852	8,783	9,400	9,650	9,900	10,150	10,400
Potable	8,521	9,818	9,720	9,589	8,359	7,450	7,700	7,950	8,200	8,450
Non-Potable	335	156	167	263	424	1,950	1,950	1,950	1,950	1,950
Total Potable Supplies	8,877	9,297	9,347	9,698	8,676	8,813	9,063	9,313	9,563	9,813
San Juan Basin Groundwater	5,966	3,267	1,616	2,756	2,297	6,813	6,813	6,813	6,813	6,813
Imported	2,912	6,029	7,731	6,942	6,379	2,000	2,250	2,500	2,750	3,000
Non-Potable Supplies	335	156	167	263	424	1,950	1,950	1,950	1,950	1,950
Recycled Water	0	0	0	0	0	0	0	0	0	0
San Juan Basin Groundwater	335	156	167	263	424	1,950	1,950	1,950	1,950	1,950
Surface Water Diversions	0	0	0	0	0	0	0	0	0	0
Moulton Niguel Water District[3]										
Service Area Population	168,172	168,327	169,361	170,675	172,068	174,342	176,616	178,891	181,165	183,439
Total Water Demand	39,819	44,730	42,670	40,941	36,593	40,600	38,000	38,500	39,000	39,500
Potable	33,438	36,679	35,083	33,744	29,735	32,100	29,300	29,600	30,000	30,400
Non-Potable	6,381	8,050	7,587	7,197	6,858	8,500	8,700	8,900	9,000	9,100
Total Potable Supplies	33,438	36,679	35,083	33,744	29,735	32,100	29,300	29,600	30,000	30,400
San Juan Basin Groundwater	0	0	0	0	0	0	0	0	0	0
Imported from MWDOC	33,438	36,679	35,083	33,744	29,735	32,100	29,300	29,600	30,000	30,400
Non-Potable Supplies	6,381	8,050	7,587	7,197	6,858	8,500	8,700	8,900	9,000	9,100
Recycled Water	6,381	8,050	7,587	7,197	6,858	8,500	8,700	8,900	9,000	9,100
San Juan Basin Groundwater	0	0	0	0	0	0	0	0	0	0
Surface Water Diversions	0	0	0	0	0	0	0	0	0	0
Santa Margarita Water District[4]										
Service Area Population	149,107	151,847	153,264	154,174	155,229	167,663	180,097	192,531	204,965	217,399
Total Water Demand	36,562	41,362	38,642	36,866	34,169	36,006	39,599	44,987	46,409	46,409
Potable	32,942	34,845	32,868	30,952	28,142	28,567	29,996	32,637	33,549	33,549
Non-Potable	3,620	6,517	5,774	5,914	6,027	7,439	9,603	12,350	12,860	12,860
Potable Supplies	32,942	34,845	32,868	30,952	28,142	28,567	29,996	32,637	33,549	33,549
San Juan Basin Groundwater	71	78	65	73	65	100	116	116	116	116
Imported	32,871	34,767	32,803	30,879	28,077	28,467	29,880	32,521	33,433	33,433
Non-Potable Supplies	3,620	6,517	5,774	5,914	6,027	7,439	9,603	12,350	12,860	12,860
Recycled Water	3,620	6,517	5,774	5,914	6,027	5,154	6,883	9,630	10,140	10,140
San Juan Basin Groundwater						0	0	0	0	0
Surface Water Diversions						2,285	2,720	2,720	2,720	2,720
South Coast Water District[5]										
Service Area Population	37,893	37,925	38,078	38,335	38,641	39,219	39,798	40,376	40,955	41,533
Total Water Demand	7,755	8,678	8,369	7,982	6,909	8,208	8,495	8,605	8,736	8,736
Potable	7,005	7,773	7,520	7,037	6,083	7,108	7,295	7,305	7,336	7,336
Non-Potable	750	905	849	945	826	1,100	1,200	1,300	1,400	1,400
Potable Supplies	7,005	7,773	7,520	7,037	6,083	7,108	7,295	7,305	7,336	7,336
San Juan Basin Groundwater	0	0	258	748	634	1,300	2,000	2,000	2,000	2,000
Imported	7,005	7,773	7,263	6,290	5,449	5,808	5,295	5,305	5,336	5,336
Non-Potable Supplies	750	905	849	945	826	1,100	1,200	1,300	1,400	1,400
Recycled Water	750	905	849	945	826	1,100	1,200	1,300	1,400	1,400
San Juan Basin Groundwater	0	0	0	0	0	0	0	0	0	0
Surface Water Diversions	0	0	0	0	0	0	0	0	0	0
Private Entities										
Non-Potable Supplies										
San Juan Basin Groundwater	660	821	752	750	653	727	727	727	727	727
Total SJBA Planning Area										
Service Area Population	394,081	397,235	400,283	403,019	406,200	422,263	438,327	454,391	470,455	486,518
Total Water Demand	92,992	104,743	99,569	95,641	86,454	94,214	95,744	101,992	104,295	105,045
Potable	81,906	89,115	85,191	81,323	72,319	75,225	74,291	77,492	79,085	79,735
Non-Potable	11,085	15,629	14,377	14,319	14,134	18,989	21,453	24,500	25,210	25,310
Potable Supplies	82,263	88,593	84,818	81,431	72,636	76,588	75,654	78,855	80,448	81,098
San Juan Basin Groundwater	6,037	3,345	1,938	3,577	2,996	8,213	8,929	8,929	8,929	8,929
Imported	76,226	85,248	82,879	77,854	69,641	68,375	66,725	69,926	71,519	72,169
Non-Potable Supplies	11,746	16,449	15,129	15,068	14,787	19,716	22,180	25,227	25,937	26,037
Recycled Water	10,751	15,472	14,210	14,056	13,710	14,754	16,783	19,830	20,540	20,640
San Juan Basin Groundwater	995	977	919	1,012	1,077	2,677	2,677	2,677	2,677	2,677
Surface Water Diversions						2,285	2,720	2,720	2,720	2,720

Notes:

1--Demands and supplies reported as acre-feet per year.

2--Historical data for the City of San Juan Capistrano provided by San Juan Basin Authority Records. Projected data is from the City's UWMP.

3--Historical and projected data for the Moulton Niguel Water District provided by the Municipal Water District of Orange County.

4--Historical and projected data for the Santa Margarita Water District provided by Santa Margarita Water District. Historical data on the relative contributions of recycled water and surface water diversions used to meet non-potable demands not provided.

5--Historical data for the South Coast Water District provided by the Municipal Water District of Orange County. Projected Data obtained from SCWD's 2010 Urban Water Management Plan.

Table 4-2
Project Recycled Water Generation for Treatment Facilities in the San Juan Basin Authority Planning Area
(acre-ft)

Wastewater Treatment Plant	Operator	Agencies Discharging to Plant	Projection				
			2015	2020	2025	2030	2035
Jay B. Latham Regional Treatment Plant	SOCWA	CSJC, MNWD, SCWD, SMWD	11,200	11,200	11,200	11,200	11,200
Joint Regional Treatment Plant	SOCWA	MNWD	10,900	11,476	11,476	11,476	11,476
Coastal Treatment Plant	SOCWA	MNWD, SCWD	5,000	5,500	5,934	5,934	5,934
Plant 3A Water Reclamation Plant	SOCWA	MNWD, SCWD	3,360	3,360	3,639	3,639	3,639
Oso Creek Water Reclamation Plant	SMWD	SMWD	2,240	2,240	2,240	2,240	2,240
Chiquita Water Reclamation Plant	SMWD	SMWD	12,096	14,224	15,680	15,680	15,680
Total Recycled Water			**44,796**	**48,000**	**50,169**	**50,169**	**50,169**
Demand for Recycled Water Reuse (from table 4-1)			14,754	16,783	19,830	20,540	20,640
Remaining Unused Recycled Water			30,042	31,217	30,339	29,629	29,529

Notes

1--All SOCWA plant data provided by the Municipal Water District of Orange County. All SMWD plant data provided by SMWD.

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Table 5-1
Safe Yield Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Ability to continue to divert foreign developed water for irrigation purposes			•					
Increase the District's reliability	•	•	•	•				
Identify project(s) to obtain water from SJBA			•					
Future level of participation in SJBA			•					
Maximize interconnections between agencies			•					
Identify the safe yield of the basin			•					
Identify and propose mitigation for impacts from proposed ocean desalination			•					
Confirm the modeling efforts are developing safe yields			•					
Review and recommend any proposed changes to the monitoring efforts			•					
Develop a uniform reporting methodology for monitoring			•					
Coordinate water harvesting with private entities			•					
Identify short and long term goals for the basin			•					
Flexible supply/Transfer/Over-Production Methodology	•							
Increase Safe Yield Based on Past Engineering Studies	•							
Dedicate Increases in Safe Yield to Agencies for Specific Basin Management Projects	•							
Need to continue to rely on stable safe yield	•							
Monitor fluctuations in basin and changes in production patterns to ID basin issues	•							
explore impacts to safe yield from basin development	•							
allow parties to use basin in their best interest and mitigate impacts	•							
Determine and assess storage losses in the basin	•							
Increase safe yield by installing wells	•							
coordinate/reduce/relocate production to reduce subsidence	•							
Evaluate impacts of desalter operations on safe yield	•							
Support sole and/or cooperative efforts to develop a	•							
Vet the GSSI groundwater model		•						
Verify impacts of Desalination project and develop mitigation measures		•						
Confirm basin safe yield		•						
Define management objectives to maintain basin safe yield		•						
Identify project(s) to optimize water from SJBA				•				
That the Basin Plan provides safe yields for current and future needs				•				
Identify the safe yield of the basin without projects versus with projects				•				

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Table 5-2
Native and Imported Water Recharge Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Support sole and/or cooperative efforts to develop additional economically feasible recharge facilities for both native and imported water	•							
Develop program to increase recharge of native runoff and create a mechanism to pledge the value of the increase in safe yield from these "new water" sources to help pay for the construction of these facilities	•							
Recharge high quality runoff and reclaimed water as hydrologically high as possible in the basin	•							
Determine availability of imported water for recharge		•						
Ability to utilize recycled water for recharge				•				
Ability to utilize stormwater for recharge				•				
Identify potential projects for economical recharge			•	•				

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Table 5-3
Quality and Quantity Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Develop sellable and/or exportable water insurance rights to replenish overproduction during drought and/or encourage basin clean-up	•							
Identify and regulate sources of contamination	•							
Develop "credit type" program to encourage development and implementation of water quality improving and conservation programs	•							
Assess the impacts of groundwater production and recharge on water quality of down gradient producers	•							
Incorporate existing remediation projects in basin water quality management program	•							
Increase conservation and develop new sources of water	•							
Manage basin to maintain/improve water quality of water supply sources to meet discharge standards	•							
Re-examine basin water quality objectives and establish naturally-occurring limits	•							
Produce maps showing problem areas and projected problem areas	•							
Identify projects to develop locate water supply source		•						
Increase the District's reliability through ground water supply				•				
Identify and propose mitigation for impacts from proposed ocean desalination				•				
Identify sources of contaminants				•				
Comprehensive groundwater quality monitoring plan				•				
Identify components required to develop and implement a Salt and Nutrient Plan				•				
Determine impacts of naturally occurring minerals on Salt and Nutrient Plan				•				
Determine impacts of naturally occurring minerals on Salt and Nutrient Plan			•					
Identify sources of contaminants			•					
Identify components required to develop and implement a Salt and Nutrient Plan			•					
Modify Basin Plan as appropriate			•	•				
Support economical programs that mitigate water quality issues	•							

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Table 5-4
Recycled Water Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Develop reuse and recharge projects to maximize use	•							
Establish agreement with RWQCB on mitigation credits for pumping in bottom and recharge in top	•							
Modify basin water quality objectives to increase levels of water recycling	•							
Coordinate basin water quality plans to permit increased levels of recycling	•							
Use reclaimed water to flush lower basin								
Confirm availability of recycled water for recharge		•						
Determine if recycled water is best used for recharge		•						
Identify recycled water recharge opportunities		•						
Coordinated review and impact of the Salt and Nutrient Plans		•						
Coordinate recycled water recharge with regulatory agencies		•						
Determine water quality impacts from MS4 permits and City enforcement		•						
Identify regional availability of recycled water				•				
Ability to utilize recycled water for recharge				•				
Ability to continue to utilize recycled water			•					
Identify regional availability of recycled water			•					
Maximize the use of reclaimed water	•							
Recharge high quality runoff and reclaimed water as hydrologically high as possible in the basin	•							

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Table 5-5
Conjunctive Use Storage Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Develop ability to market basin losses	•							
Provide transfer mechanisms between pools to ensure beneficial use of water	•							
Determine and assess storage losses	•							
Develop programs to construct facilities and deliver water between agencies	•			•				
Develop pumping regimes to optimize basin production				•				
Analyze benefit of water harvesting with private entities, agencies or the SJBA				•				
Coordinate facilities with the Orange County Southern Sub region Habitat Conservation Plan				•				
Characterize unused storage space within the basin		•						

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Table 5-6
Cost Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Seek financial aid to meet management goals, including grants and loans	•	•	•	•				
Develop five year capital improvement program, identify projects out 20 years			•	•				
Identify realistic and economically feasible long-term goals	•							
Develop incentives to encourage basin management objectives	•							
Develop equity and the perception of equity in the operation of the basin	•							
Estimate costs and benefits for water supply and recharge projects (recycled, storm and imported)		•						

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Table 5-7
Human Resources and Administration Issues, Needs and Wants

	San Juan Basin Authority				Other Interested Parties			
	SJC	MNWD	SMWD	SCWD	MWDOC	TCWD	RMV	SJHGC
Develop and maintain centralized database for the San Juan Basin	•	•	•	•				
Develop comprehensive groundwater and surface water monitoring program for basin management	•			•				
Prepare regular "State of the Basin" reports with recommendations for monitoring plan modifications	•			•				
Develop rules intended to prevent agency impacts and avoid litigious situations	•							
Coordinate efforts with other appropriate entities (SOCWA, MWDOC)		•						
Staffing requirements for alternatives of governance				•				
Accounting for cyclic and local losses				•				
Clearly define water rights				•				
Verify to what extent previous hydraulic models are still valid				•				
Utilization of “Paper Swaps”				•				
Identify short and long term goals for the basin				•				
Authority proactive in legislation and regulations				•				
Coordinate facilities with the Orange County Southern Sub region Habitat Conservation Plan			•					

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Table 5-8

Summary Matrix of SJBGMP Goals, Impediments and Action Items

Impediments to the Goal	Action Items to Implement Goal	Implications
Goal 1 -- Enhance Basin Water Supplies		
1 Regulatory concerns regarding the diversion and use of storm water discharge and dry-weather discharge.		
1a Water quality	Characterize by water type the magnitude, temporal occurrence and ranges of diversion at locations of interest. Determine locations for diversion, storage and use. Describe conceptual diversion locations, storage, use types, use areas, new recharge to the basin, and changes in discharge after diversion. Characterize water quality and the issues from naturally occurring contamination anthropogenic impacts. Determine the changes in water quality that occur in groundwater through soil aquifer treatment and surface water after diversion.	Collectively these actions will define the resource, storage and use schemes for conceptual projects, and characterize the expected quantity and quality impacts to surface and groundwater.
1b Regulatory uncertainty as to how the diversions of dry-weather discharge and recycled water reuse will be regulated. This leads to confusion as to how compliance with the MS4 permit can be achieved and the facilities and strategies to obtain and comply with permits	Develop a regulatory compliance strategy for the use of all waters available to the SJBA members.	This action will create certainty in how to comply with the Basin Plan and DPH requirements
1c Impacts on habitat and species	Define and characterize the existing riparian habitat, the species dependent on the habitat and the relationship of groundwater and surface water discharge to the habitat. Characterize by water type the magnitude, temporal occurrence and ranges of diversion at locations of interest. Determine locations for diversion, storage and use. Describe conceptual diversion locations, storage, use types use areas, new recharge to the basin, changes in discharge after diversion consistent with minimum requirements for habitat maintenance.	Collectively these actions will define the resource, storage and use schemes for conceptual projects, and characterize the expected impacts to riparian habitat and dependent species. (These action items are almost identical to the action items for impediment 1a.
1d There is uncertainty as to the right to divert native runoff, and to use or claim credit for the new diverted water.	Characterize by water type the magnitude, temporal occurrence and ranges of diversion at locations of interest. Determine locations for diversion, storage and use. Describe conceptual diversion locations, diversions for beneficial use for each party, and changes in downstream discharge and recharge.	These actions will create certainty regarding the impacts of diversions of native runoff, the impacts of these diversions on downstream water users and allow the SJBA members to develop agreements related to the equitable beneficial use of these diversions.
2 High cost of developing and operating facilities to divert, store, recharge and use storm water and dry-weather discharge.	Develop facility plan concepts and cost to show the cost of developing new reliable yield.	This action will provide information to the SJBA member agencies that can be used to make decisions regarding the feasibility of creating new yield
3 The safe yield of the groundwater basin is uncertain and varies based on recharge and production schemes.	Develop a definition for safe yield consistent with the basin recharge hydrology, storage capabilities and range of production plans. Develop safe yield estimates for various recharge, storage management and groundwater production alternatives.	These actions will result in estimates of safe yield for various expected groundwater management plans that can be used to identify unused safe yield for exploitation, groundwater storage opportunities for improving water supply reliability, and the associated facilities and operational requirements.
4 High cost of developing and operating groundwater well fields and conveyance facilities for some SJBA members.	Develop facility plan concepts and cost to show the cost of developing new reliable yield.	This action will provide information to the SJBA member agencies that can be used to make decisions regarding the feasibility of creating new yield

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Table 5-8

Summary Matrix of SJBGMP Goals, Impediments and Action Items

Impediments to the Goal	Action Items to Implement Goal	Implications
5 Constraints on recycled water reuse		
5a Uncertainty in the results of the forthcoming salt and nutrient management programs. 5b Regulatory perception/constraint that the use of recycled water in the SJB will degrade surface and groundwater.	Develop maximum benefit water quality objectives based on EO 68-16, WC 13241 and other criteria that will maximize the use of all available waters in the SJB and protect the beneficial use of waters in the SJB.	This action will maximize the use of recycled water in the SJB and will include a series of commitments by SJBA and the SJBA member agencies to guarantee maximum benefit to the State.
5c There is uncertainty as to the optimum use of recycled water in the SJBA service area -- what is the best combination of reuse among direct use and groundwater recharge?	Review the existing recycled water reuse strategies and water management strategies and determine the potential projects and need for indirect potable reuse of recycled water and the tradeoffs of direct use versus indirect potable reuse.	This action will produce a list of indirect potable reuse projects and their potential benefits and costs for comparison with planned direct reuse projects.
6 Existing production patterns are not balanced with recharge and result in reduced safe yield.	Develop and implement a comprehensive groundwater level and quality monitoring program. Store data in a relational database for real-time use by all SJBA members. Develop and calibrate a groundwater flow model to evaluate how the groundwater system works and how to maximize the yield and the use of unused storage space for supplemental water storage.	These actions will provide information that can be used to calibrate groundwater models and subsequently study the balance of recharge and discharge and maximize safe yield.
7 There is a possibility that groundwater production by overliers could reduce the amount of groundwater available for the SJBA members.	Estimate production by existing overliers and future groundwater production by existing and other overliers, Develop plans to identify and serve alternative water supplies to existing and future overliers or to retire their demands.	These actions will provide certainty to the SJBA members as to their access to the safe yield of the SJB.
Goal 2 -- Protect and Enhance Water Quality		
1 Existing water quality problems		
1a The sources and extent of water quality degradation are not well characterized in the SJB.	Develop and implement a groundwater quality assessment program consisting of: an assessment of historical groundwater quality data, comprehensive monitoring of all wells in the basin, analysis of new and historical water quality data and the implementation of a long-term focused water quality monitoring program. Monitoring will based on existing monitoring programs supplemented by the new monitoring required to characterize important water quality issues.	These actions will result in the most complete understanding of the existing water quality conditions in the basin and provide the monitoring for continuing assessment of water quality conditions. The actions are designed to leverage existing data sources and to limit new monitoring to fill in important gaps and to characterize all constituents of concern. This water quality characterization will also be required to some extent to meet the requirements of maximum benefit based water quality objectives.
1b There are natural occurring sources of mineral degradation.	Characterize the contribution of naturally occurring minerals as to location and hydrologic conditions that exacerbate this degradation and develop tools to reduce the loading of naturally occurring minerals and to maximize the beneficial use of these degraded waters.	
2 There is lack of coordinated response to water quality threats. The RWQCB does not have adequate resources to address water quality issues in the SJB in a timely manner.	Coordinate with regulatory agencies to share monitoring and other information to detect and define water quality problems. Take coordinated action regarding SJB priorities of mutual interest.	This action will result in more efficient use of SJBA, SJBA member agencies, and regulatory resources.
4 Poor ambient groundwater quality limits the direct use of groundwater and can lead to loss of basin yield.	Expand groundwater treatment capacity to recover all groundwater in the basin for beneficial use; no losses to the ocean.	This action will contribute to maximizing the basin safe yield.
5 The lack of storm water recharge facilities limits the amount of high quality storm water recharge in the SJB	Develop and implement a comprehensive storm water recharge plan.	This action will result in a list of recharge projects that when implemented will maintain/increase basin yield, and improve surface water and groundwater quality.

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Table 5-8

Summary Matrix of SJBGMP Goals, Impediments and Action Items

Impediments to the Goal	Action Items to Implement Goal	Implications
Goal 3 -- Maximize the use of unused storage space		
1 The unused storage available for storage of new storm water recharge and supplemental water is undefined. The unused storage available for these waters is a function of groundwater management and there is no formal groundwater management program that maximizes yield and the storage of supplemental water.	Conduct an investigation of unused storage to determine the range of operating storage for supplemental water based on long-term historical hydrology, groundwater production and supplemental recharge strategies.	This action will result in a series of groundwater production and supplemental water storage alternatives that will maximize safe yield and improve the reliability of supplemental water supplies
2 Existing production patterns are not balanced with recharge and result in reduced safe yield.	Develop and implement a comprehensive groundwater level and quality monitoring program. Store data in a relational database for real-time use by all SJBA Develop and calibrate a groundwater flow model to evaluate how the groundwater system works and how to maximize the yield and the use of unused storage space for supplemental water storage.	These actions will provide information that can be used to calibrate groundwater models and subsequently study the balance of recharge and discharge, maximize safe yield and optimize the use of unused storage.
3 Equitably sharing the unused storage capacity	Develop an equitable formula for sharing in the benefits of storage of native and supplemental waters.	This action will allocate storage to participating SJBA members and provide certainty and predictability to these members allowing them to develop storage and recovery projects
Goal 4 -- Satisfy the State requirements for a groundwater management program		
1 Obtaining appropriate and acceptable input from non SJBA entities involved in the MODOC IRWMP for inclusion into the SJBGMP. The intent here is to ensure that the SJBGMP is included in the MWDOC IRWMP.	Demonstrate the value of the SJBGMP to the region. Consider MWDOC staff input in the development of the SJBGMP update and coordinate with MWDOC to ensure that the SJBGMP is included in its IRWMP.	SJBGMP is included in the MWDOC IRWMP
Goal 5 -- Establish equitable share of the funding, benefits and costs of the SJBGMP		
1 Not all SJBA member agency service areas overlie the exploitable parts of the SJB and the development of projects to exploit the SJB for some member agencies is not economically attractive given their location and/or the current way of allocating benefits of the SJBGMP.	Develop new ways to allocate the benefits of the existing and future SJBGMP projects to all SJBA members in an equitable way.	The yield of all SJBA projects will be allocated to all members of the SJBA in an equitable manner although the physical delivery of the water produced by the projects will be distributed in such a way as to minimize the cost and impacts to the environment.

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Table 7-1
Consistency of Groundwater Management Plan Alternatives to Goals

Alternative	Goals				
	Goal 1 -- Enhance Basin Water Supplies	Goal 2 -- Protect and Enhance Water Quality	Goal 3 -- Maximize the use of Unused Storage Space	Goal 4 -- Satisfy the State Requirements for a Groundwater Management Program	Goal 5 -- Establish Equitable Share of the Funding, Benefits and Costs of the SJBGMP[1]
Alternative 1 – Adaptive Production Management within Existing Recharge and Production Facilities					
Alternative 2 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Injection Barrier	✔	✔		✔	tbd
Alternative 3 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Extraction Barrier	✔	✔		✔	tbd
Alternative 4a – Adaptive Production Management with Seawater Injection Barrier and Construction of Ranney-Style Collector Well(s)	✔	✔	✔	✔	tbd
Alternative 4b – Adaptive Production Management with Seawater Extraction Barrier and Construction of Ranney-Style Collector Well(s)	✔	✔	✔	✔	tbd
Alternative 5a – Adaptive Production Management, with Seawater Injection Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	✔	✔	✔	✔	tbd
Alternative 5b – Adaptive Production Management, with Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	✔	✔	✔	✔	tbd
Alternative 6 – Adaptive Production Management, Creation of a Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, In-stream Recharge and Recycled Water Recharge	✔	✔	✔	✔	tbd
Alternative 7– Adaptive Production Management within Existing Recharge and Production Facilities (Alternative 1 with SOCOD).					
Alternative 8– Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), Construction of Ranney-Style Collector Wells	✔	✔	✔	✔	tbd
Alternative 9– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Wells, and In-stream Recharge	✔	✔	✔	✔	tbd
Alternative 10– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Wells, In-stream Recharge and Recycled Water Recharge	✔	✔	✔	✔	tbd

[1] tbd -- to be determined in the final implementation plan.

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Table 7-2
Estimated Yield of the SJBGMFP Alternatives

Alternative	Yield from Key Features (acre-ft/yr)							
	Adaptive Production	Seawater Injection Barrier	Seawater Extraction Barrier	Ranney Collector Wells	Enhanced Stormwater Recharge	Recycled Water Recharge	Alternative Water Supply for Overlying Water Right Holders	Total
Alternative 1 – Adaptive Production Management within Existing Recharge and Production Facilities	9,200							9,200
Alternative 2 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Injection Barrier	9,200	800						10,000
Alternative 3 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Extraction Barrier	9,200		3,000					12,200
Alternative 4a – Adaptive Production Management with Seawater Injection Barrier and Construction of Ranney-Style Collector Well(s)	9,200	800		800			400	11,200
Alternative 4b – Adaptive Production Management with Seawater Extraction Barrier and Construction of Ranney-Style Collector Well(s)	9,200		3,000	800			400	13,400
Alternative 5a – Adaptive Production Management, with Seawater Injection Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	9,200	800		800	800		400	12,000
Alternative 5b – Adaptive Production Management, with Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	9,200		3,000	800	800		400	14,200
Alternative 6 – Adaptive Production Management, Creation of a Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, In-stream Recharge and Recycled Water Recharge	9,200		3,000		800	8,000	400	21,400
Alternative 7– Adaptive Production Management within Existing Recharge and Production Facilities (Alternative 1 with SOCOD).	7,500							7,500
Alternative 8– Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), Construction of Ranney-Style Collector Wells	7,500			800			400	8,700
Alternative 9– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Wells, and In-stream Recharge	7,500			800	800		400	9,500
Alternative 10– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Wells, In-stream Recharge and Recycled Water Recharge	7,500				800	8,000	400	16,700

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Table 7-3a
Construction Cost and Annual and Unit Cost Opinions for the Proposed 1,000 Acre-ft/yr Seawater Injection Barrier

Item	Description	Unit Type	Units	Cost per Unit	Cost
	Capital Cost				
C1	Injection Well Construction and Development	LS	4	$184,500	$738,000
C2	Injection Wellhead Completion and Equipping	LS	4	$70,500	$282,000
C3	Piping to Connect Injection Wells to the Imported Water Pipeline	LS	1	$1,000,000	$1,000,000
C4	Misc Fittings[4]	LS	1		$100,000
	Subtotal Construction Cost				$2,120,000
C5	Contingency[1]				$424,000
	Total Construction Cost				$2,544,000
	Planning, Engineering and Legal[2]				$381,600
	Total Capital Cost				$2,925,600
	Annual and Unit Costs				
A1	Annualized Cost of Construction[3]				$190,314
A2	Injection Water	AF	1,000	$953	$953,000
A3	Fixed O&M	LS	1	$71,000	$88,000
	Total Annual Cost				$1,231,314
	Unit Cost				$1,539.14

[1]Contingency estimated to be 20% of subtotal construction cost

[2]Planning, Engineering and Legal estimated to be 15% of total construction cost

[3]Annual amortization cost based on 30-yr bond at 5.00%

[4]Misc Fitting estimated at 10% of pipeline construction cost

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Table 7-3b
Construction Cost and Annual and Unit Cost Opinions for the
Proposed Extraction Well Barrier Well Field and Water Supply Project

Derivation of 2013 Construction Cost Opinion for the Proposed Extraction Barrier Well Field and Water Supply Project

16	mgd product water capacity of the proposed SOCOD project			
$125,577,000	MWDOC 2011 Level 4 Estimate of the construction cost of the SOCOD project			
$44,759,000	MWDOC estimate of slant wells construction cost			
$80,818,000	Subtotal 2011 SOCOD construction cost for treatment and product water conveyance system to end users			
5%	Escalator to 2013			
$84,858,900	Subtotal 2013 SOCOD construction cost for treatment and product water conveyance system to end users			
$5,303,681.25	Subtotal 2013 SOCOD construction cost for treatment and product water conveyance system to end users per mgd			
3.00	mgd product water capacity for proposed extraction barrier project			
$15,911,044	Subtotal 2013 construction cost for proposed extraction barrier treatment and product water conveyance system to end users			
6,000	Raw water pumping rate of extraction barrier wells in acre-ft/yr			
6.00	No. of wells required to pump 8,000 acre-ft/yr at	800	gpm and	90% utilization
2.00	No. of back up wells			
5.95	mgd raw water production rate			
$10,400,000	Subtotal 2013 construction cost of new equipped extraction barrier wells at			$1,300,000 ea.
$4,000,000	2013 construction cost estimate for raw water conveyance			
$30,311,044	Subtotal 2013 extraction barrier system construction cost			
$7,577,761	Contingency at	25%		
$4,546,657	Engineering at	15%		
$42,435,461	Total Construction Cost			

Derivation of 2013 Unit Cost Opinion for the Proposed Extraction Barrier Well Field and Water Supply Project

$2,760,488	Annualized capital cost at	30	years and	5%
362	2011 per acre-ft for O&M, all cost in per MWDOC			
5%	Escalator to 2013			
$380	2013 O&M cost for the extraction barrier			
$1,277,304	2013 total O&M costs			
$3,976,968	2013" All-in" Annual Cost			
$1,326	per acre-ft unit cost			

Source of 2011 proposed SOCOD project costs were obtained from the MWDOC presentation entitled "SOCOD Project Decision Making: Spring 2013" prepared in December 2012, and the handout from the SOCOD March 21, 2013 TAC meeting.

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Table 7-3c

Construction Cost and Annual and Unit Cost Opinions for the

Proposed 4,300 Acre-ft/yr Ranney Collector Well

Line Item	Description	Unit Type	Units	Cost per Unit	Cost
	Capital Cost				
C1	16-ft OD, 13-ft ID RC Caisson	LF	100	$8,000	$800,000
C2	12-in Stainless Steel Wire-wrapped Screens	LF	1,200	$1,000	$1,200,000
C3	Motor, Pump, Motor Control Panels and SCADA	LS	1	$1,500,000	$1,500,000
C4	Piping to Connect to SJBA Desalter	LF	1	$500,000	$500,000
C5	Misc Fittings[4]	LS	1		$50,000
	Subtotal Construction Cost				$4,000,000
C6	Contingency[1]				$800,000
	Total Construction Cost				$4,800,000
	Planning, Engineering and Legal[2]				$720,000
	Total Capital Cost				$5,520,000
	Annual and Unit Costs				
A1	Annualized Construction Cost[3]				$359,084
A2	Energy at 4,300 acre-ft/yr	kwh	628,842	$0.20	$125,768
A3	Fixed O&M	LS	1	$166,000	$166,000
	Total Annual Cost				$650,852
	Additional Cost per Acre-ft of Desalter Production				$151

[1]Contingency estimated to be 20% of subtotal construction cost

[2]Planning, Engineering and Legal estimated to be 15% of total construction cost

[3]Annual amortization cost based on 30-yr bond at 5.00%

[4]Misc Fitting estimated at 10% of pipeline construction cost

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Table 7-4
Unit Cost Comparisons of SJBGMFP Alternatives

Alternative	New Yield	Annual Cost	Unit Cost
Alternative 1 – Adaptive Production Management within Existing Recharge and Production Facilities	0	$0	na
Alternative 2 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Injection Barrier	800	$1,951,314	$2,439
Alternative 3 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Extraction Barrier	3,000	$3,976,968	$1,326
Alternative 4a – Adaptive Production Management with Seawater Injection Barrier and Construction of Ranney-Style Collector Well(s)	2,000	$3,682,167	$1,841
Alternative 4b – Adaptive Production Management with Seawater Extraction Barrier and Construction of Ranney-Style Collector Well(s)	4,200	$6,067,820	$1,445
Alternative 5a – Adaptive Production Management, with Seawater Injection Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	2,800	$4,802,167	$1,715
Alternative 5b – Adaptive Production Management, with Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	5,000	$7,187,820	$1,438
Alternative 6 – Adaptive Production Management, Creation of a Seawater Extraction Barrier, In-stream Recharge and Recycled Water Recharge	12,200	--	$1,042
Alternative 7– Adaptive Production Management within Existing Recharge and Production Facilities (Alternative 1 with SOCOD).	0	$0	na
Alternative 8– Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), Construction of Ranney-Style Collector Well	1,200	$1,730,852	$1,442
Alternative 9– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Well, and In-stream Recharge	2,000	$2,130,852	$1,065
Alternative 10– Adaptive Production Management, Existing Recharge and Production Facilities, In-stream Recharge and Recycled Water Recharge	9,200	--	$949

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Table 7-5
Implementation Difficulty

Alternative	Adaptive Production	Seawater Injection Barrier	Seawater Extraction Barrier	Ranney Collector Wells	Enhanced Stormwater Recharge	Recycled Water Recharge	Alternative Water Supply for Overlying Water Right Holders
Alternative 1 – Adaptive Production Management within Existing Recharge and Production Facilities	not significant						
Alternative 2 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Injection Barrier	not significant	not significant					
Alternative 3 – Adaptive Production Management within Existing Recharge and Production Facilities with a Seawater Extraction Barrier	not significant		potentially significant				
Alternative 4a – Adaptive Production Management with Seawater Injection Barrier and Construction of Ranney-Style Collector Well(s)	not significant	not significant		potentially significant			potentially significant
Alternative 4b – Adaptive Production Management with Seawater Extraction Barrier and Construction of Ranney-Style Collector Well(s)	not significant		potentially significant	potentially significant			potentially significant
Alternative 5a – Adaptive Production Management, with Seawater Injection Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	not significant	not significant		potentially significant	potentially significant		potentially significant
Alternative 5b – Adaptive Production Management, with Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, and In-stream Recharge	not significant		potentially significant	potentially significant	potentially significant		potentially significant
Alternative 6 – Adaptive Production Management, Creation of a Seawater Extraction Barrier, Construction of Ranney-Style Collector Wells, In-stream Recharge and Recycled Water Recharge	not significant		3,000		potentially significant	significant	potentially significant
Alternative 7– Adaptive Production Management within Existing Recharge and Production Facilities (Alternative 1 with SOCOD).	not significant						
Alternative 8– Adaptive Production Management, Existing Recharge and Production Facilities (Alternative 1 with SOCOD), Construction of Ranney-Style Collector Wells	not significant			potentially significant			potentially significant
Alternative 9– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Wells, and In-stream Recharge	not significant				potentially significant		potentially significant
Alternative 10– Adaptive Production Management, Existing Recharge and Production Facilities, Construction of Ranney-Style Collector Wells, In-stream Recharge and Recycled Water Recharge	not significant				potentially significant	significant	potentially significant

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Table 8-1
Major Implementation Steps for the Recommended SJBGMFP Alternatives 6 and 10[1]

Program Element / Feature	Implementation Steps	Ten-Year Implementation Schedule										Annual Implementation Cost by Year Excluding Construction[2] ($1,000)										
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	Total
Adaptive Production Management												**$260**	**$230**	**$140**	**$160**	**$140**	**$140**	**$160**	**$140**	**$140**	**$160**	**$1,670**
Groundwater level monitoring and the development of groundwater level maps and storage estimates; and groundwater chemistry monitoring to assess state of seawater intrusion and determine if SJBGMFP is contributing to degradation																						
	Currently being implemented by the SJBA[3]	■	■	■	■	■	■	■	■	■	■	*$140*	*$140*	*$140*	*$140*	*$140*	*$140*	*$140*	*$140*	*$140*	$140	*$1,400*
The SJBA, in its role as "Basin Manager" will establish an annual production amount for the CSJC and the SCWD as required to not interfere with private pumpers, and to ensure sustainable production																						
	The SJBA establishes the Basin Management Committee which is empowered by the March 1998 settlement agreement to set an annual Available Safe Yield	■	■	■	■	■	■	■	■	■	■											*$0*
	The SJBA will need to develop and periodically revise a relationship between Available Safe Yield and Spring groundwater storage; the relationship will depend on the then existing production and conveyance facilities	■			■			■			■	*$20*			*$20*			*$20*			*$20*	*$80*
Groundwater substitution																						
	Conduct preliminary design and assess feasibility	■										*$50*										*$50*
	Complete CEQA process	■										*$30*										*$30*
	Finalize agreements with private well owners	■	■									*$20*	*$20*									*$40*
	Obtain permits		■										*$20*									*$20*
	Prepare final design		■										*$50*									*$50*
	Construct conveyance facilities to enable substitute supply			■																		
Planning and CEQA Process												**$0**	**$875**	**$600**	**$325**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,800**
Conduct CEQA process through the preparation of a draft PEIR			■	■									*$125*	*$125*								*$250*
Prepare application/petition to SWRCB for new points of diversion, new pumping, to divert surface water, store and subsequently recover																						
	Prepare initial application/petition, review with SWRCB staff until application/petition is accepted		■	■									*$50*	*$50*								*$100*
	Coordinate with SWRCB to complete process and acquire diversion permits			■	■									*$25*	*$25*							*$50*
Conduct engineering investigations to develop alternative preliminary designs, determine feasibility and to identify fatal flaws																						
	Groundwater extraction barrier		■	■									*$200*	*$200*								*$400*
	In-stream stormwater recharge		■										*$100*									*$100*
	In-stream recycled water recharge and groundwater recycled water reuse		■	■	■								*$400*	*$200*	*$200*							*$800*

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Table 8-1
Major Implementation Steps for the Recommended SJBGMFP Alternatives 6 and 10[1]

Program Element / Feature	Implementation Steps	Ten-Year Implementation Schedule 1	2	3	4	5	6	7	8	9	10	Annual Implementation Cost by Year Excluding Construction[2] ($1,000) 1	2	3	4	5	6	7	8	9	10	Total
Finalize and certify PEIR for the SJBGFMP															*$50*							*$50*
Finalize SWRCB application/petition															*$50*							*$50*
Complete Agreements for SJBA Member Participation, Construction and Operation														**$100**	**$100**							**$200**
Design and Construction												**$0**	**$0**	**$0**	**$0**	**$4,150**	**$4,000**	**$0**	**$0**	**$0**	**$0**	**$8,150**
Groundwater Extraction Barrier																						
	Obtain permits															*$50*	*$50*					*$100*
	Complete design															*$1,900*	*$1,900*					*$3,800*
	Construct extraction barrier																					
In-stream Stormwater Recharge																						
	Obtain permits															*$50*						*$50*
	Complete design															*$100*						*$100*
	Operate in-stream stormwater recharge																					
In-stream Recycled Water Recharge and Groundwater Recycled Reuse (Indirect Potable Reuse)																						
	Obtain permits															*$50*	*$50*					*$100*
	Complete design															*$2,000*	*$2,000*					*$4,000*
	Construct recycled water conveyance, recovery wells and treatment system																					
Totals for Alternative 6												**$260**	**$1,105**	**$840**	**$585**	**$4,290**	**$4,140**	**$160**	**$140**	**$140**	**$160**	**$11,820**
Totals for Alternative 10[4]												**$260**	**$905**	**$640**	**$585**	**$2,340**	**$2,190**	**$160**	**$140**	**$140**	**$160**	**$7,520**

[1] Alternative 10 contains all the program elements of Alternative 6 except the extraction barrier

[2] Costs shown in italics total to the cost shown above in the grey bar highlighting the program element.

[3] Costs of current program and recommended program for this part of the recommended SJBGFMP. Significant additional cost will be incurred with recycled water recharge.

[4] There could be additional reduced cost in the processing of SWRCB applications and in the CEQA process if the extraction barrier is excluded.

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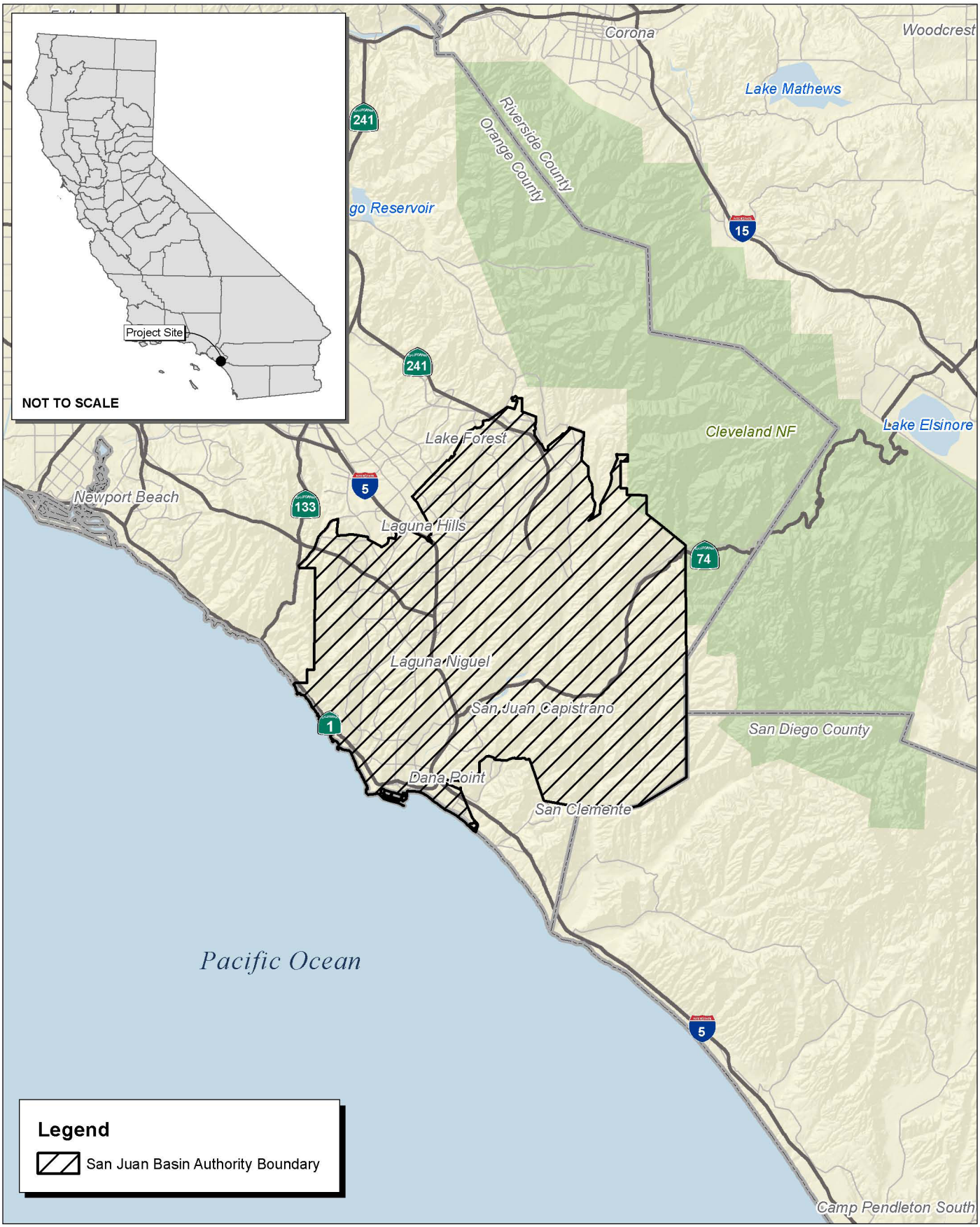

Source: Census 2000 Data, The CaSIL, MBA GIS 2011.

DRAFT

Michael Brandman Associates

NORTH

5 2.5 0 5 Miles

Figure 2-1
Regional Location Map

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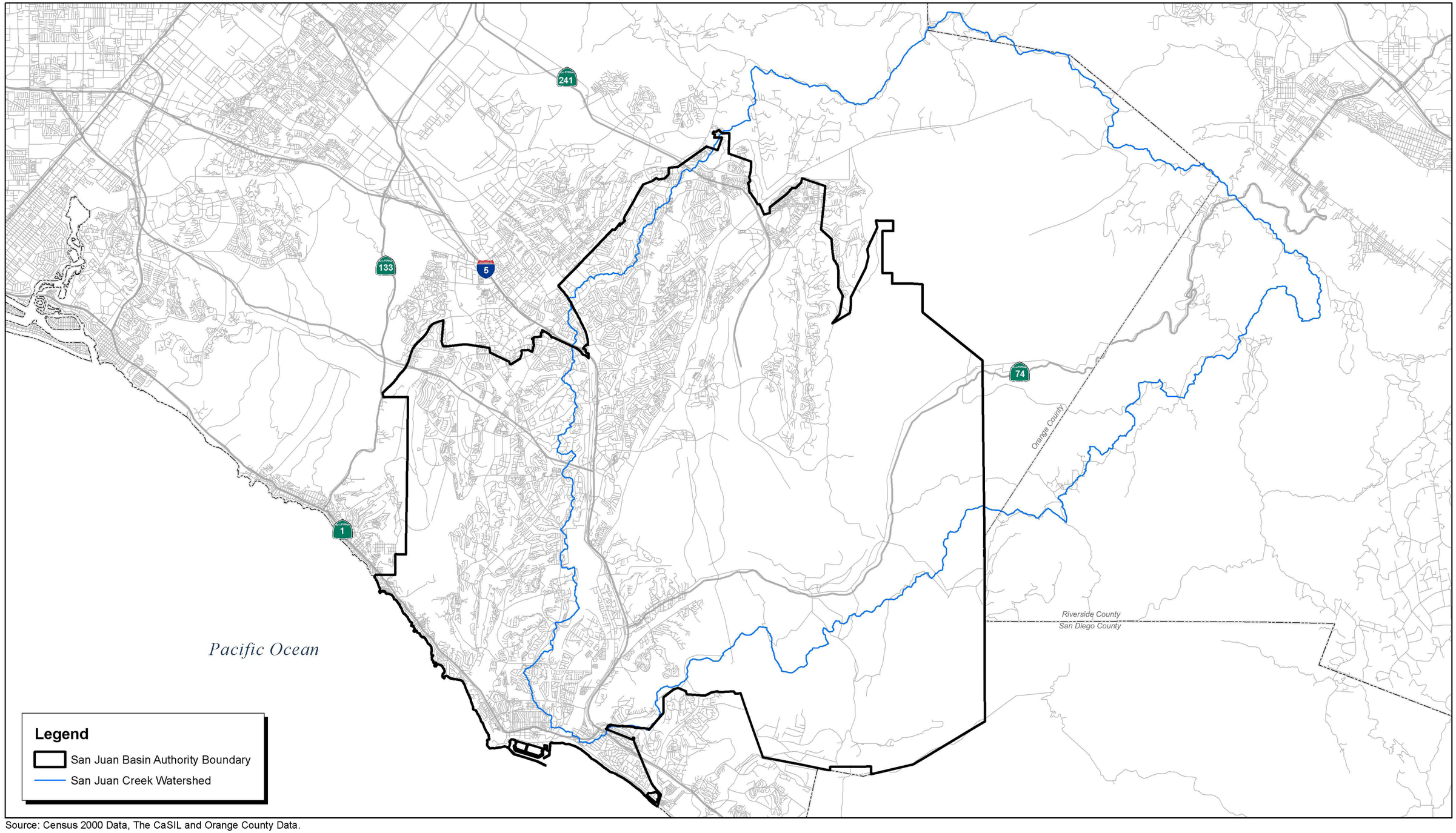


Source: Census 2000 Data, The CaSIL and Orange County Data.

Michael Brandman Associates

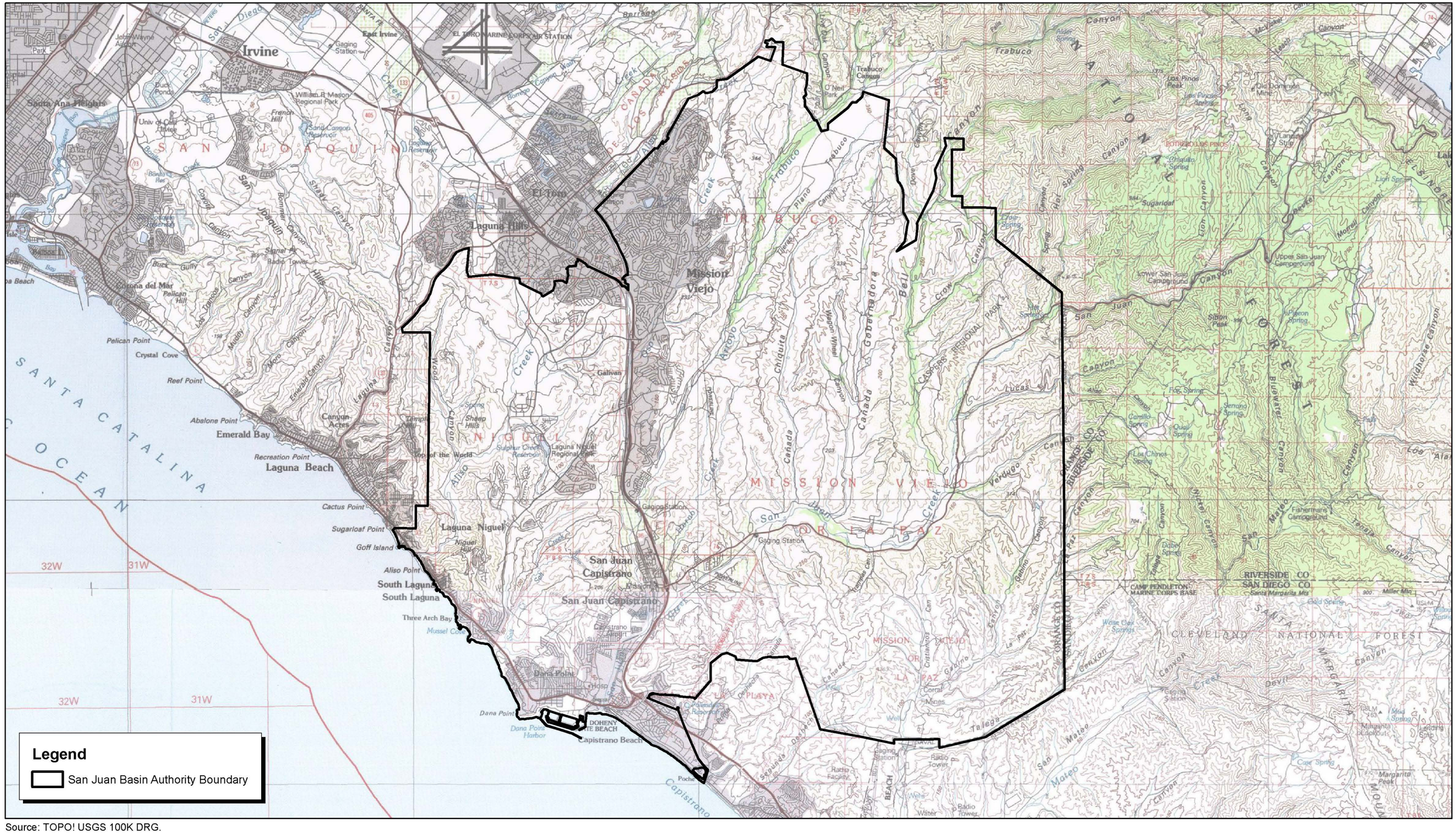
NORTH

2.2 1.1 0 2.2 Miles

DRAFT

38340001 • 02/2011 | 2-2_local_vicinity.mxd

Figure 2-2
Local Vicinity Map



Source: TOPO! USGS 100K DRG.

NORTH

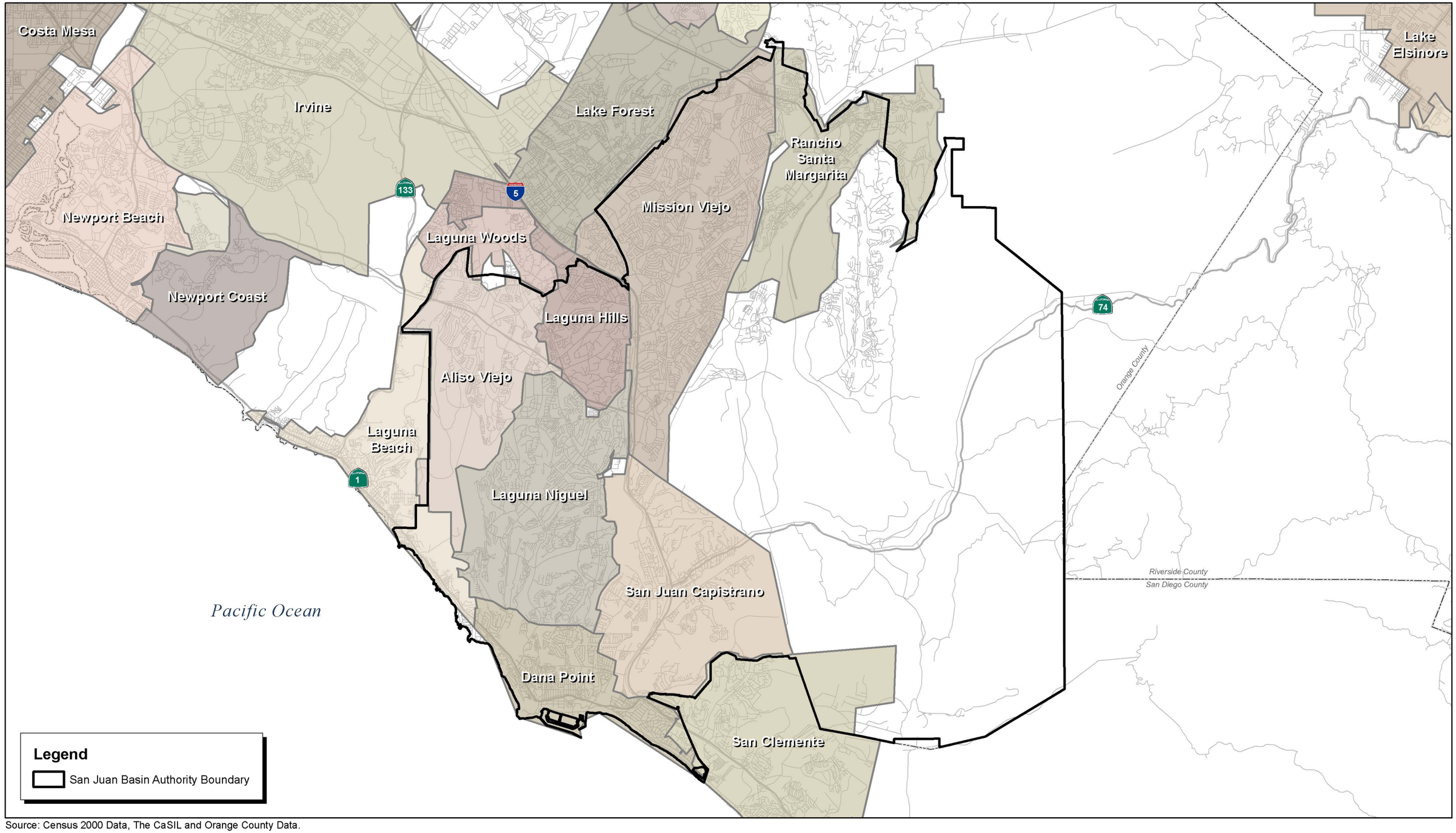
2 1 0 2 Miles

Michael Brandman Associates

38340001 • 02/2011 | 2-3_topo.mxd

DRAFT

Figure 2-3
Topographic Map



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

Michael Brandman Associates

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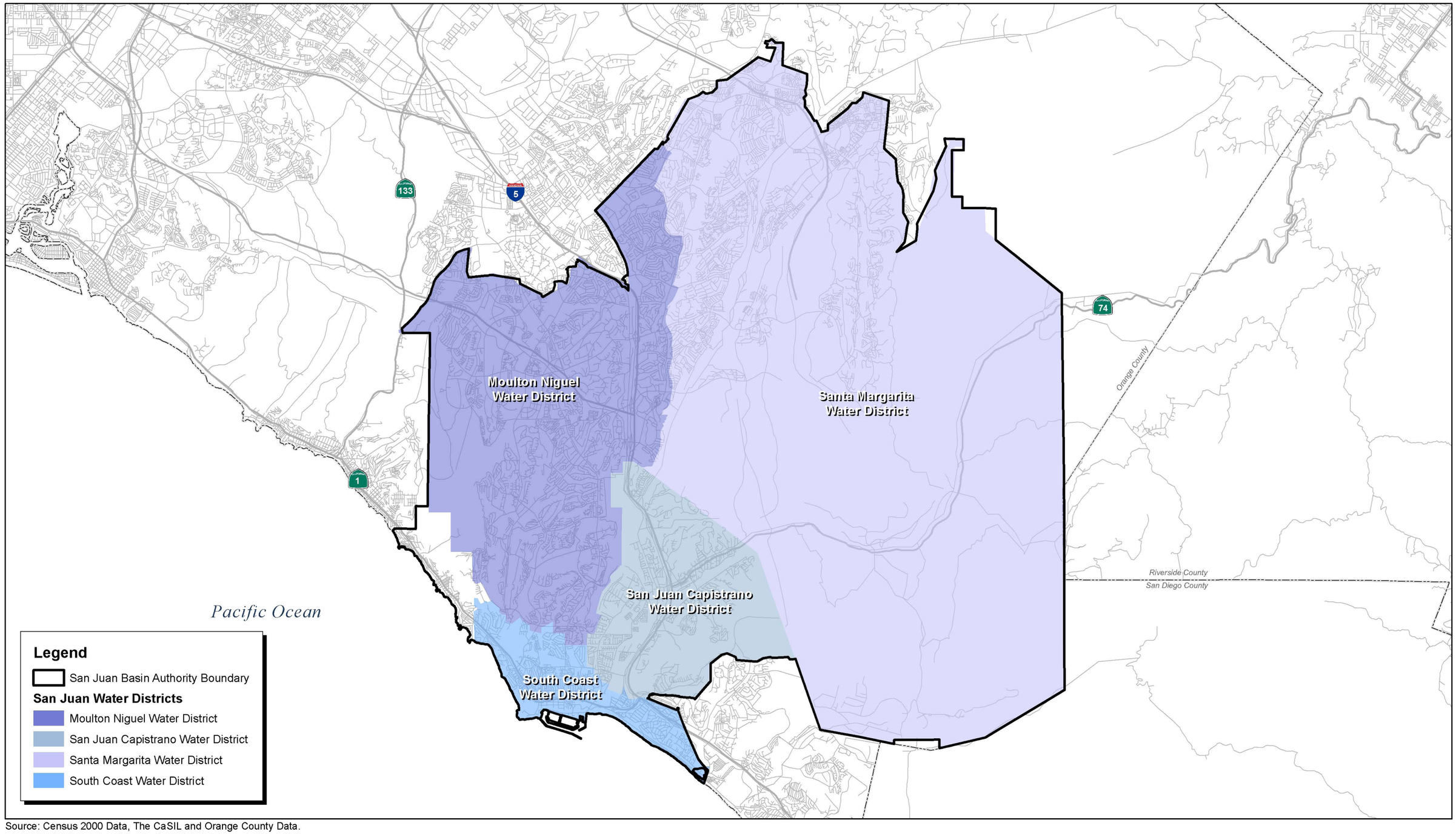
38340001 • 02/2011 | 2-4_city_boundaries.mxd

Figure 2-4
City Boundaries



Source: Census 2000 Data, The CaSIL and Orange County Data.

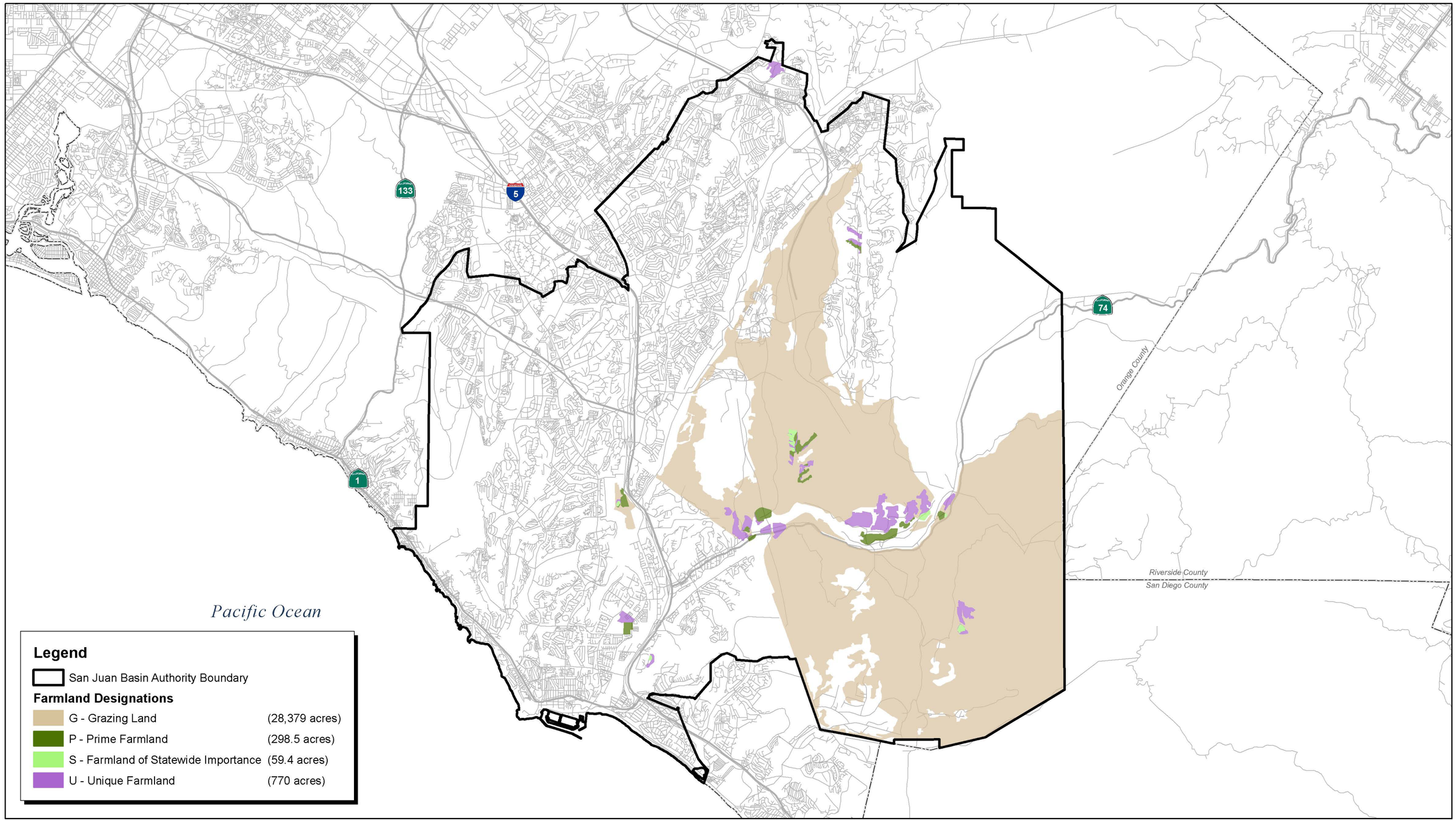
NORTH

2 1 0 2 Miles

Michael Brandman Associates

DRAFT

Figure 2-5
San Juan Water Districts



Source: Census 2000 Data, The CaSIL. Farmland Mapping and Monitoring Program, 2008.

Michael Brandman Associates

NORTH

2 1 0 2 Miles

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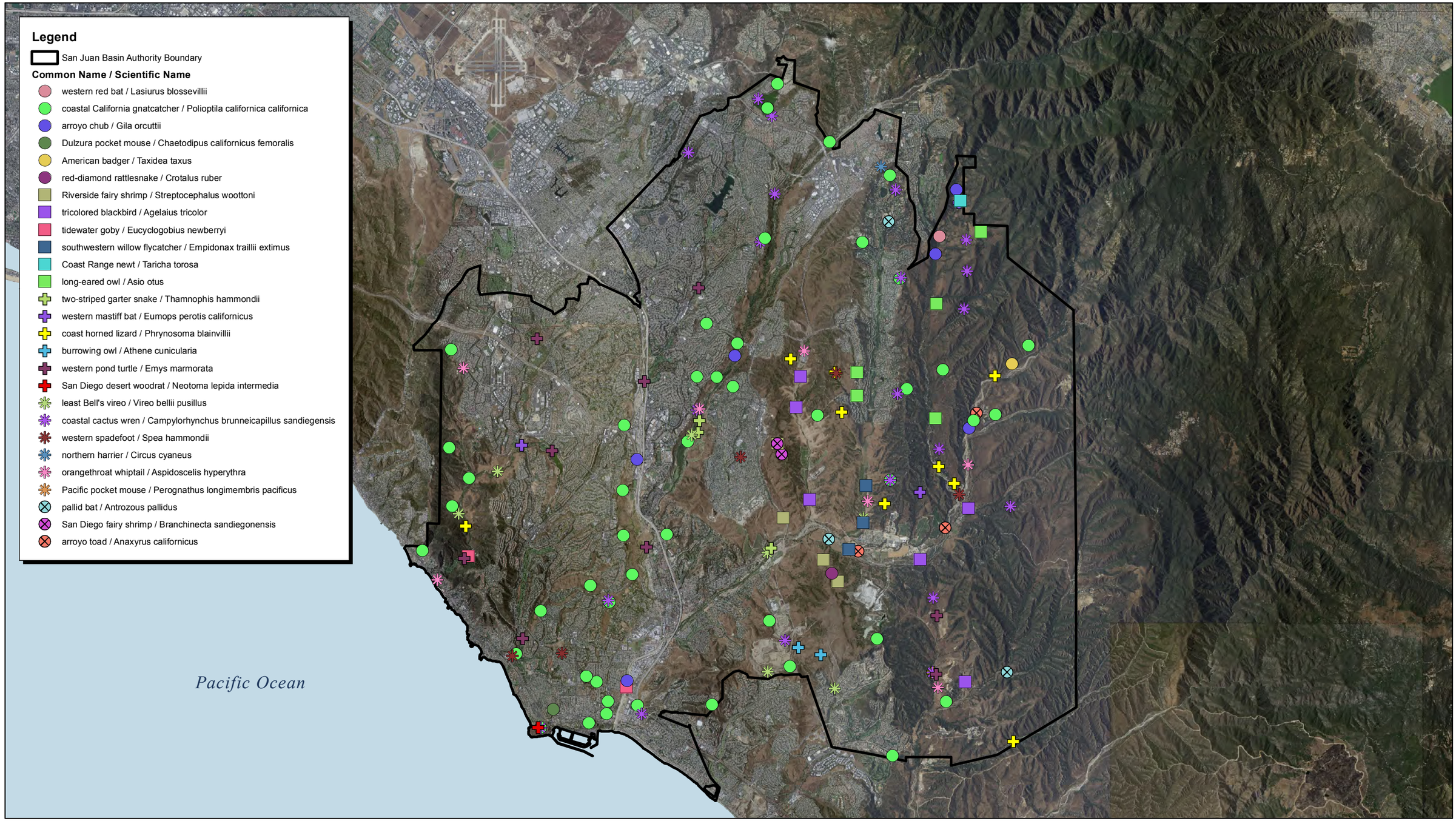
38340001 • 02/2011 | 2-6_Ag_Resources.mxd

Figure 2-6
Agricultural Resources Map



Source: Orange County, Riverside County and San Diego Diego County NAIP, 2009. CNDDB Data, February 2011.

Michael Brandman Associates

NORTH

2 1 0 2 Miles

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Figure 2-7
CNDDB Recorded Occurrences of
Special-Status Wildlife Species within San Juan Basin Boundary

Legend

San Juan Basin Authority Boundary

Common Name / Scientific Name

- Valley Needlegrass Grassland / Valley Needlegrass Grassland
- Southern Coast Live Oak Riparian Forest / Southern Coast Live Oak Riparian Forest
- Southern Sycamore Alder Riparian Woodland / Southern Sycamore Alder Riparian Woodland
- Southern Mixed Riparian Forest / Southern Mixed Riparian Forest
- Southern Cottonwood Willow Riparian Forest / Southern Cottonwood Willow Riparian Forest
- thread-leaved brodiaea / Brodiaea filifolia
- Orcutt's pincushion / Chaenactis glabriuscula var. orcuttiana
- summer holly / Comarostaphylis diversifolia ssp. diversifolia
- Laguna Beach dudleya / Dudleya stolonifera
- Nuttall's scrub oak / Quercus dumosa
- Coulter's saltbush / Atriplex coulteri
- chaparral nolina / Nolina cismontana
- intermediate mariposa-lily / Calochortus weedii var. intermedius
- big-leaved crownbeard / Verbesina dissita
- southern tarplant / Centromadia parryi ssp. australis
- many-stemmed dudleya / Dudleya multicaulis
- Blochman's dudleya / Dudleya blochmaniae ssp. blochmaniae
- Allen's pentachaeta / Pentachaeta aurea ssp. allenii
- sticky dudleya / Dudleya viscida
- aphanisma / Aphanisma blitoides

Pacific Ocean

Source: Orange County, Riverside County and San Diego Diego County NAIP, 2009. CNDDB Data, February 2011.

NORTH

2 1 0 2 Miles

Michael Brandman Associates

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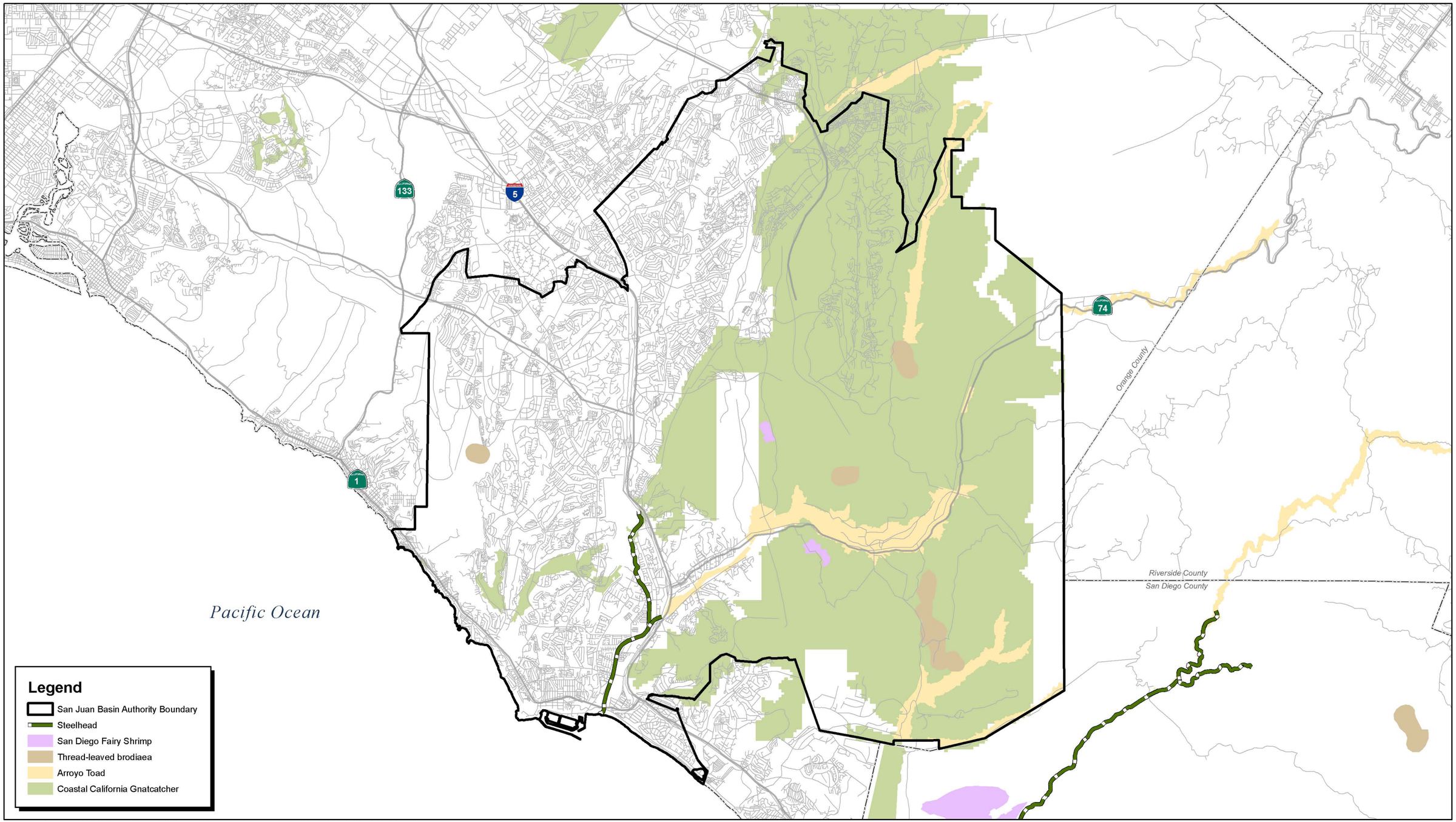
38340001 • 02/2011 | 2-8_cnddb_plant.mxd

Figure 2-8
CNDDB Recorded Occurences of
Special-Status Plant Species within the San Juan Basin Boundary



Source: Census 2000 Data, The CaSIL and Orange County Data. USFWS Critical Habitat Data.

NORTH

2 1 0 2 Miles

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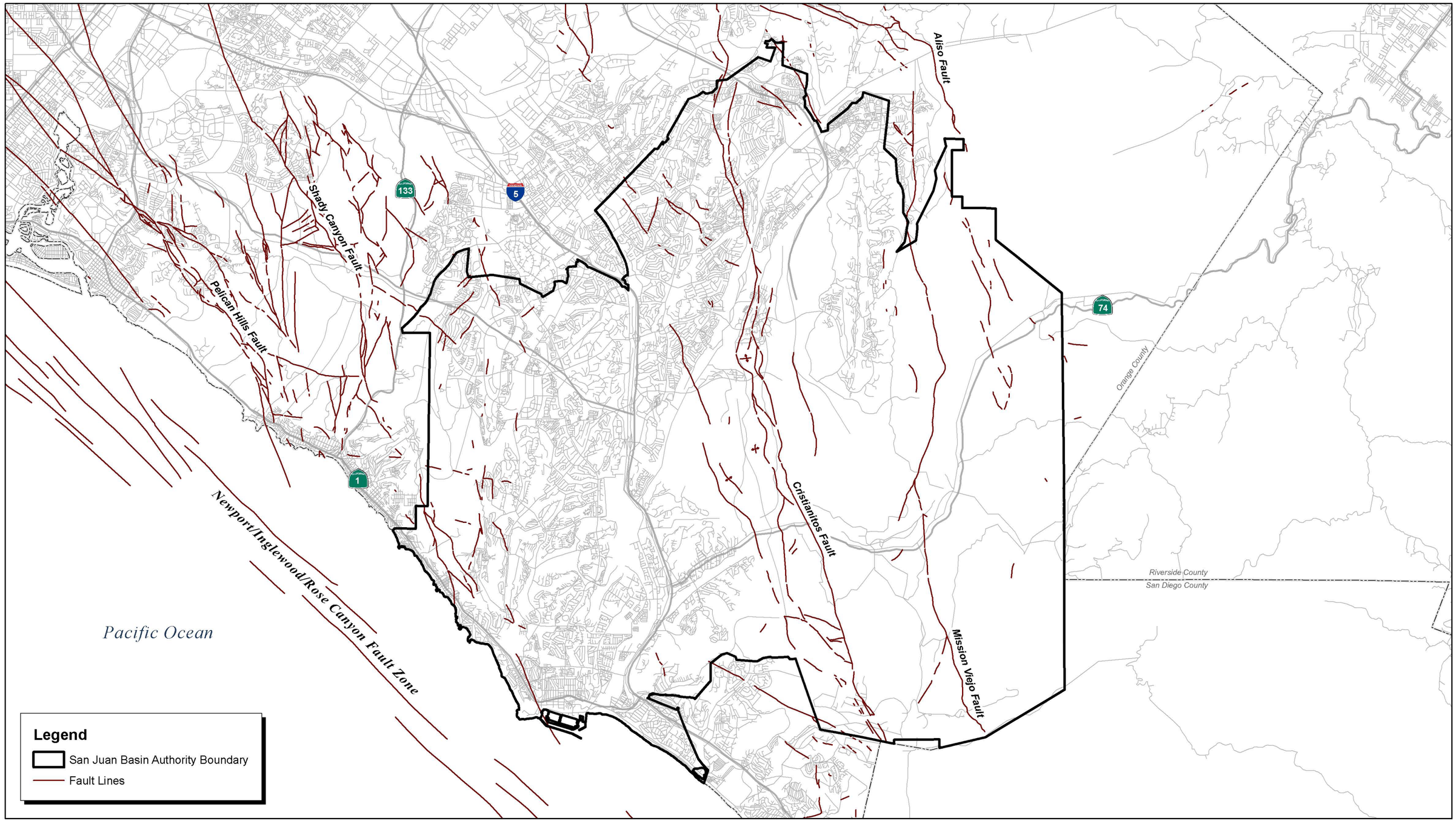
38340001 • 02/2011 | 2-9_critical_habitat.mxd

Figure 2-9
Critical Habitat Areas



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

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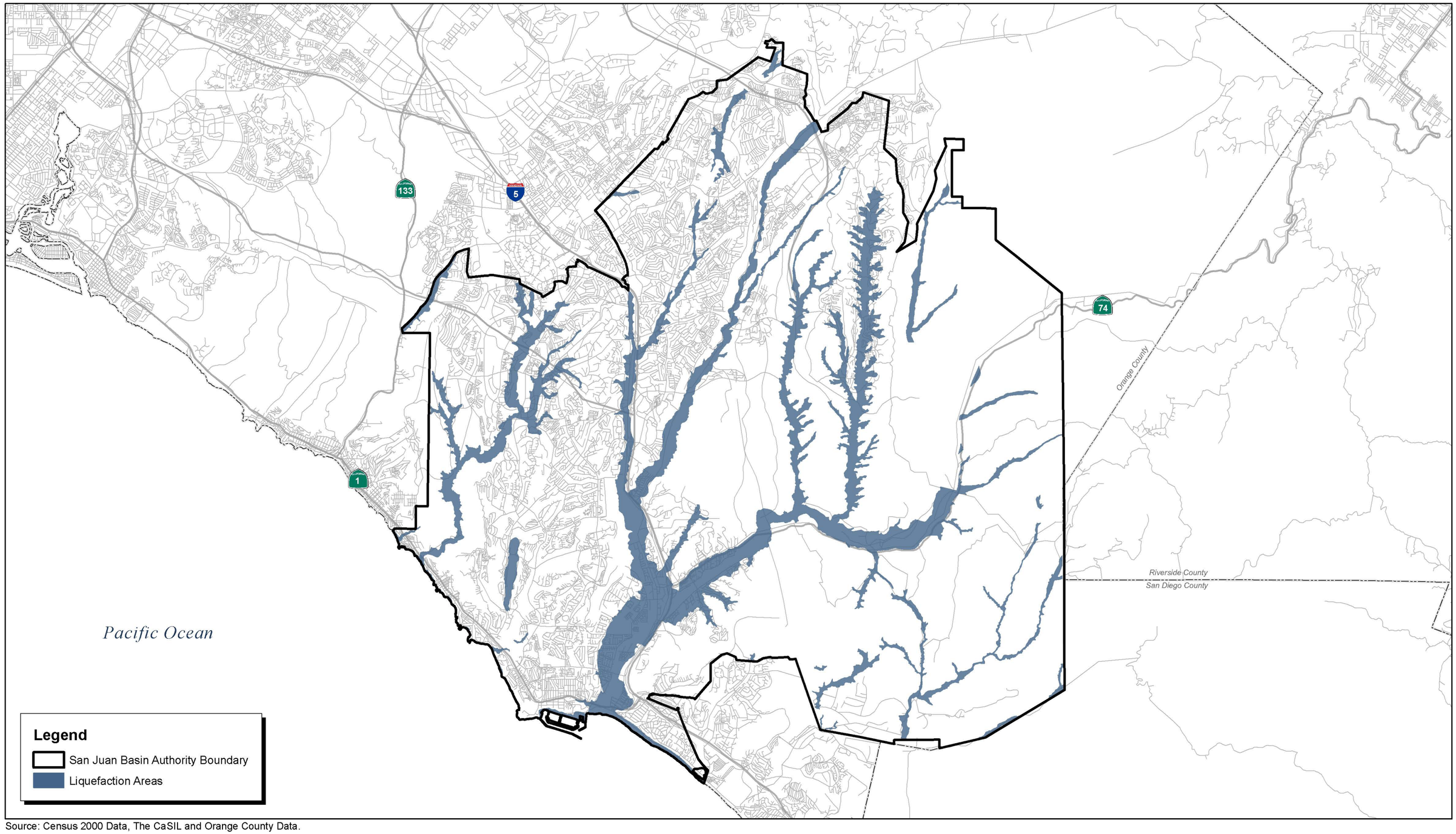
Figure 2-10
Fault Lines



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

Michael Brandman Associates

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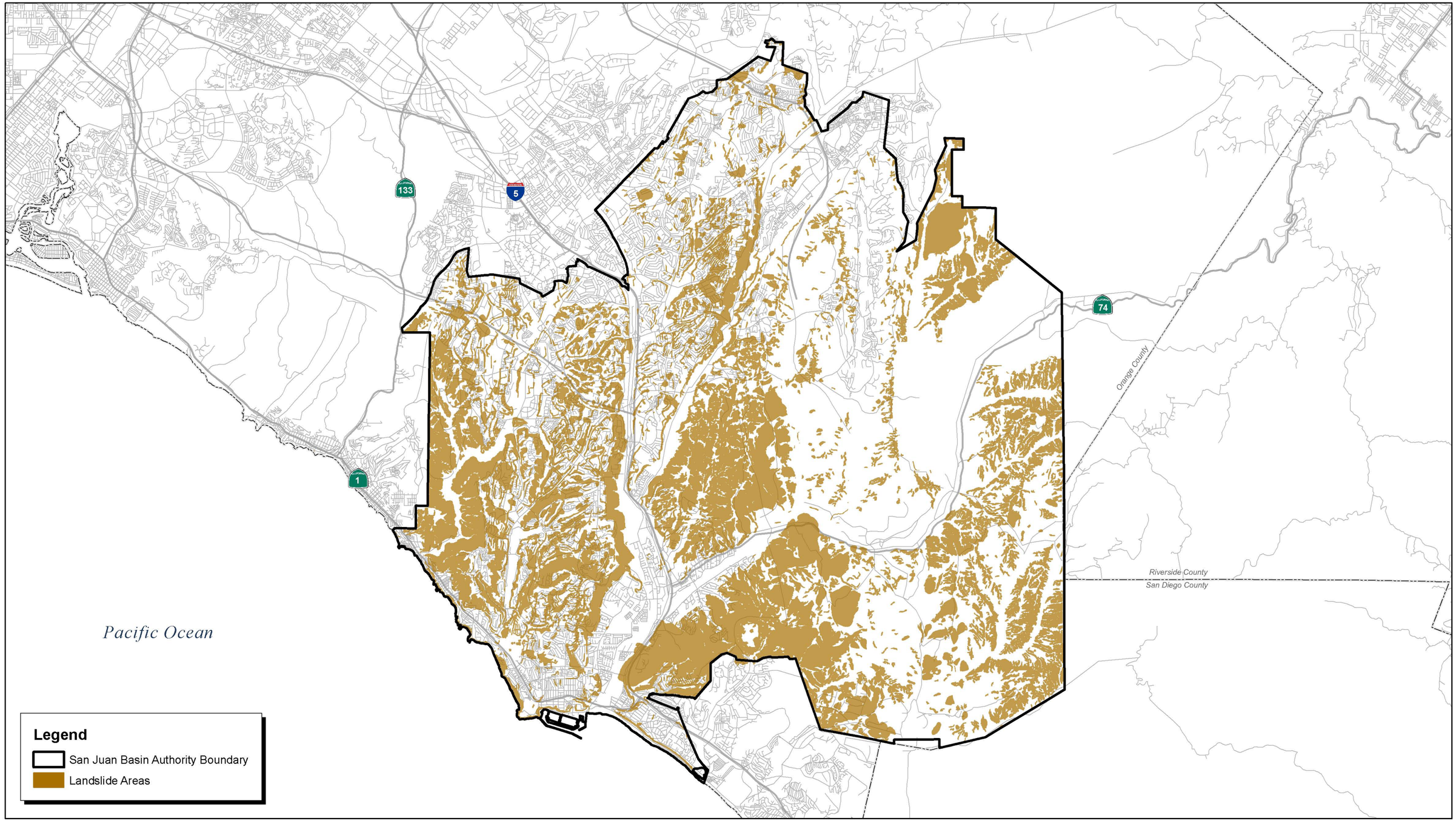
38340001 • 02/2011 | 2-11_liquefaction.mxd

Figure 2-11
Liquefaction Areas



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

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Figure 2-12
Landslide Areas

Pacific Ocean

Legend

- San Juan Basin Authority Boundary

Soil Permeability

- Slow
- Moderate
- Rapid

Source: Orange County, Riverside County and San Diego Diego County NAIP, 2009. USDA Soils Data.

Michael Brandman Associates

NORTH

2 1 0 2 Miles

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38340001 • 02/2011 | 2-13_soil_permeability.mxd

Figure 2-13
Soil Permeability

Pacific Ocean

Legend

- San Juan Basin Authority Boundary

Shallow Excavation Development Constraint

- Slight
- Moderate
- Severe

Source: Orange County, Riverside County and San Diego Diego County NAIP, 2009. USDA Soils Data.

NORTH

2 1 0 2 Miles

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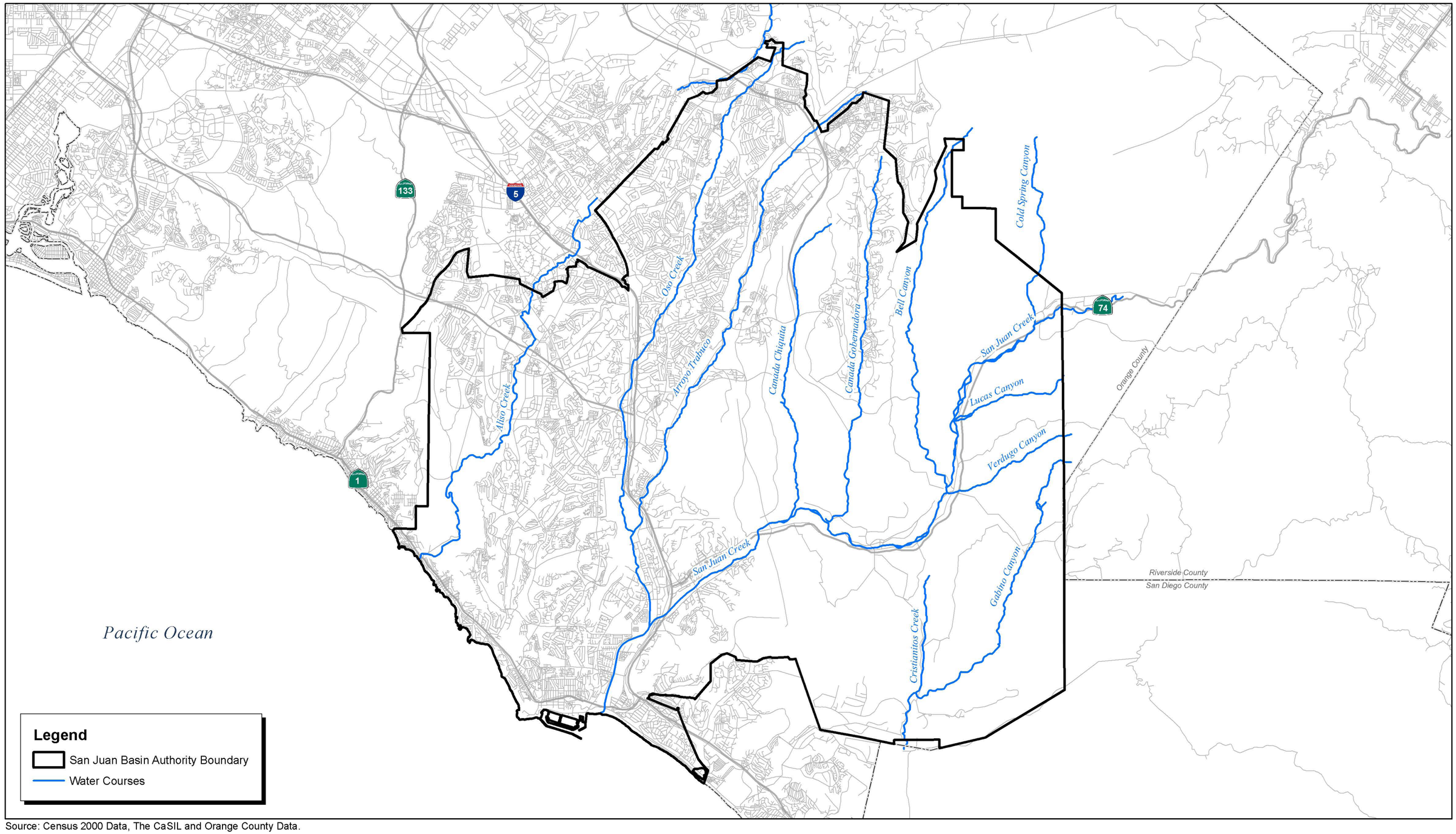
38340001 • 02/2011 | 2-14_shallow_excavation_devel_constraint.mxd

Figure 2-14
Shallow Excavation Development Constraint



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

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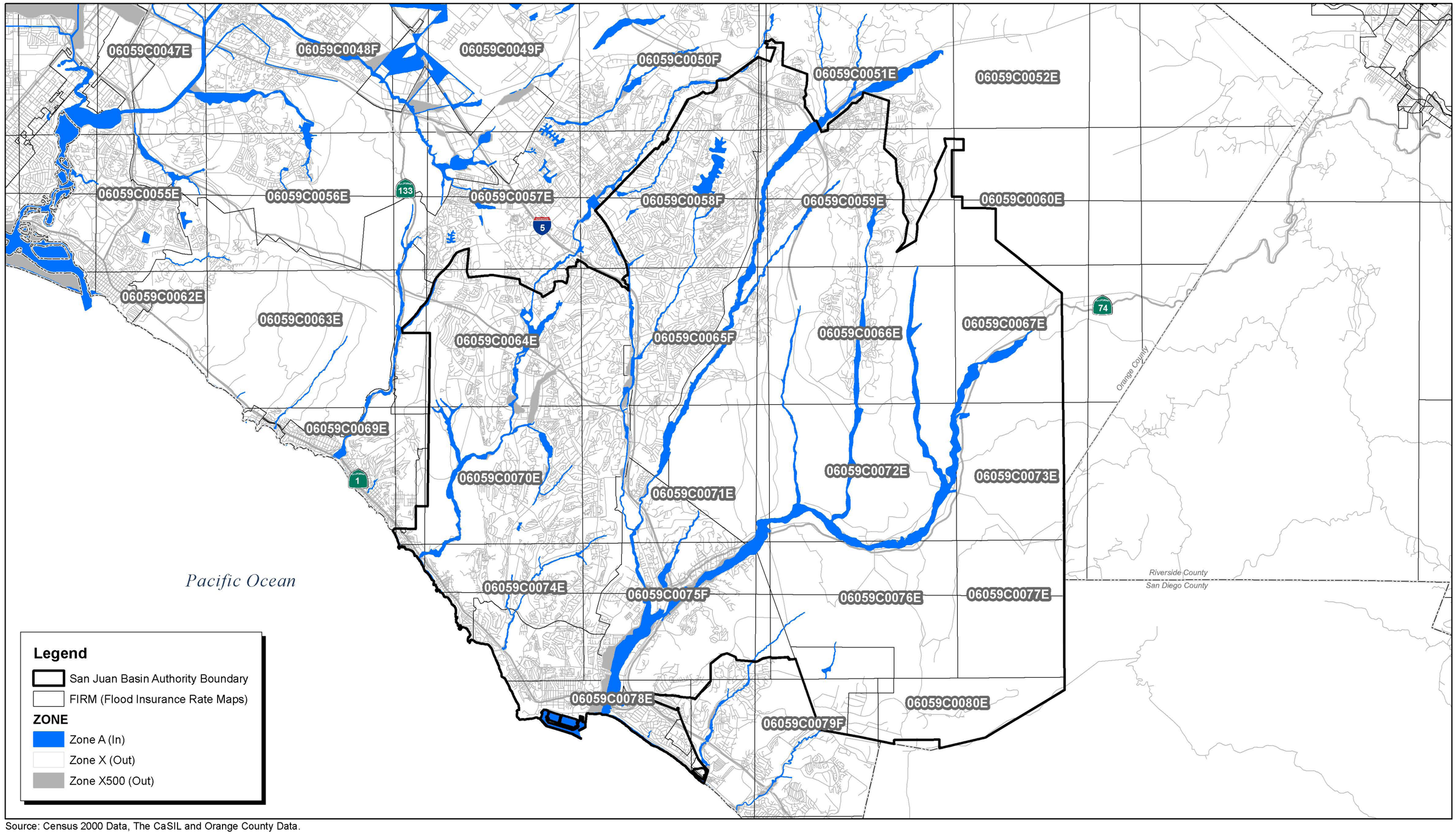
Figure 2-15
Water Courses



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

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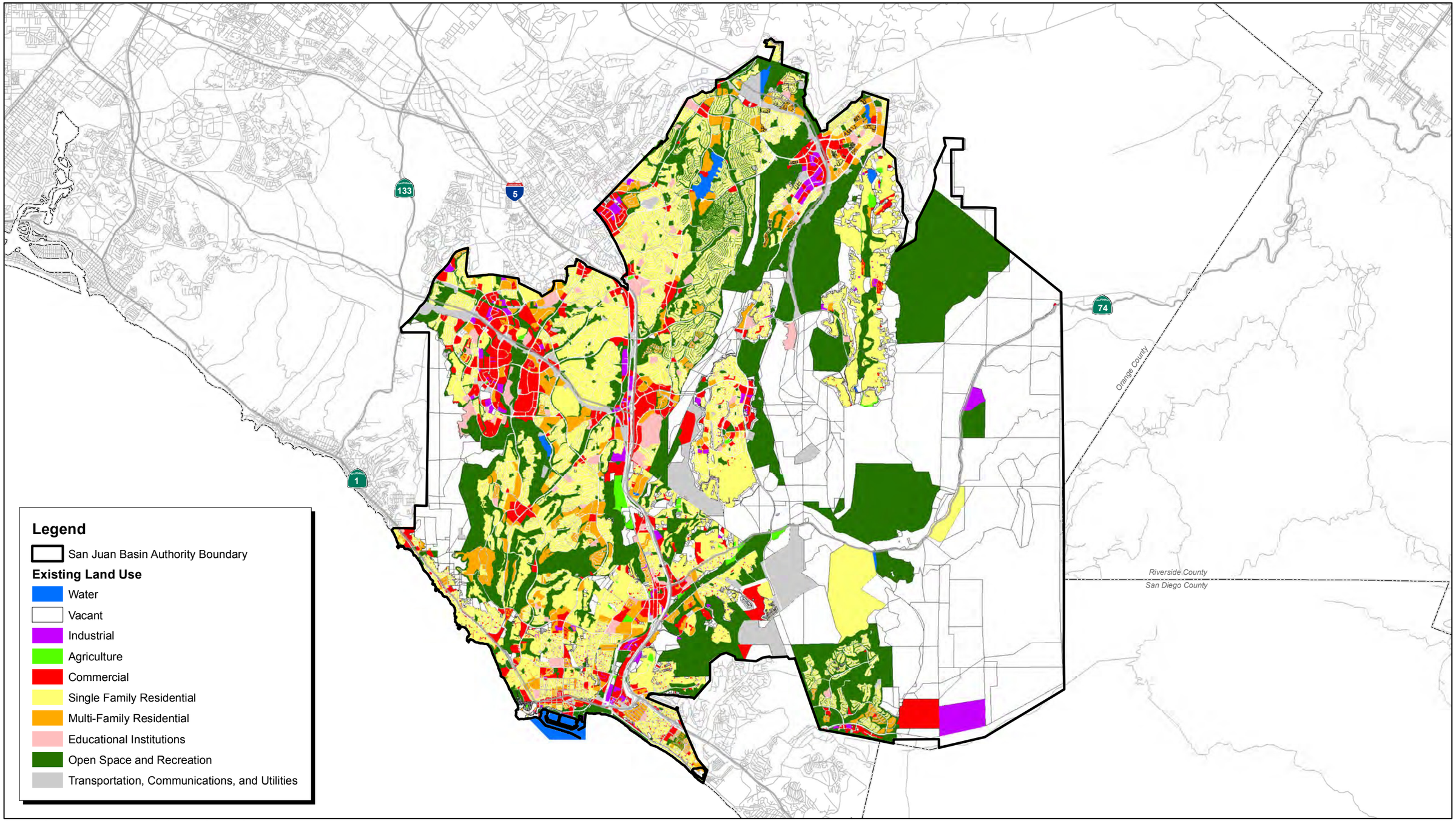
38340001 • 02/2011 | 2-16_FEMA.mxd

Figure 2-16
FEMA Flood Zone Map



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

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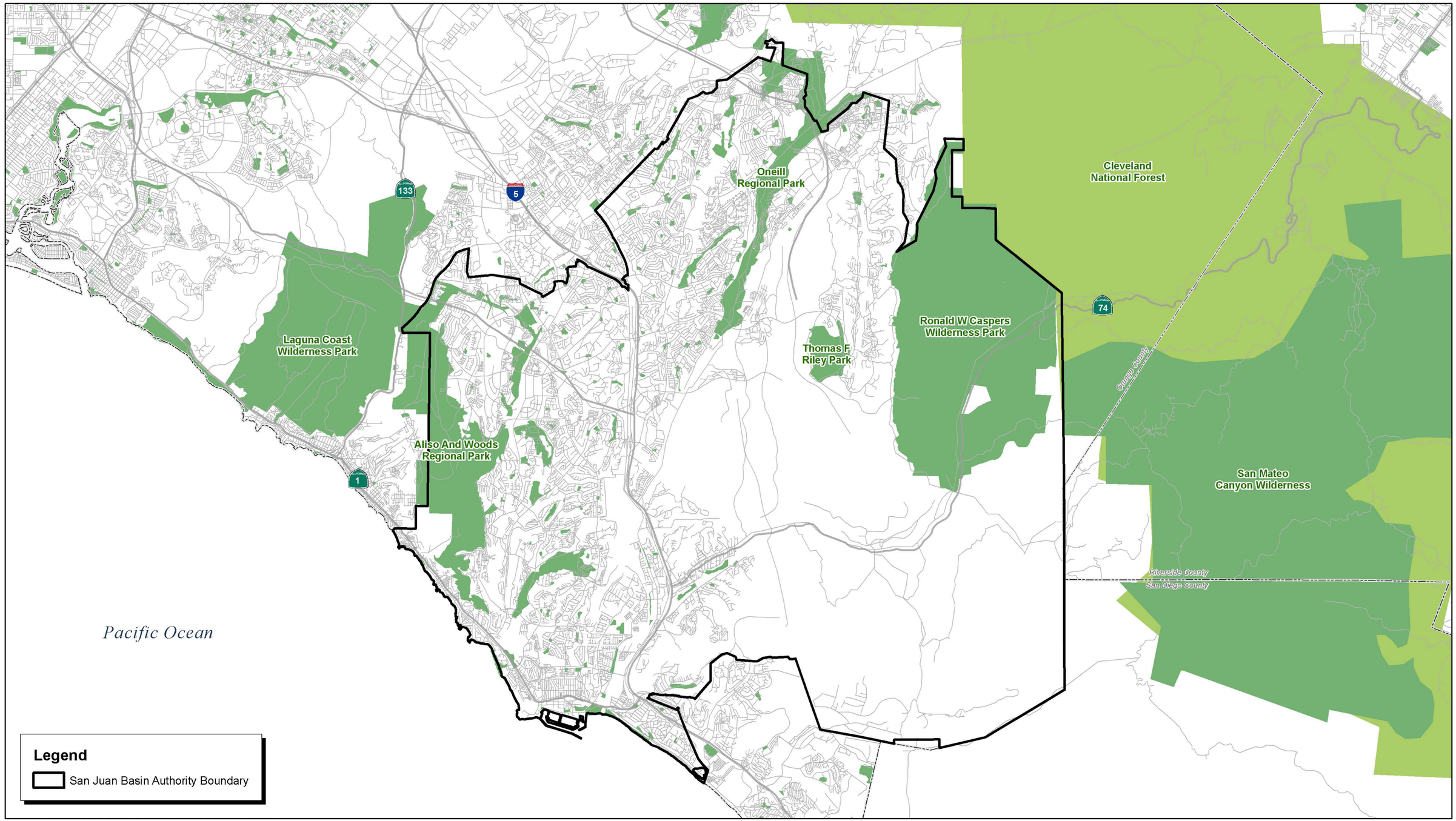
38340001 • 02/2011 | 2-17_LU.mxd

Figure 2-17
Existing Land Use



Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

Michael Brandman Associates

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Figure 2-18
Parks and Recreation

Pacific Ocean

Orange County

Riverside County

San Diego County

Legend

- San Juan Basin Authority Boundary

Arterial Highways

- Principal
- Major
- Primary
- Secondary
- Collector
- Freeway
- SMART Street 6 Lane

Source: Census 2000 Data, The CaSIL and Orange County Data.

NORTH

2 1 0 2 Miles

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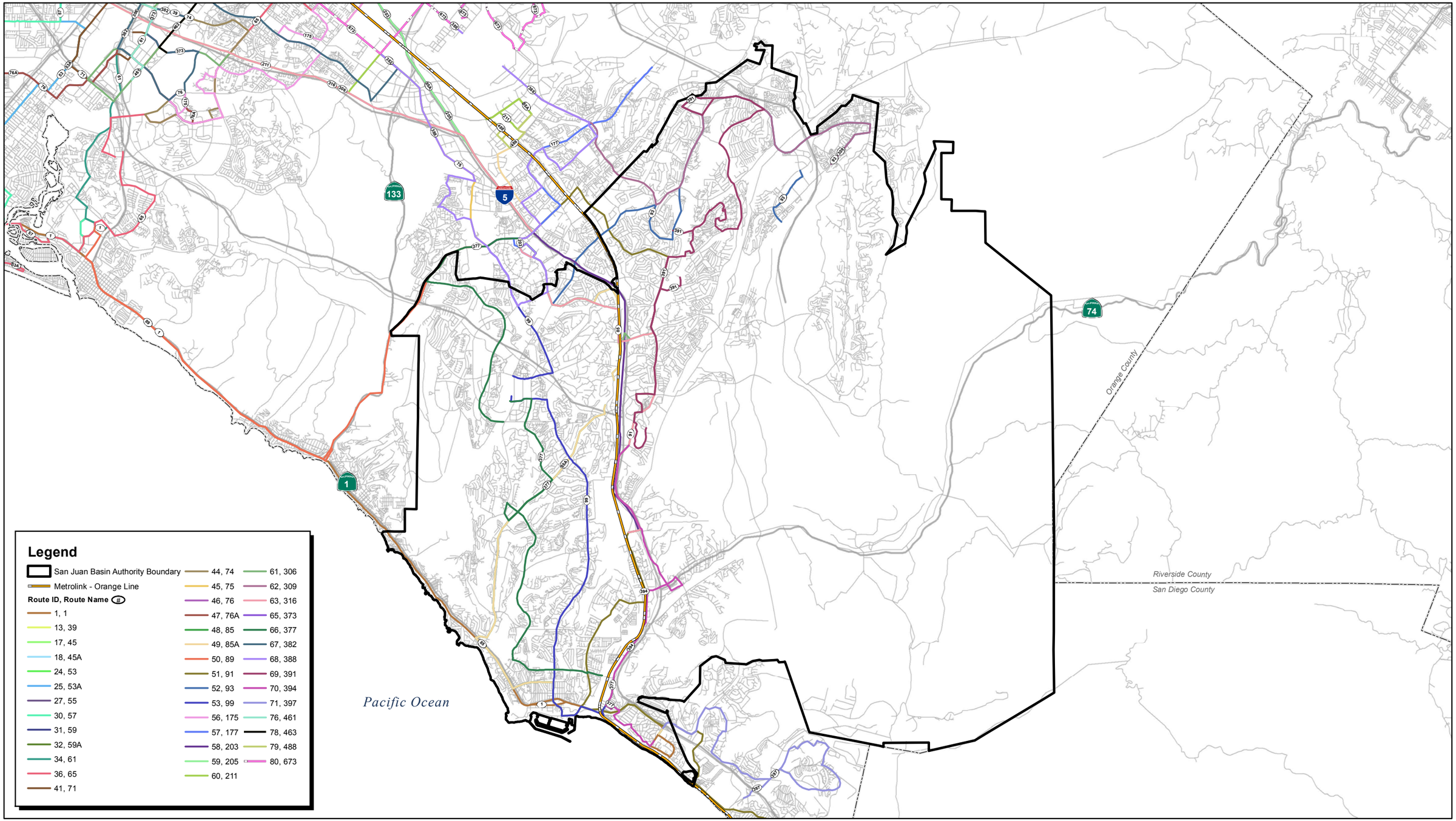
38340001 • 02/2011 | 2-19_mp_arterial_hwys.mxd

Figure 2-19
Master Plan of Arterial Highways



Source: Census 2000 Data, The CaSIL and Orange County Data.

Michael Brandman Associates

NORTH

2 1 0 2 Miles

DRAFT

Figure 2-20
Fixed Bus Routes & Rail Systems

117°40'0"W

117°20'0"W

33°40'0"N

Main Features

- San Juan Creek Watershed Boundary
- Precipitation Station with Station ID
- City Boundaries (various colors)
- Streams and Creeks

Lemon Heights
Silverado
Modjeska
Portola Hills
Foothill Ranch
El Toro
Trabuco Canyon
Rancho Santa Margarita
Mission Viejo
Lake Forest
Laguna Woods
Laguna Hills
Aliso Viejo
Las Flores
Coto de Caza
San Juan Hot Springs
Lake Elsinore
Lakeland Village
Laguna Beach
Laguna Niguel
South Laguna
Three Arch Bay
Dana Point
Capistrano Beach
San Juan Capistrano

61 119 214 156 178 133 206 176 234 216 100 134 186

Bee Canyon Wash
Agua Chinon Wash
Borrego Canyon Wash
Serrano Creek
San Diego Creek
Aliso Creek
Oso Creek
Santiago Creek
Arroyo Trabuco
Cañada Chiquita
Cañada Gobernadora
Bell Canyon
Sulphur Creek
Salt Creek
Horno Creek
San Juan Creek
Cristianitos Creek
San Mateo Creek
Arroyo Salado

Riverside County
Orange County
San Diego County

Pacific Ocean

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Date: 4/11/2013
Path: N:\MapDocs\Clients\SJBA\2011 GWMP\Figure 3-1.mxd

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0 1 2 3 4 Miles
0 2 4 6 KM

SAN JUAN BASIN AUTHORITY

075-003
004

The San Juan Creek Watershed

City Boundaries and Precipitation Station Locations

Figure 3-1

117°40'0"W

11047200
11046400
11047000
11046500
11046530
11047300
11046501
11046550
11047350

Aliso Creek
ALICIA PKWY
LA PAZ RD
CROWN VALLEY PKWY
Sulphur Creek
PASEO DE LA CONCHAS
Arroyo Trabuco
Horno Creek
ANTONIO PKWY
Chiquita
Cañada
Gobernadora
Cañada
San Juan Creek
ORTEGA HWY
Oso Creek
Salt Creek
MARINA HILLS DR
CAMINO CAPISTRANO
74
MISSION RD
Arroyo Salado
CAMINO DEL AVION
DEL OBISPO ST
San Juan Creek
SAN JUAN CREEK RD
STONEHILL DR
GOLDEN LANTERN ST
CAMINO DE LOS MARES
Cristianitos Creek
1
5

117°40'0"W

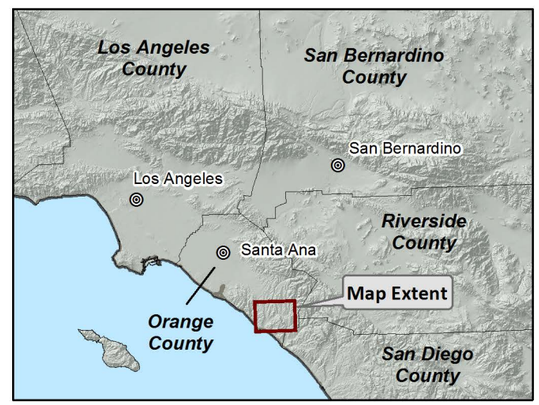
Main Features

- San Juan Creek Watershed Boundary
- USGS Stream Gauge Station with Station ID
- San Juan Basin
- Streams and Creeks

Geologic Features

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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Author: lboehm
Date: 4/11/2013
Path: N:\MapDocs\Clients\SJBA\2011 GWMP\Figure 3-2.mxd

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0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

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004

Location of USGS Stream Gauging Stations

Figure 3-2

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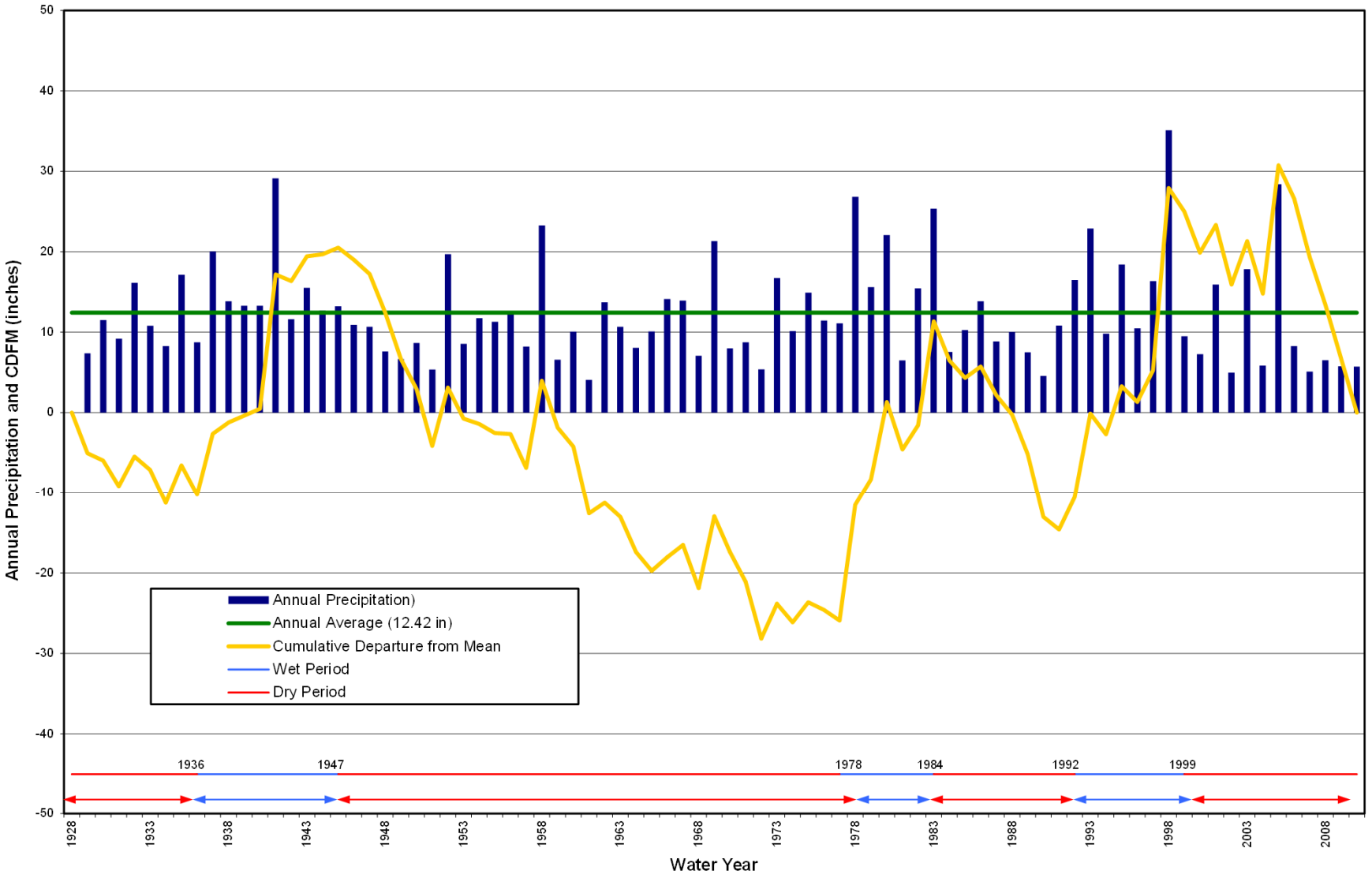
Figure 3-3 Cumulative Departure from Mean (CDFM)
Laguna Beach Station



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S:\Clients\San Juan Basin Authority\Groundwater Management Plan\Report\2013 Report Compilation\Figures\Figure 3-3 CumDepMean -- Fig 3-3

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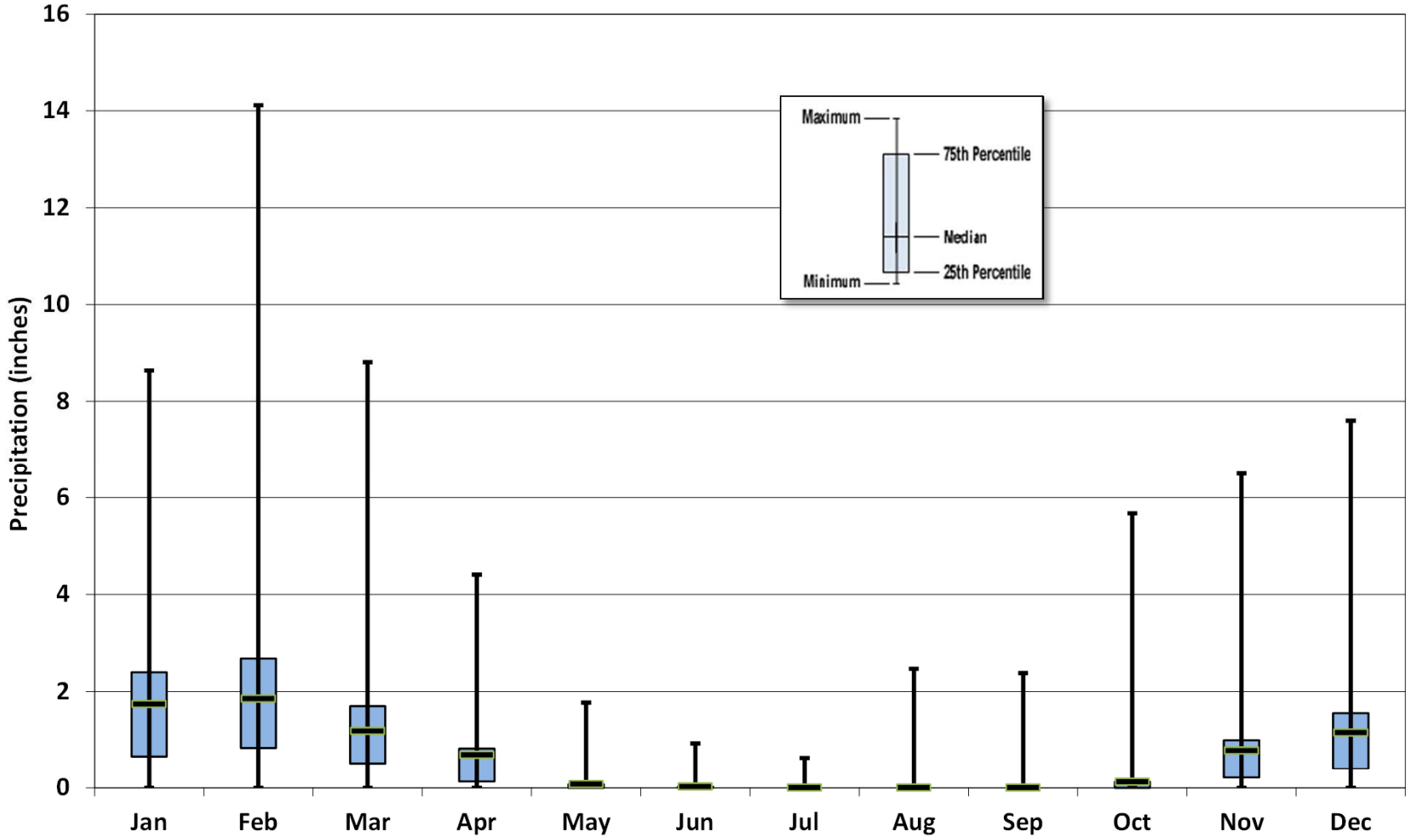
Figure 3-4 Monthly Precipitation Variability in Laguna Beach Station from 1928 to 2010



D R A F T

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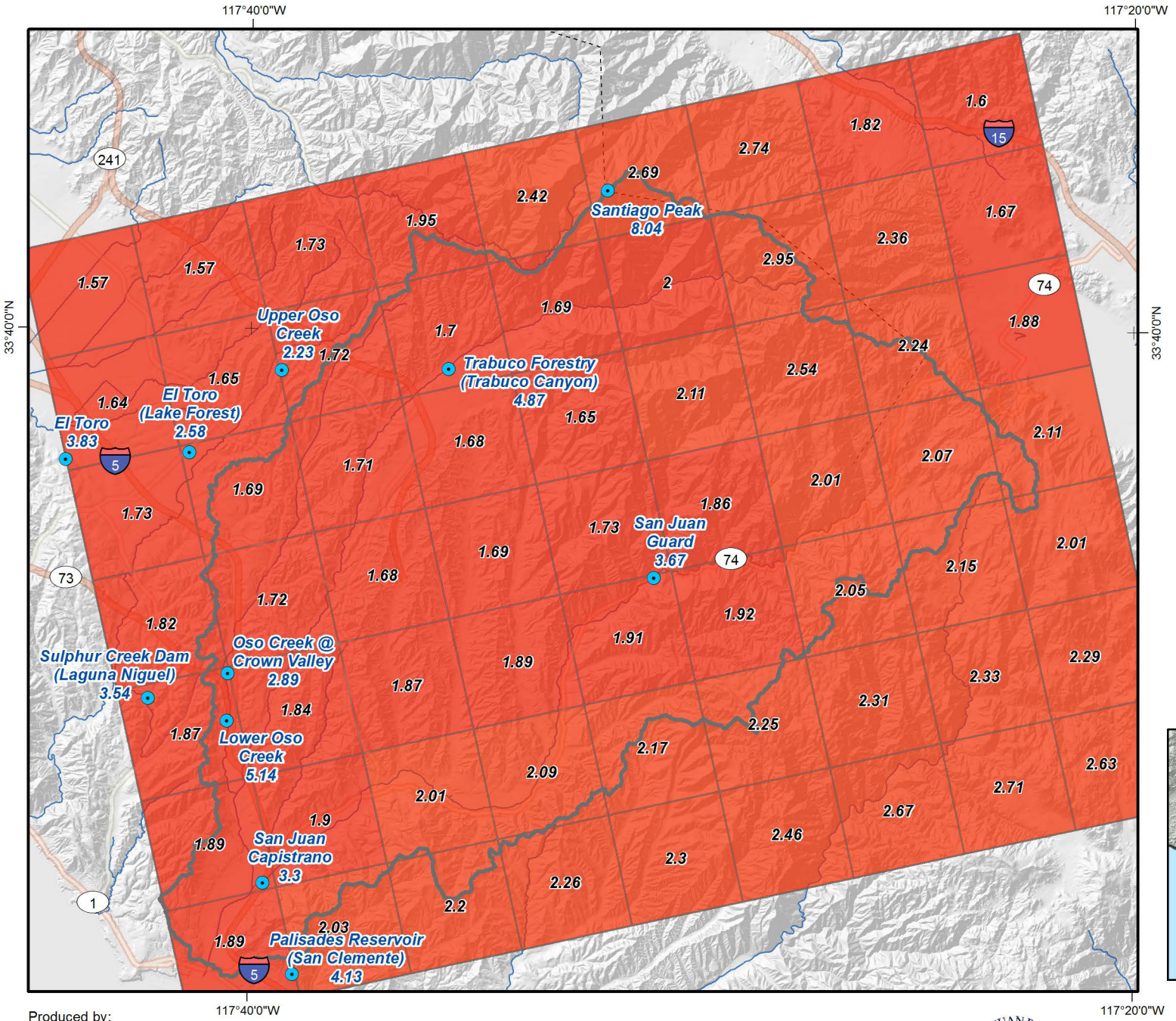


Annual Rainfall (inches)

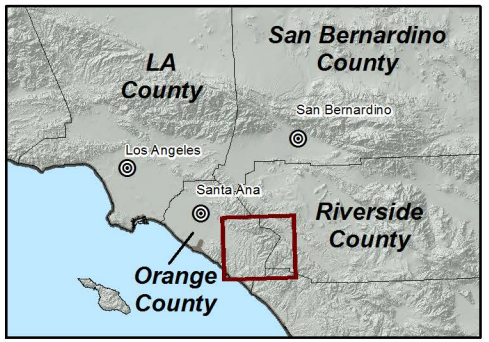
50
25
0

Data collected from the National Center for Atmospheric Research

Annual Precipitation at Precipitation Station

Watershed Boundary

Streams and Creeks



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Author: lboehm

Date: 4/15/2013

Path: N:\...SJBA\2011 GWMP\Figure 3-6.mxd

0 2 Miles

0 2 4 6 Kilometers

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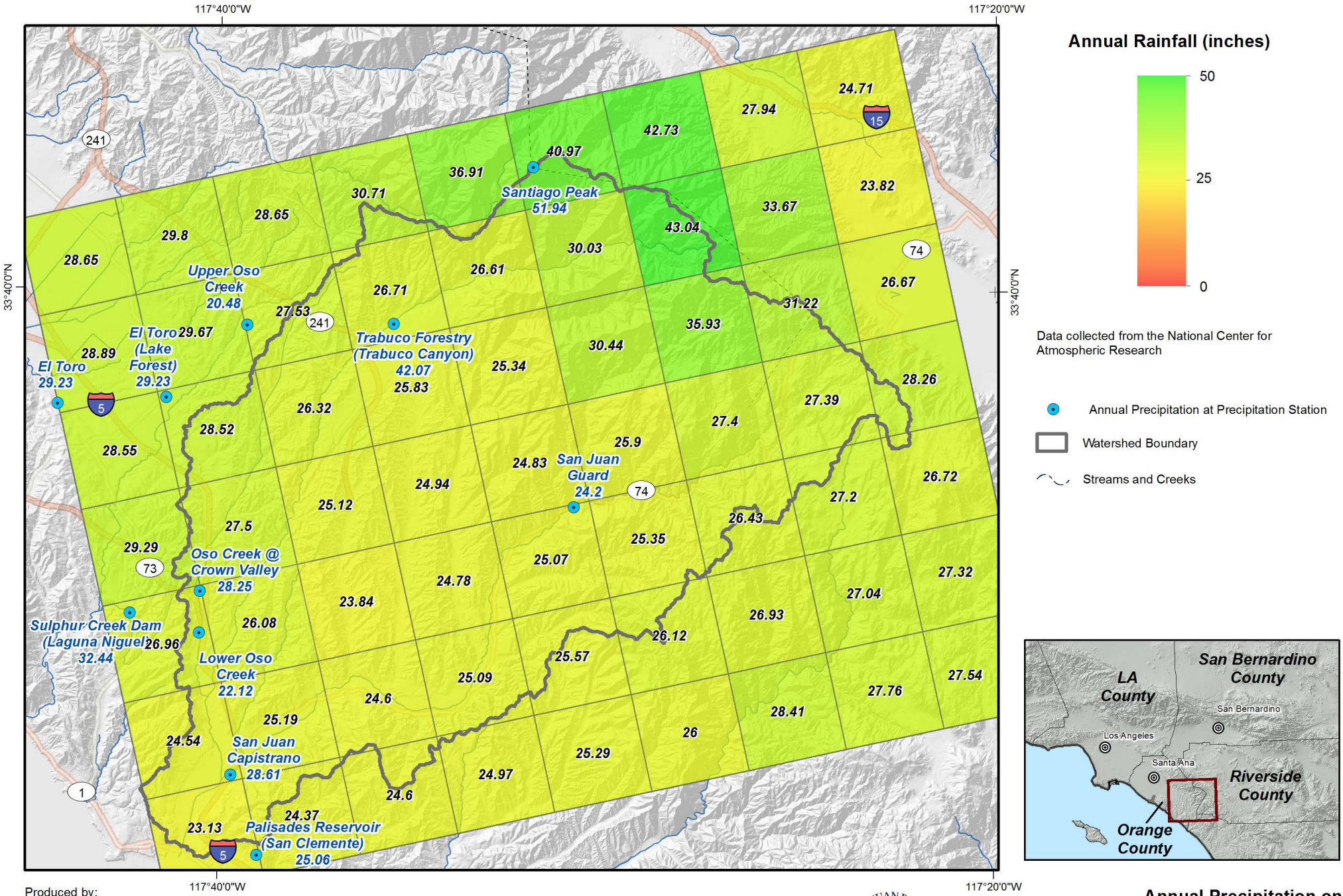
004

Annual Precipitation on San Juan Basin in Fiscal Year 2007

Figure 3-5


117°40'0"W
117°20'0"W
33°40'0"N
Annual Rainfall (inches)
50
25
0
Data collected from the National Center for Atmospheric Research
Annual Precipitation at Precipitation Station
Watershed Boundary
Streams and Creeks
Santiago Peak 51.94
Upper Oso Creek 20.48
Trabuco Forestry (Trabuco Canyon) 42.07
El Toro 29.23
El Toro (Lake Forest) 29.23
San Juan Guard 24.2
Oso Creek @ Crown Valley 28.25
Sulphur Creek Dam (Laguna Niguel) 32.44
Lower Oso Creek 22.12
San Juan Capistrano 28.61
Palisades Reservoir (San Clemente) 25.06
40.97
36.91
42.73
27.94
24.71
30.71
28.65
29.8
33.67
23.82
43.04
30.03
28.65
26.61
26.71
27.53
29.67
28.89
25.34
30.44
35.93
31.22
26.67
28.26
27.39
26.32
28.52
28.55
27.4
25.9
24.83
24.94
25.12
26.72
27.2
26.43
27.5
29.29
25.35
25.07
24.78
27.32
27.04
23.84
26.08
26.93
26.96
26.12
25.57
25.09
27.54
27.76
24.6
28.41
25.19
24.54
26
25.29
24.97
24.6
24.37
23.13
241
15
74
73
5
1
LA County
San Bernardino County
San Bernardino
Los Angeles
Santa Ana
Riverside County
Orange County
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Author: lboehm
Date: 4/15/2013
Path: N:\...SJBA\2011 GWMP\Figure 3-6.mxd
0 2 Miles
0 2 4 6 Kilometers
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004
Annual Precipitation on San Juan Basin in Fiscal Year 2005
Figure 3-6

Figure 3-7 Projected Average Monthly Temperature for the San Juan Creek Watershed
Based on the IPCC A2 Emission Scenario and the MPI-ECHAM5 Model

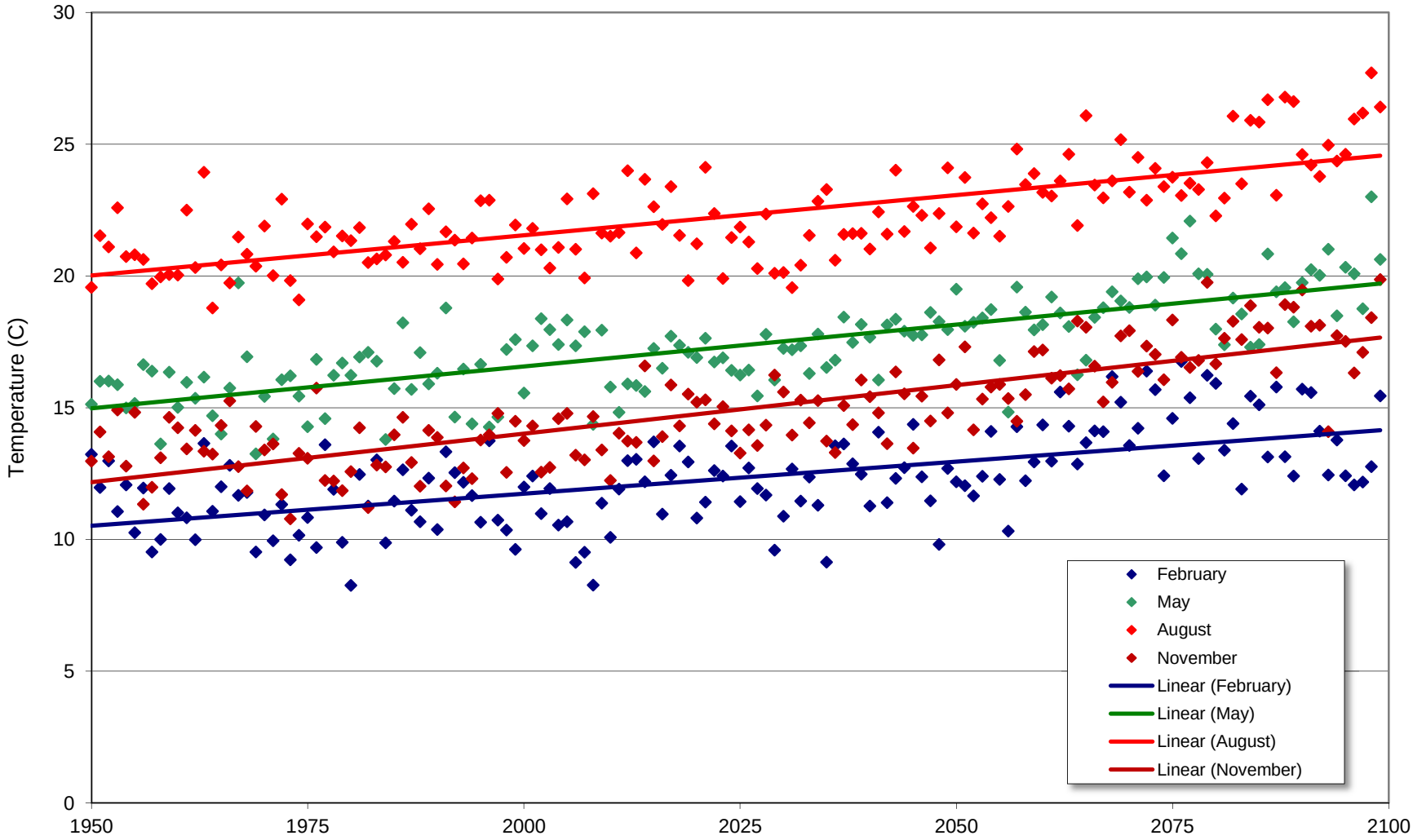

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Figure 3-8 Projected Precipitation on the San Juan Creek Watershed
MPI-ECHAM 5.1 Model - A2 Emissions Scenario

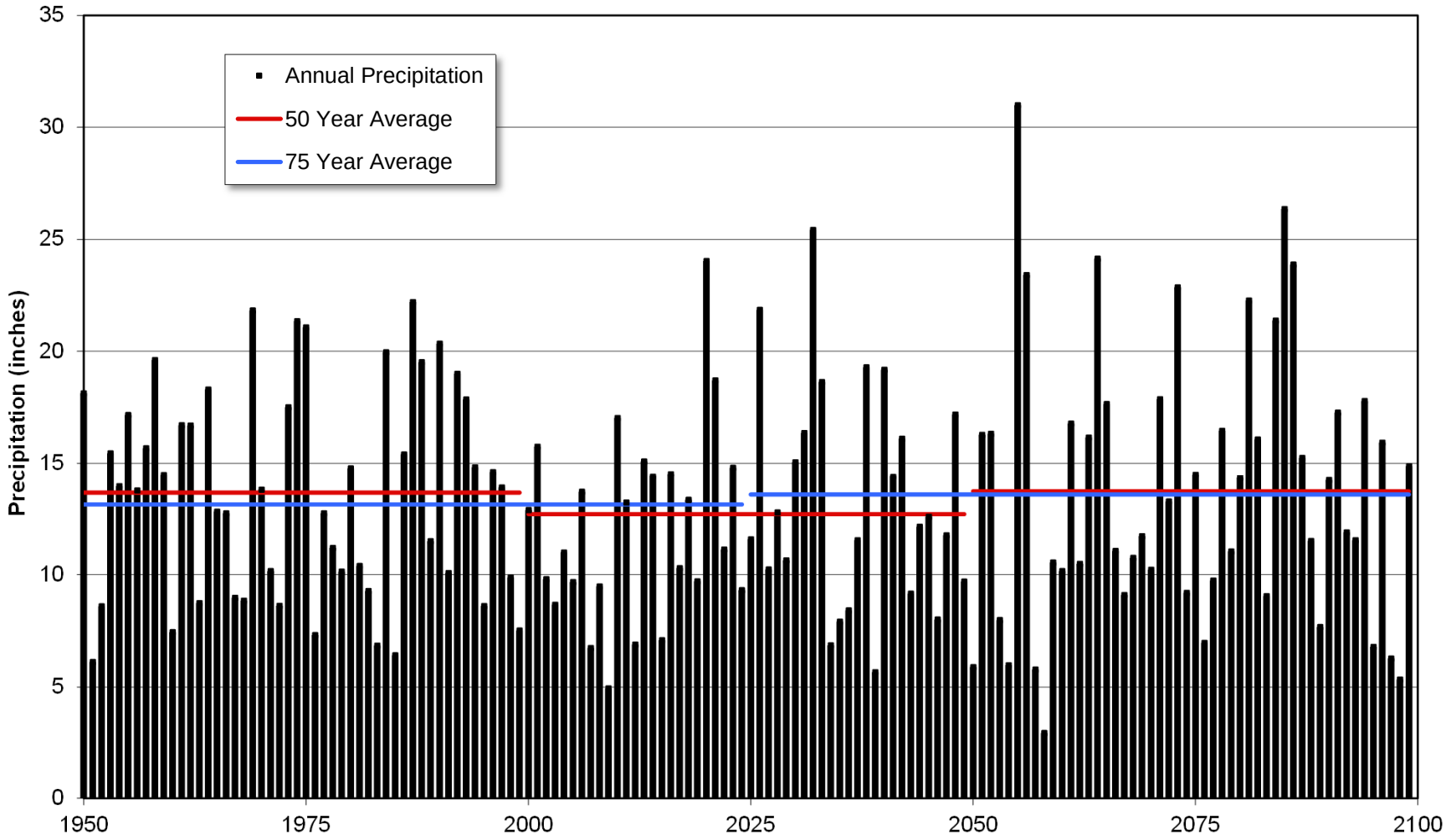

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Figure 3-9 Projected Annual Precipitation on the San Juan Watershed 1950 through 2100
Based on the IPCC A2 Emission Scenario and the MPI-ECHAM5 Model

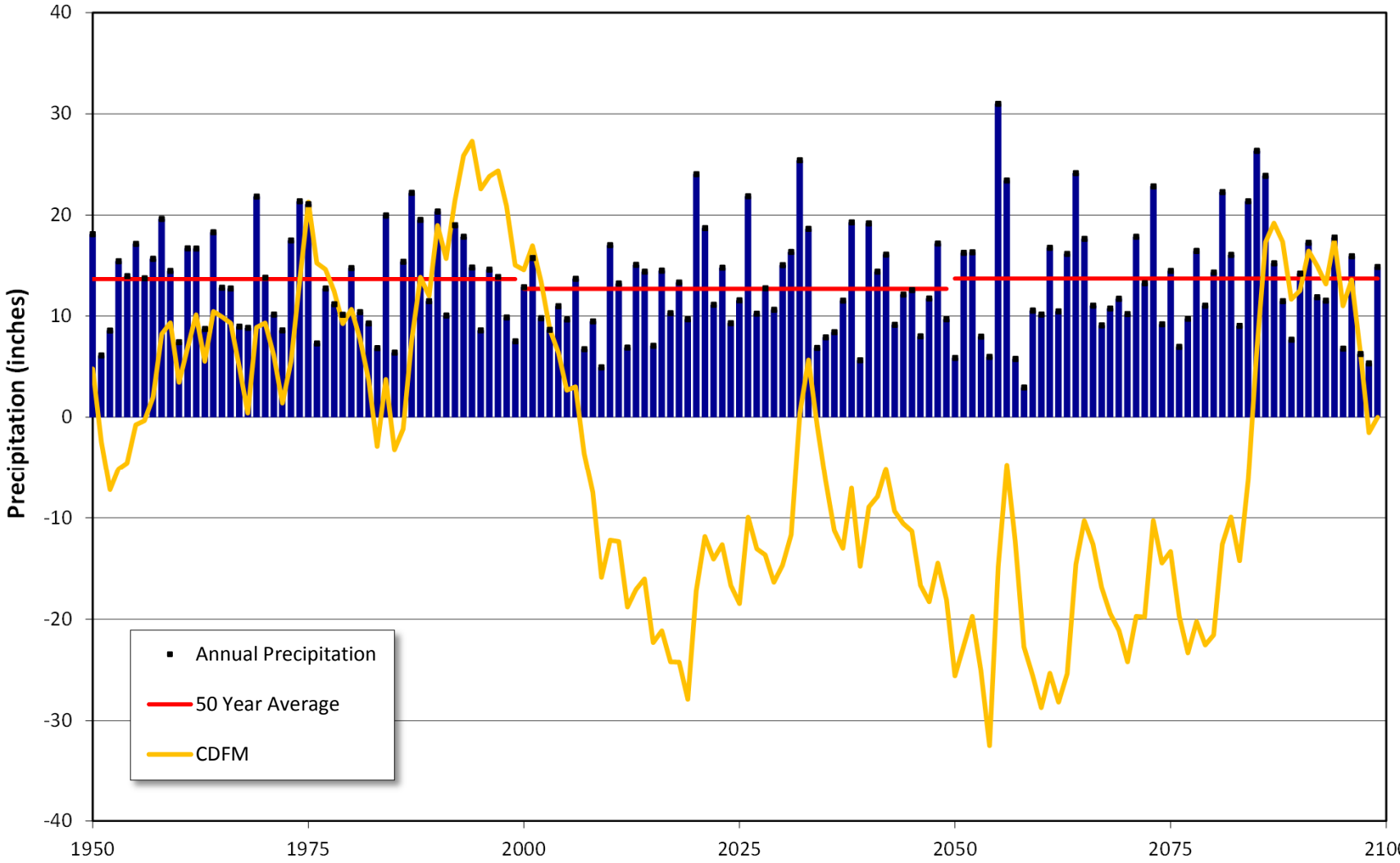

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Figure 3-10 Mass Curve of Stream Flow
San Juan Creek (1928 - 2010)

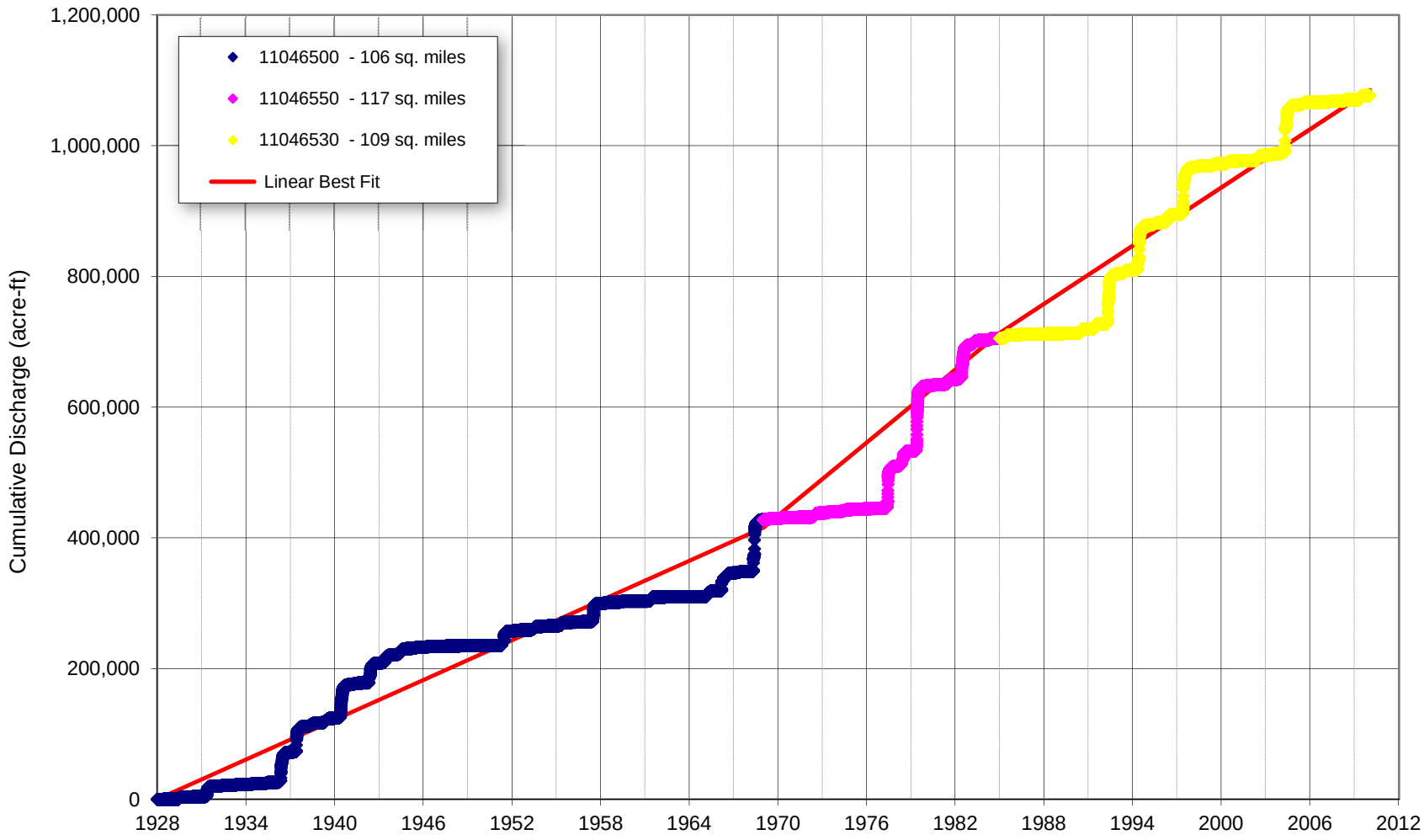

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Figure 3-11 Annual Stream Discharge with CDFM
San Juan Creek Composite Gage

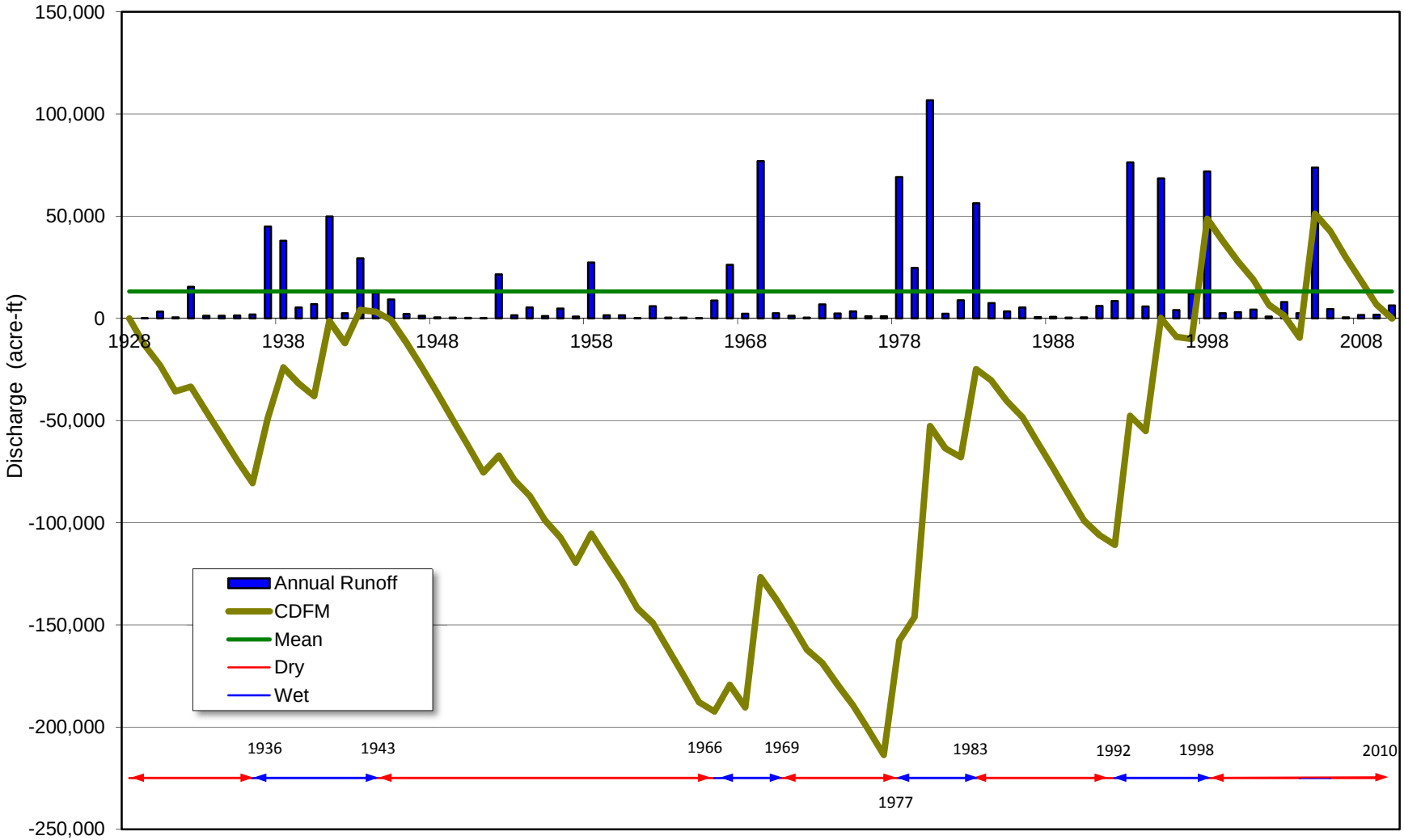

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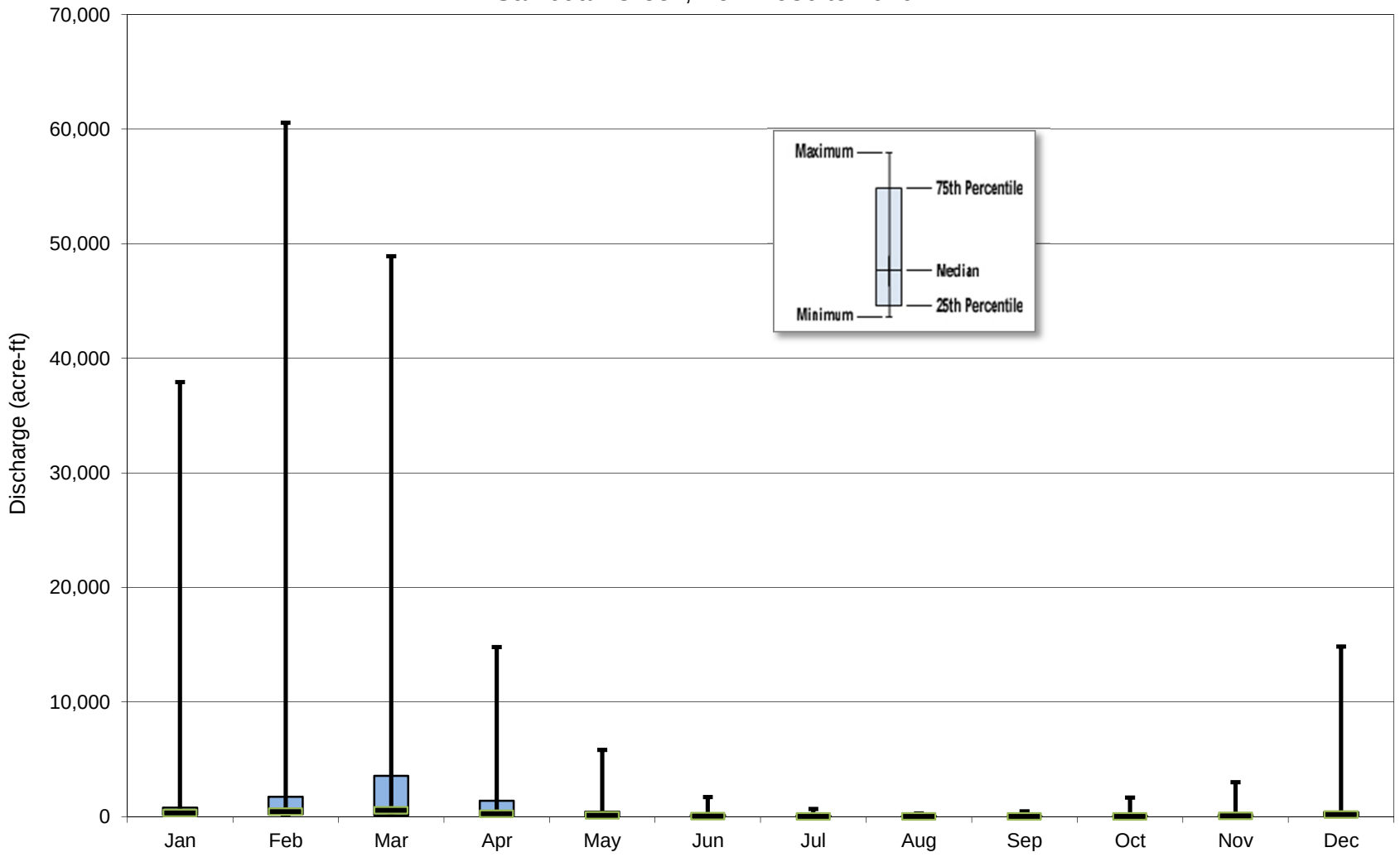
Figure 3-12 Monthly Discharge Variability Plot
San Juan Creek, from 1930 to 2010



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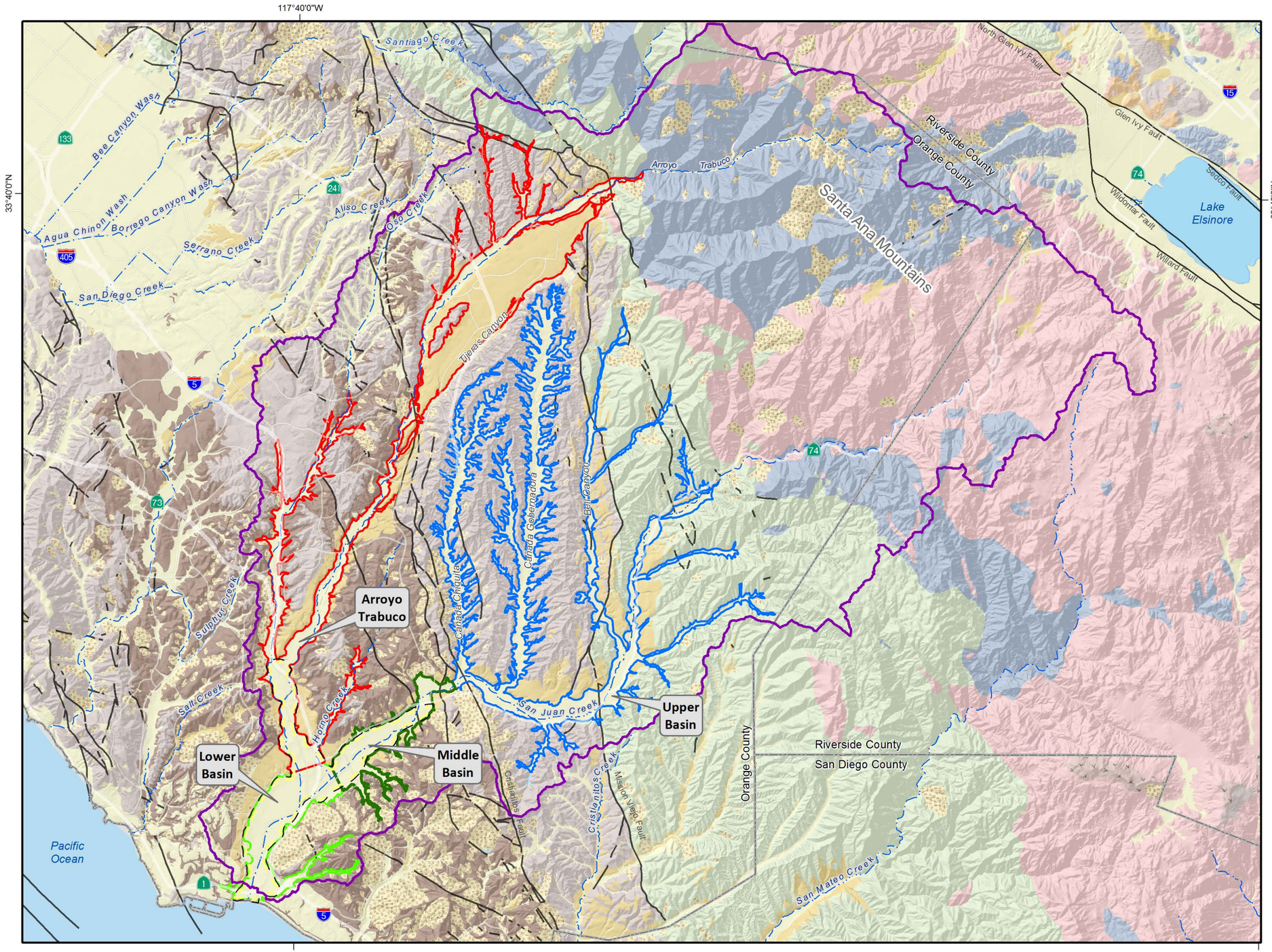


Hydrologic Features

San Juan Creek Watershed Boundary

San Juan Sub-Basins

- Arroyo Trabuco
- Lower Basin
- Middle Basin
- Upper Basin

Active Groundwater Storage Area

Geologic Features

Late Holocene to Early Pleistocene Surficial Deposits

- Younger Alluvial Deposits
- Landslide Deposits
- Older Alluvial Deposits

Tertiary Bedrock Units

- Fine-grained Formations (Capistrano and Monterey Formations)
- Coarse-grained Formations (Santiago,Sespe, and Niguel Formations)

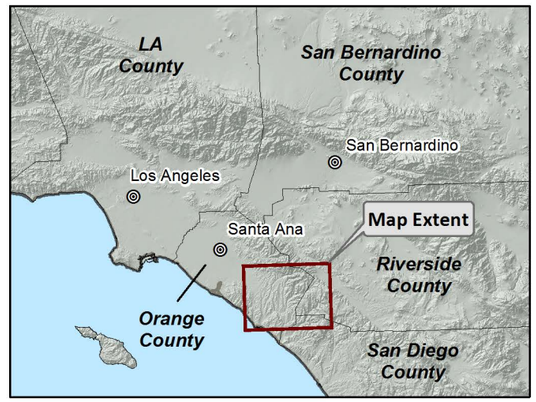
Mesozoic and Older Bedrock Units

- Cretaceous Age Formations of Sedimentary Origin (Williams and Trabuco Formations)
- Pre-Cretaceous Metamorphic Formations of Sedimentary and Volcanic Origins (Menifee Valley and Bedford Canyon Formations)
- Granitic and other intrusive crystalline rocks

Source: CGS Special Report 217.

Faults

- Location Certain
- Location Approximate



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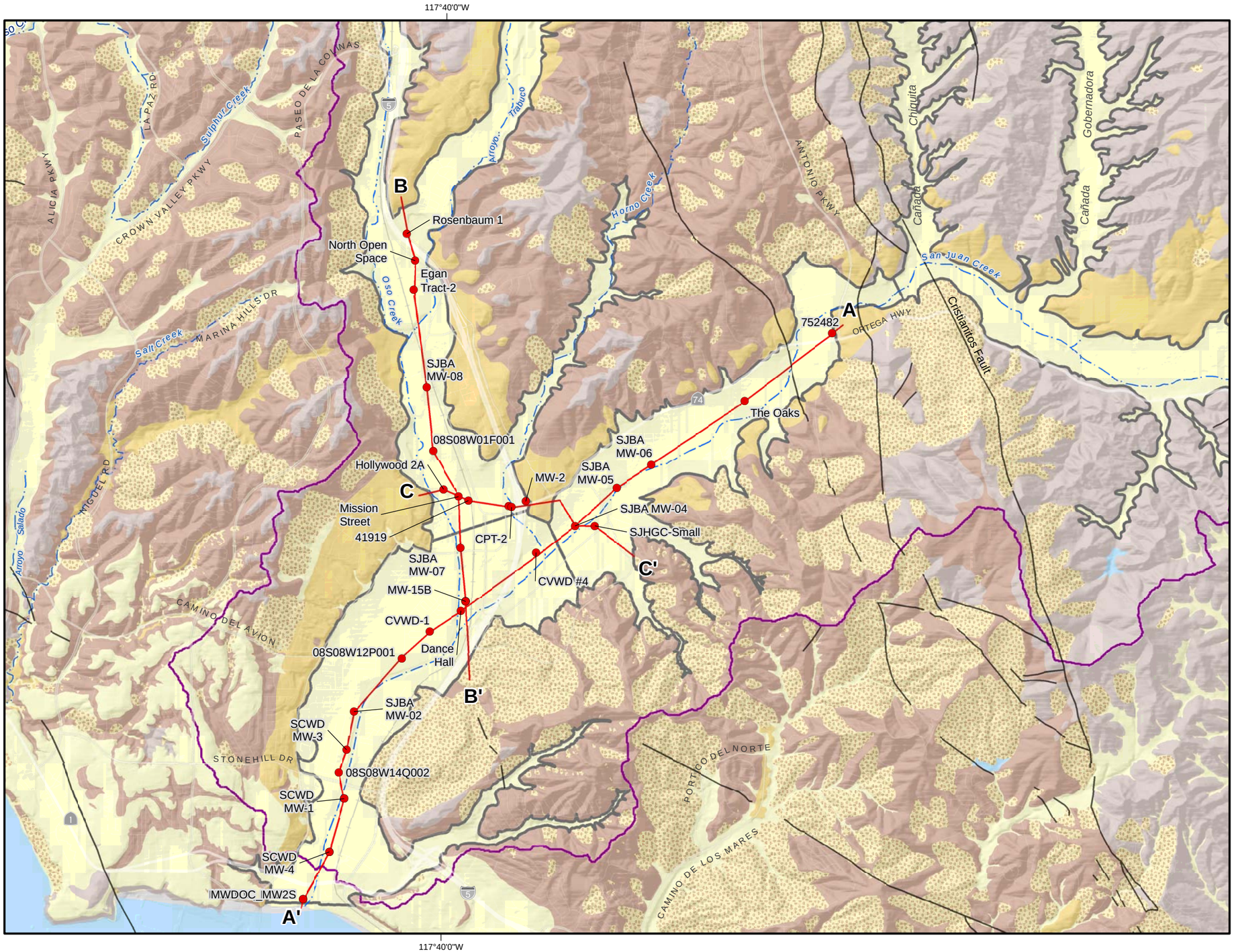
0 1 2 3 4 Miles
0 2 4 6 KM

SAN JUAN BASIN AUTHORITY

075-003
004

Generalized Geology and Locations of Groundwater Sub-Basins

Figure 3-13



Main Features

Line of Geologic Cross Section
(shown in Figures 3-15 thru 3-17)

Well Used in Cross Section

Hydrologic Features

Groundwater Sub-basin

San Juan Creek Watershed Boundary

Geologic Features

Late Holocene to Early Pleistocene Surficial Deposits

Younger Alluvial Deposits

Landslide Deposits

Older Alluvial Deposits

Tertiary Bedrock Units

Fine-grained Formations
(Capistrano and Monterey Formations)

Coarse-grained Formations
(Santiago,Sespe, and Niguel Formations)

Source: CGS Special Report 217.

Faults

Location Certain

Location Approximate

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0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

075-003
004

Plan View of Geologic Cross Sections

Figure 3-14

A
Northeast

A'
Southwest

C-C'

B-B'

Middle Basin

Lower Basin

(752482)

Ortega Hwy

San Juan Creek

The Oaks (757121)

SJBA MW-06

SJBA MW-05

La Novia Ave

SJBA MW-04

CVWD-4,(08S07WD01)

Interstate 5

Dance Hall,(e009695)

Arroyo Trabuco

CVWD-1,(e016490)

08S08W12P01,(16428)

San Juan Creek

SJBA MW-02

SCWD MW-3

08S08W14Q02,(13168)

Stonehill Dr

San Juan Creek

SCWD MW-1D

SCWD MW-4D

San Juan Creek

Pacific Coast Hwy

MWDOC MW2

Pacific Ocean

Alluvial Deposits

Capistrano Formation

200
150
100
50
0
-50
-100
-150
-200

0
5,000
10,000
15,000
20,000
25,000
30,000
35,000

Distance Along Baseline (ft)

Elevation (ft-msl)

Report: STRAT+GEOPHYSICAL_11X17; File: XSECTIONS.GPJ; 4/6/2011

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Vertical Scale: 1" = 50'

Horizontal Scale: 1" = 2,500'

Vertical Exaggeration = 50:1

- Topsoil
- Gravel with Sand
- Clay with Sand
- Boulders/Cobbles with Gravel
- Boulders/Cobbles with Clay
- Boulders/Cobbles with Sand
- Clay
- Clay with Gravel
- Gravel
- Cobbles and/or Boulders
- Shale
- Fill (made ground)
- Clay with Silt
- Sand with Gravel
- Siltstone

- Well Screen Interval
- Water Level (Fall 2010)
- Resistivity Log

Local Name, (DWR Well Completion Report No.)

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SAN JUAN BASIN AUTHORITY

San Juan Basin

Cross-Section A-A'

Figure 3-15

B North

B' South

C-C'

A-A'

Lower Arroyo Trabuco Basin

Lower Basin

Rosenbaum 1,(30776)

Interstate 5

North Open Space,(537318)

Egan Tract-2,(40192)

Arroyo Trabuco

Camino Capistrano

SJBA MW-08

08S08W01F001,(41846)

Mission Street,(51043)

SJBA MW-07

Del Obispo St

Dance Hall,(e009695)

San Juan Creek

Interstate 5

Alluvial Deposits

Capistrano Formation

Elevation (ft-msl)

300
250
200
150
100
50
0
-50
-100
-150
-200

0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000

Distance Along Baseline (ft)

Report: STRAT+GEOPHYSICAL_11X17; File: XSECTIONS.GPJ; 4/6/2011

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Vertical Scale: 1" = 27'

Horizontal Scale: 1" = 1,350'

Vertical Exaggeration = 50:1

- Topsoil
- Sand with Gravel
- Clay with Gravel and Sand
- Clay
- Shale
- Clay with Sand
- Boulders/Cobbles with Gravel and Clay
- Sand with Travel and Clay
- Boulders/Cobbles with Gravel and Sand
- Boulders/Cobbles with Sand
- Sand
- Gravel with Clay
- Gravel with Sand and Clay
- Gravel
- Clay with Gravel

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- Well Screen Interval
- Water Level (Fall 2010)

Local Name, (DWR Well Completion Report No.)

SAN JUAN BASIN AUTHORITY

San Juan Basin

Cross-Section B-B'

Figure 3-16

West C B-B' Lower Arroyo Trabuco Basin A-A' Middle Basin C' East

Arroyo Trabuco
Hollywood 2A,(51036)
Mission Street,(51043)
08S08W01K003,(41919)
Camino Capistrano
(1084952)
CPT-2
Horno Creek
Interstate 5
MW-2 (779598)
SJBA MW-04
San Juan Creek
SJHGC-Small,(34546)
San Juan Creek Rd

Alluvial Deposits

Capistrano Formation

200
150
100
50
0
-50
-100

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000

Distance Along Baseline (ft)

Elevation (ft-msl)

Report: STRAT+GEOPHYSICAL_11X17; File: XSECTIONS.GPJ; 4/7/2011

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Vertical Scale: 1" = 27'
Horizontal Scale: 1" = 680'
Vertical Exaggeration = 25:1

- Topsoil
- Sand with Gravel
- Clay with Gravel
- Clay with Sand
- Gravel with Sand and Clay
- Clay
- Gravel with Sand
- Sand
- Gravel with Clay
- Shale
- Gravel
- Boulders/Cobbles with Gravel and Clay
- Sand with Clay
- Clay with Gravel and Sand
- Cobbles and/or Boulders
- Well Screen Interval
- Water Level (Fall 2010)

Local Name, (DWR Well Completion Report No.)

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San Juan Basin

Cross-Section C-C'

Figure 3-17

117°40'0"W

Alicia Pky
Moulton Pky
Sulphur Creek
PASEO De La Colinas
Marguerite Pky
Arroyo Trabuco
Antonio Pky
Chiquita Cañada
Gobernadora Cañada
La Paz Rd
Crown Valley Pky
Marina Hills Dr
Salt Creek
Oso Creek
Rancho Viejo Rd
San Juan Creek
Ortega Hwy
Niguel Rd
Arroyo Salado
Golden Lantern
Stonehill Dr
Del Obispo
Del Prado
La Novia Ave
Portico Del Norte
CAMINO Las Ramblas
CAMINO De Los Mares
AVE Vista Hermosa

179 178 179 148 139 128 114 95 91 85 50 40 42 17 10

100 90 80 70 60 50 40 30 20 10

117°40'0"W

Main Features

- Groundwater Elevation Contours (ft-amsl)
- Groundwater Elevation at Well (ft-amsl)
- Active Groundwater Storage Area
- San Juan Creek Watershed Boundary
- San Juan Basin
- Streams and Creeks

Geologic Features

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.

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0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

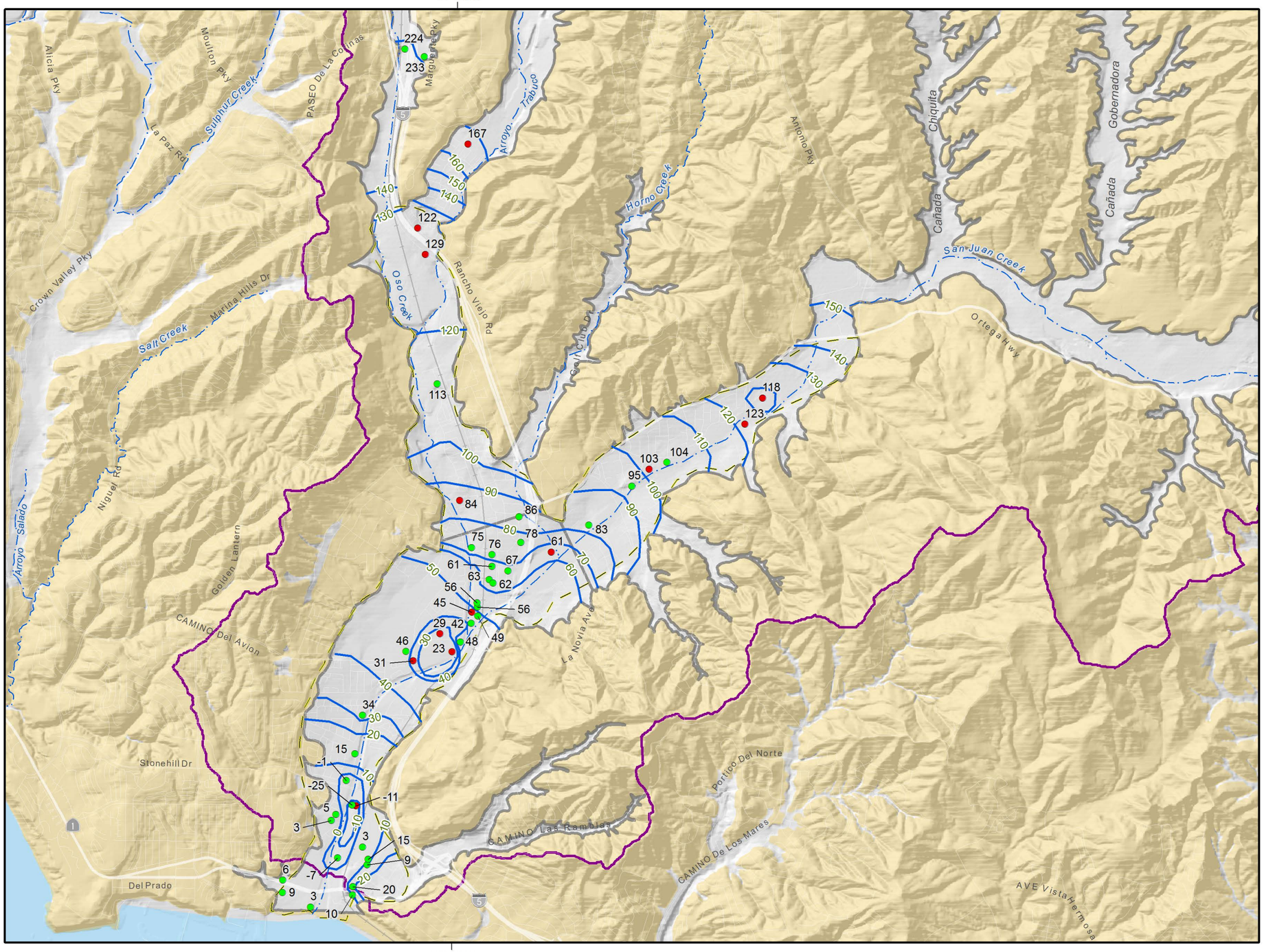
075-003
004

Groundwater Level Elevation

Spring 1987

Figure 3-18

117°40'0"W



117°40'0"W

Main Features

- Groundwater Elevation Contours (ft-above msl)
- Monitoring Well with Groundwater Elevation (ft amsl)
- Production Well with Groundwater Elevation (ft amsl)
- Active Groundwater Storage Area
- San Juan Creek Watershed Boundary
- San Juan Basin
- Streams and Creeks

Geologic Features

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.

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DRAFT

0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

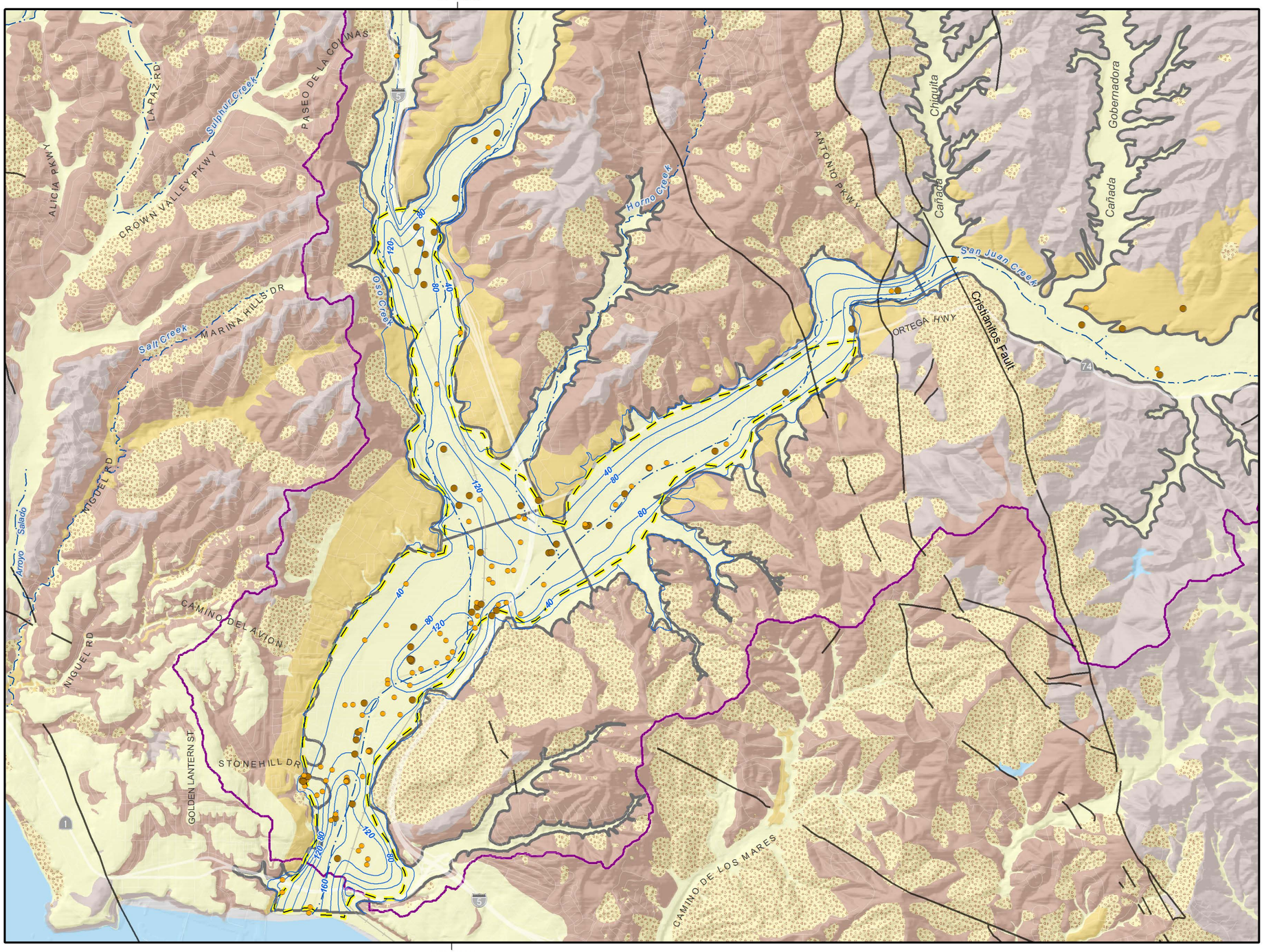
075-003
004

Groundwater Level Elevation

Fall 2010

Figure 3-19

117°40'0"W



117°40'0"W

Hydrologic Features

- 100 — Contour of Depth to Effective Base of the Alluvial Aquifer (feet-amsl)
- Well/Boring which fully penetrated the alluvial aquifer
- Well/Boring with lithology information
- Groundwater Sub-basin
- Active Groundwater Storage Area
- San Juan Creek Watershed Boundary

Geologic Features

Late Holocene to Early Pleistocene Surficial Deposits

- Younger Alluvial Deposits
- Landslide Deposits
- Older Alluvial Deposits

Tertiary Bedrock Units

- Fine-grained Formations (Capistrano and Monterey Formations)
- Coarse-grained Formations (Santiago,Sespe, and Niguel Formations)

Source: CGS Special Report 217.

Faults

- Location Certain
- Location Approximate

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0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

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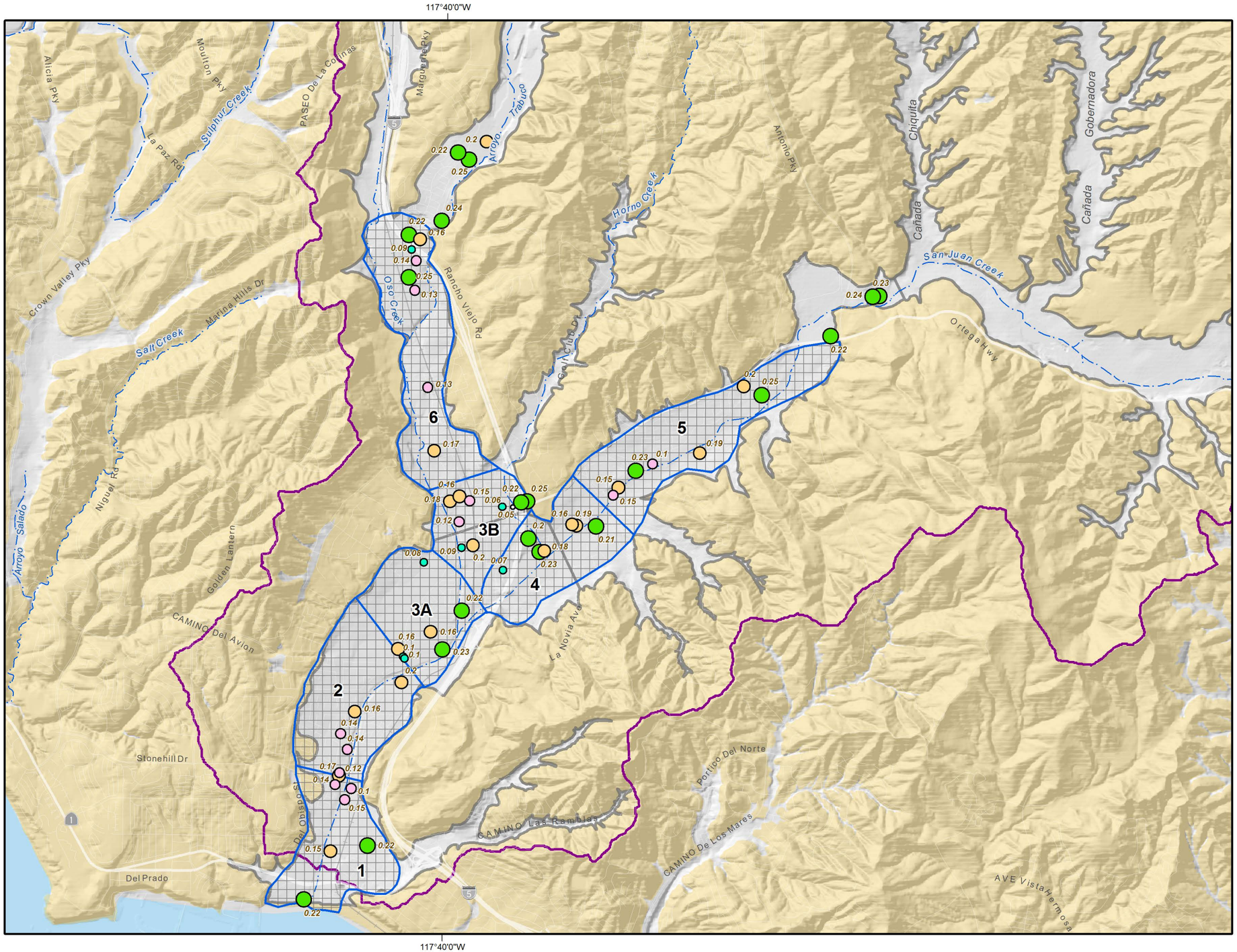
Effective Base of Alluvial Aquifer

Figure 3-20



Main Features

Specific Yield at Well Sites (percentage)

- 0 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.2
- 0.2 - 0.25

Storage Grid (100 m x 100 m)

1 — Active Groundwater Storage Area Segments

San Juan Creek Watershed Boundary

San Juan Basin

Streams and Creeks

Geologic Features

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.

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0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

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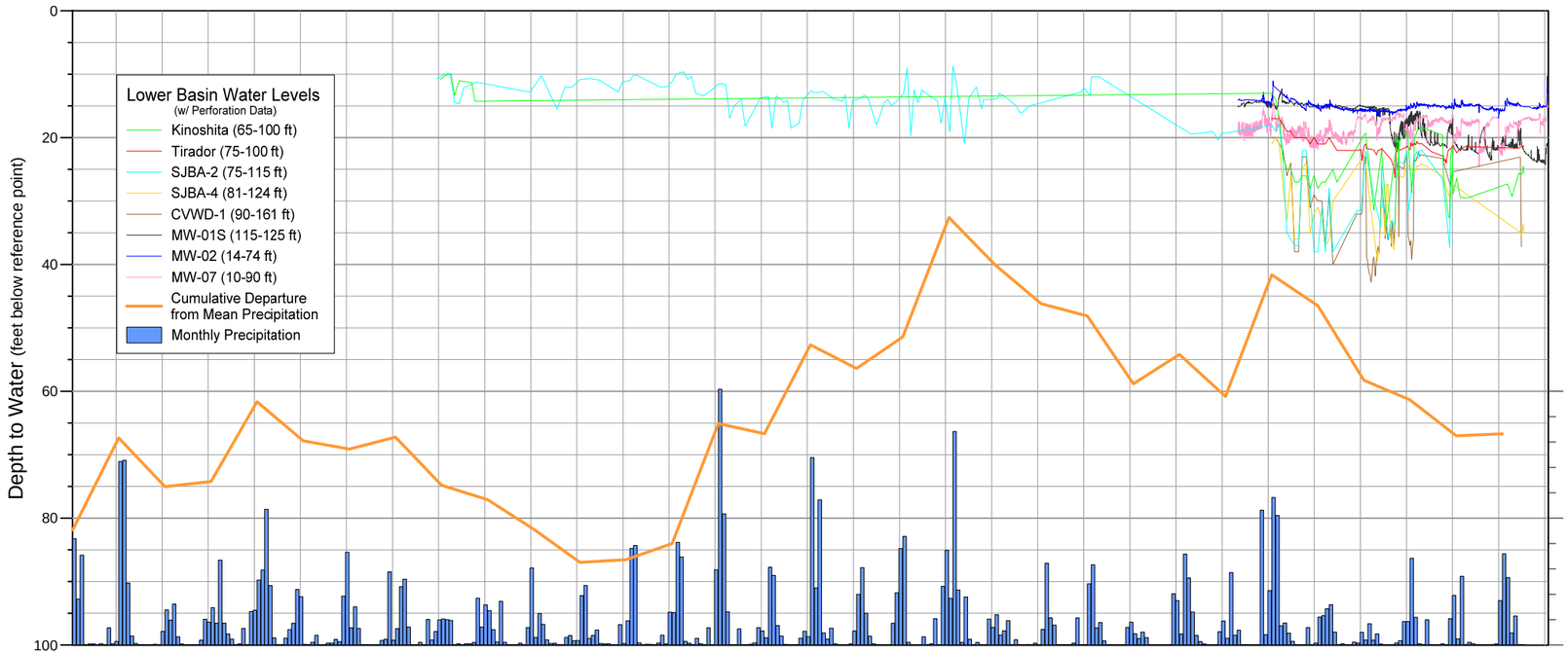
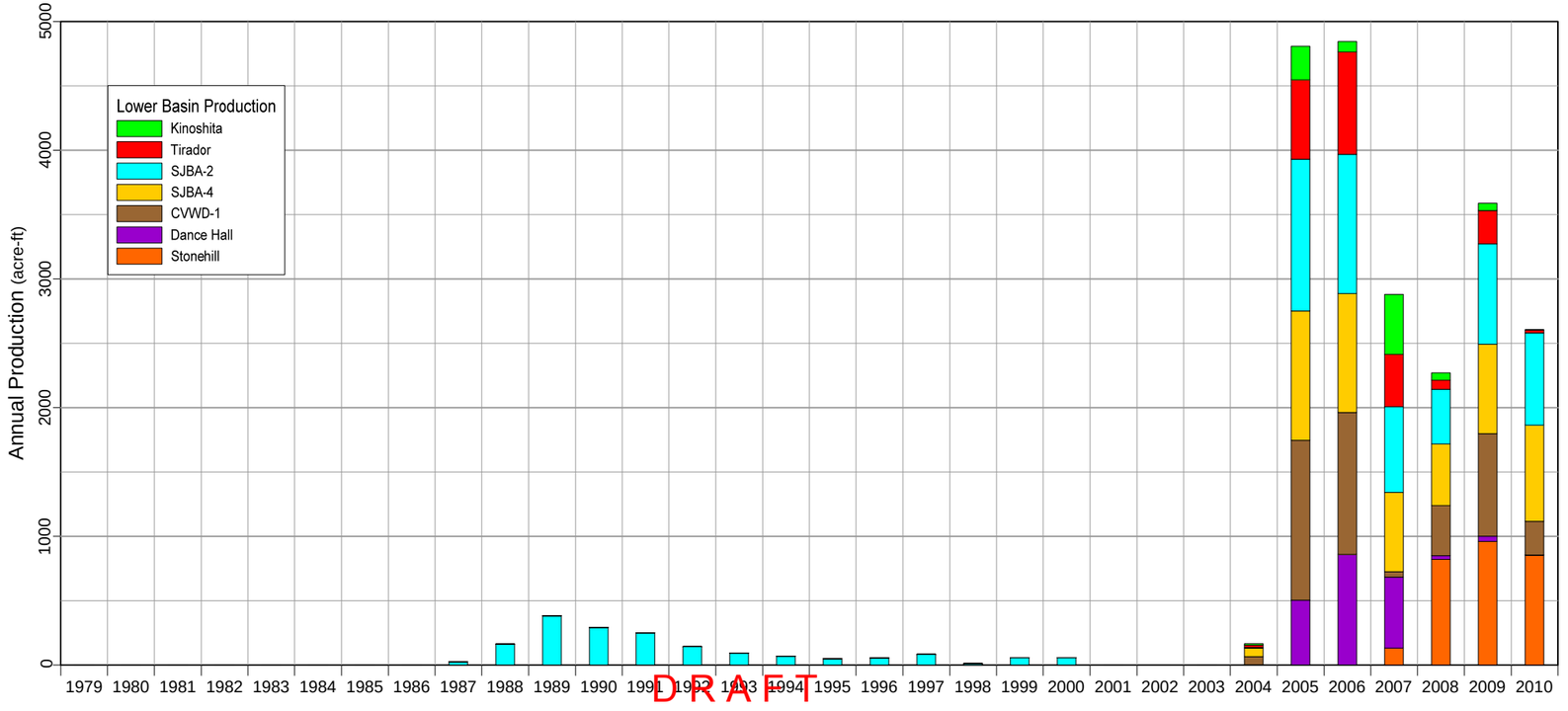
004

Storage Capacity Grid and Estimated Specific Yield

Figure 3-21





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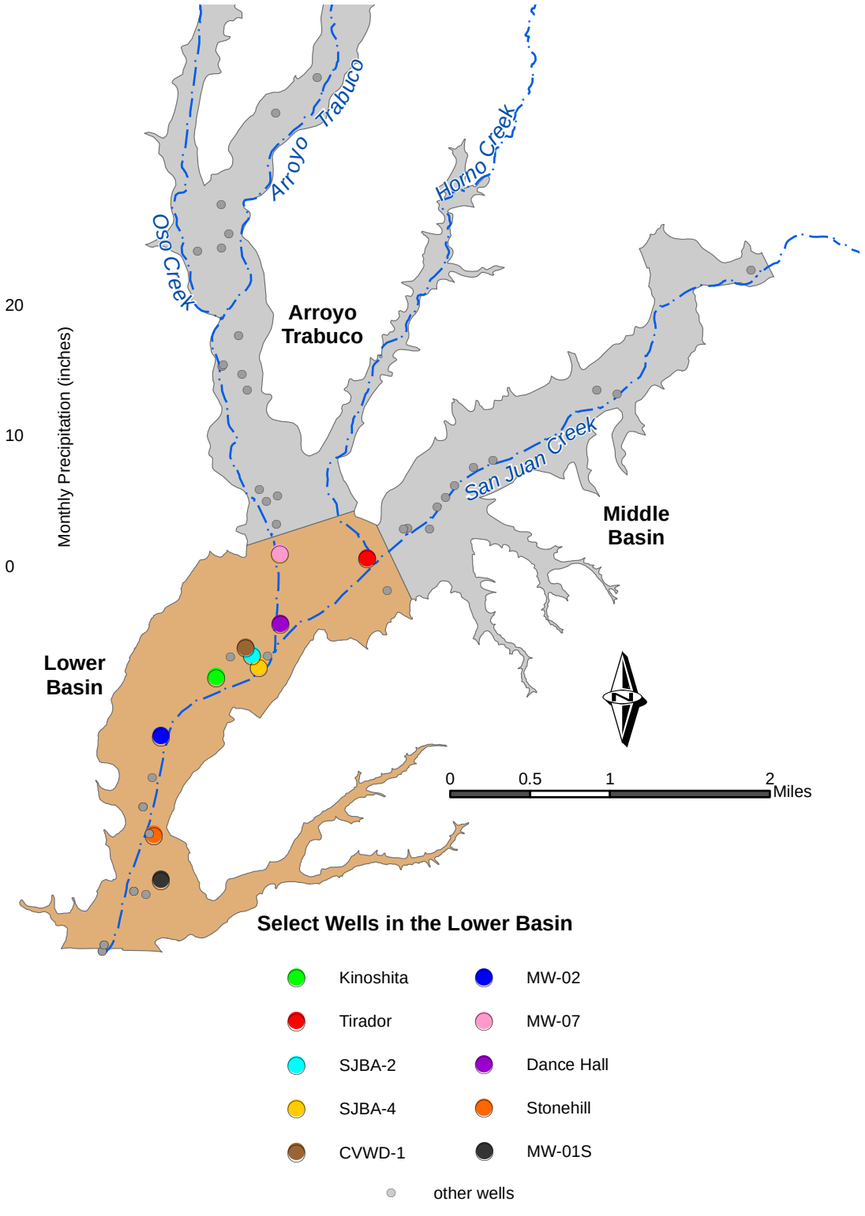

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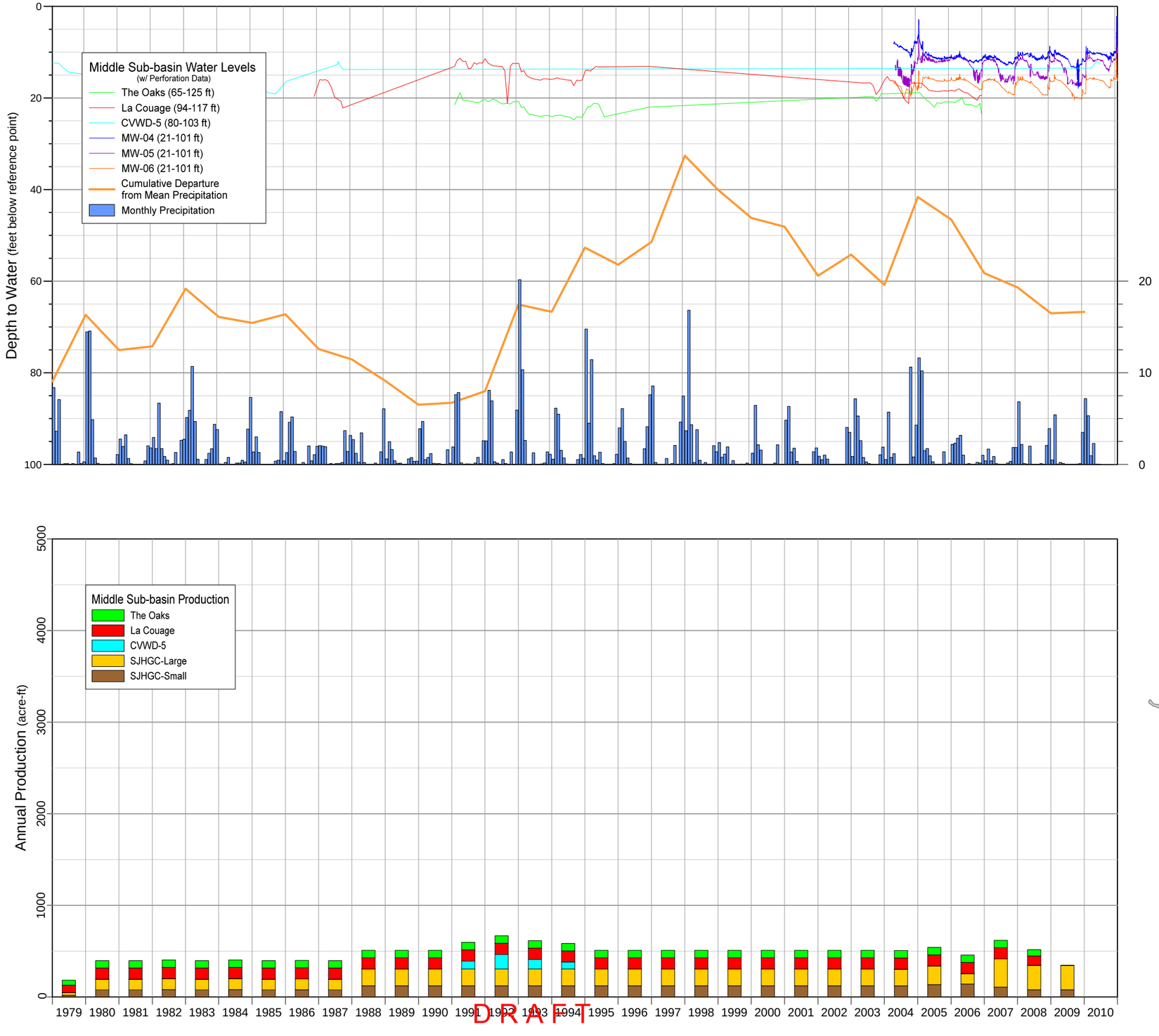
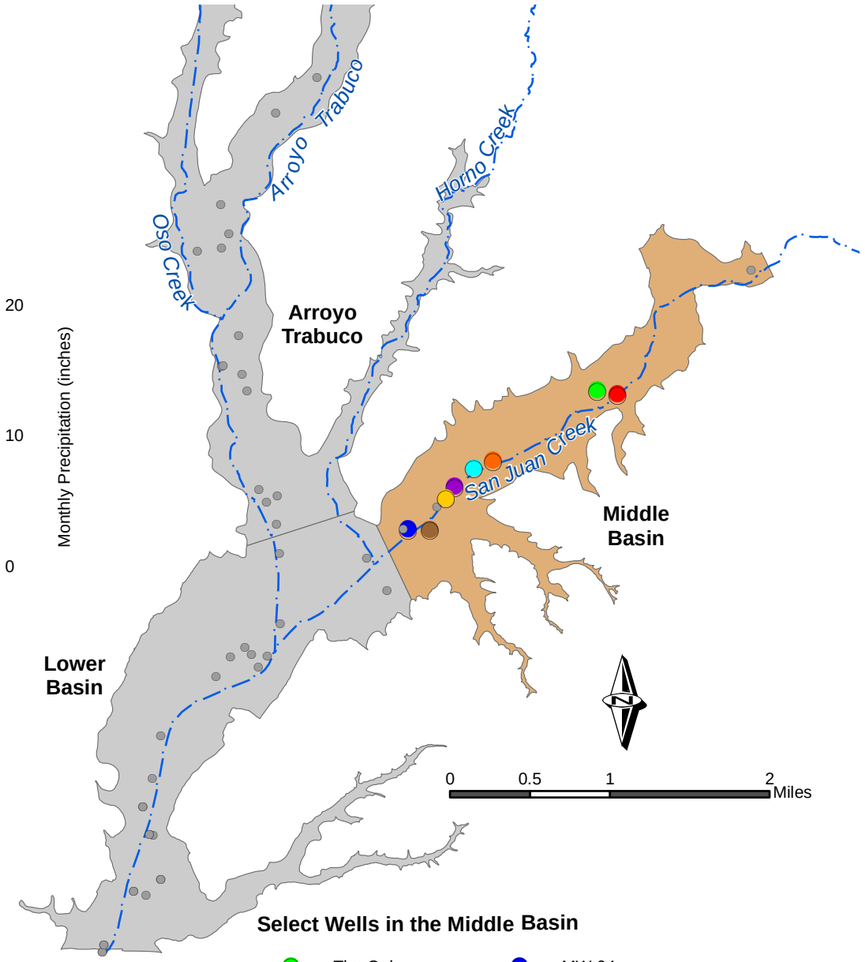
Time History of Production and Groundwater Levels in the Lower Basin

Figure 3-22





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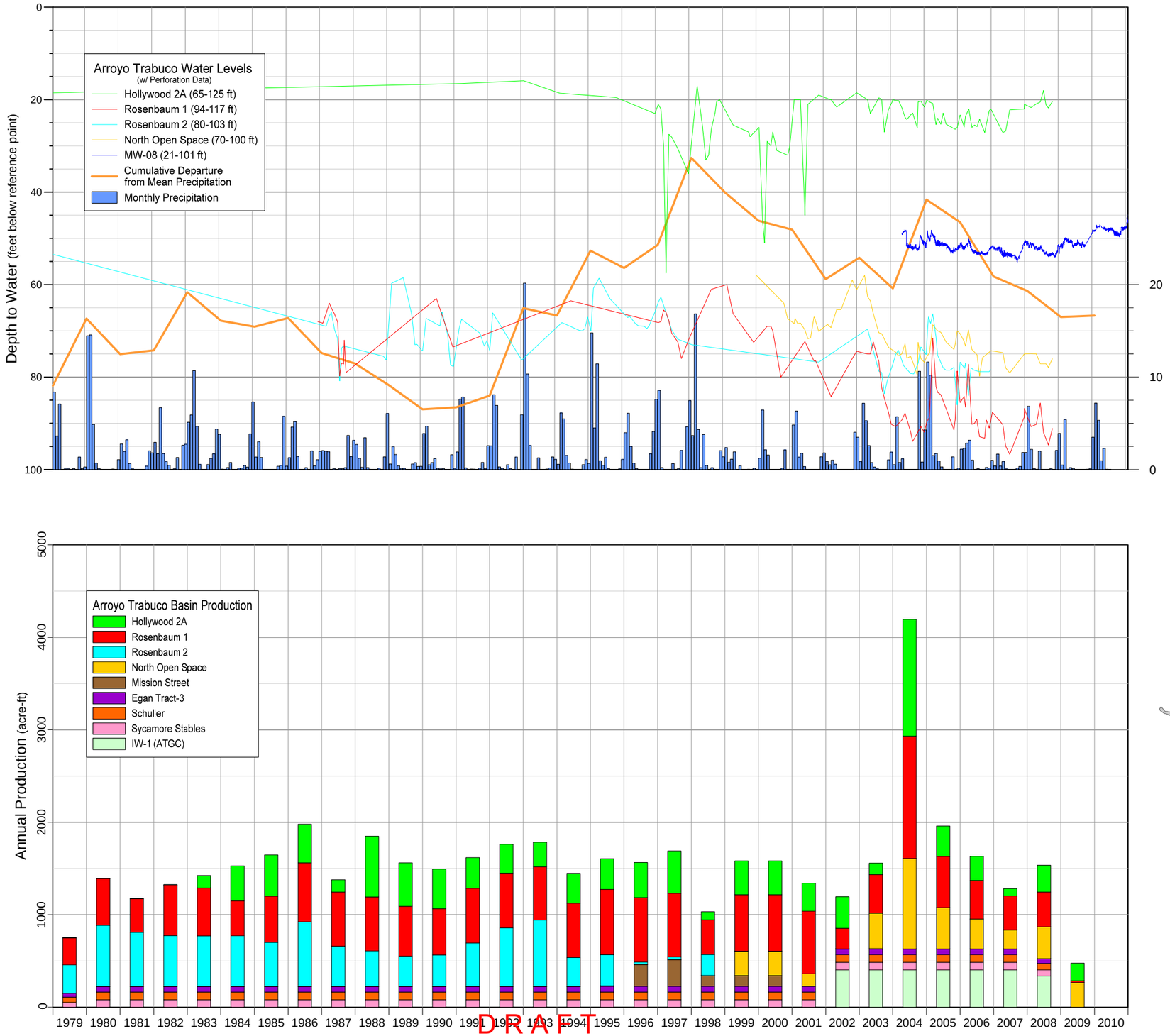
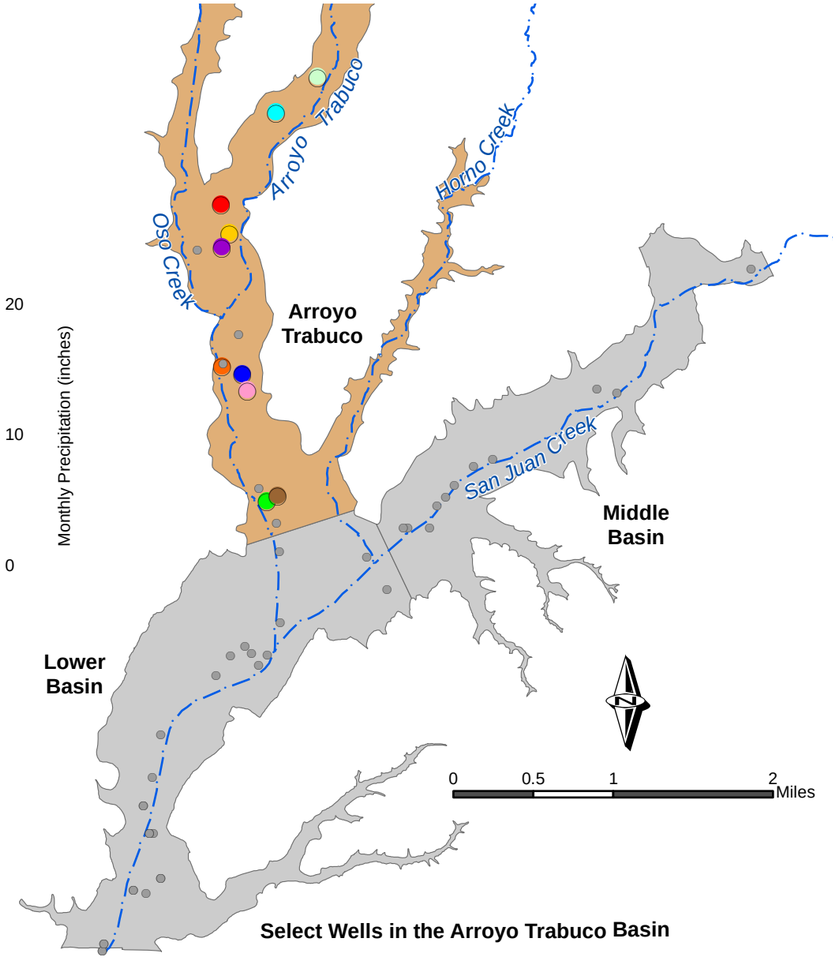
Time History of Production and Groundwater Levels in the Middle Basin

Figure 3-23





Select Wells in the Arroyo Trabuco Basin

- Hollywood 2A
- Rosenbaum 1
- Rosenbaum 2
- North Open Space
- MW-08
- Mission Street
- Egan Tract-3
- Schuller
- Sycamore Stables
- IW-1 (ATGC)
- other wells

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Time History of Production and Groundwater Levels in the Arroyo Trabuco Basin

Figure 3-24

Figure 3-25 Model Predicted Relationship for Production vesus End of Year Storage

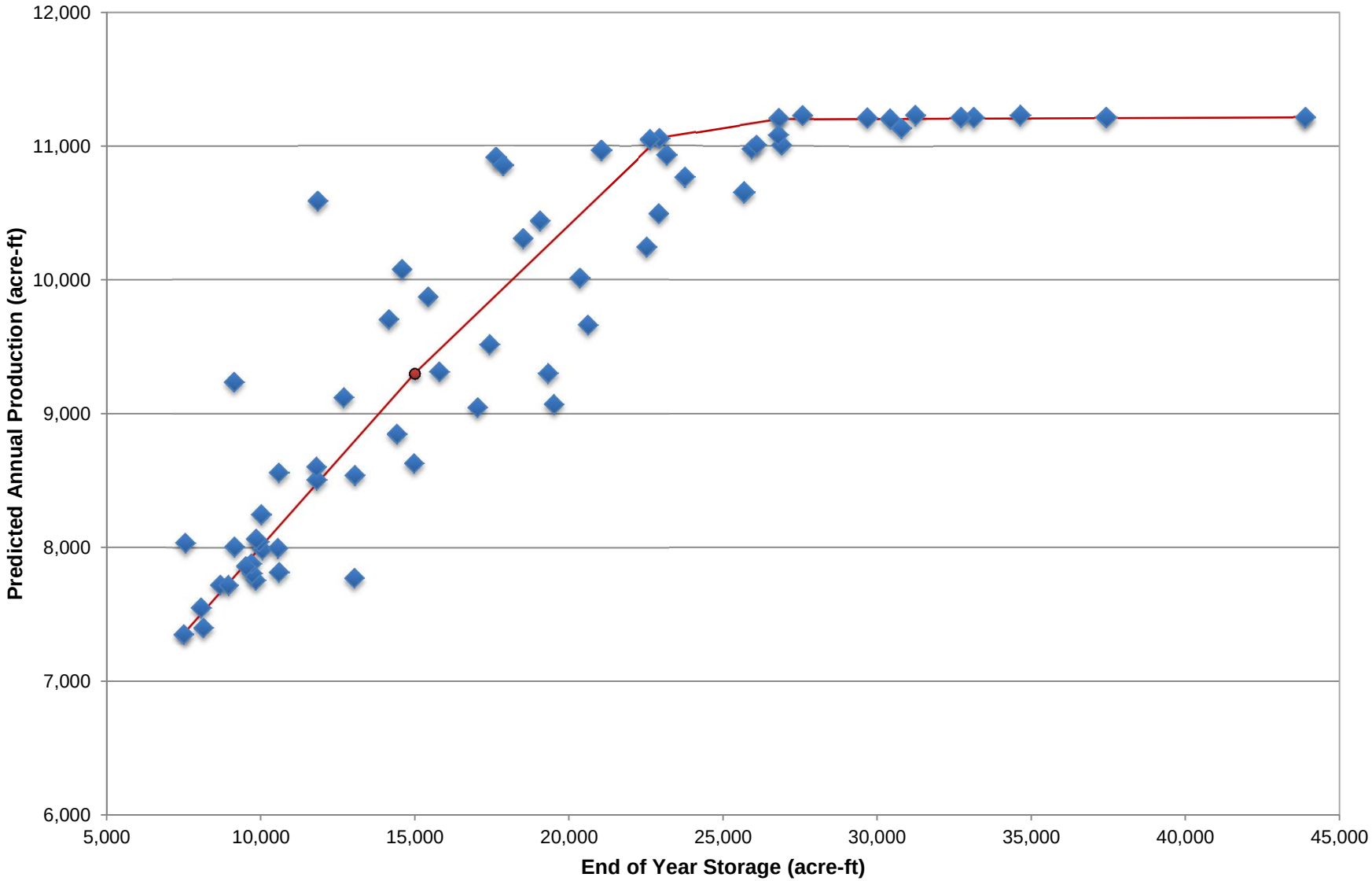

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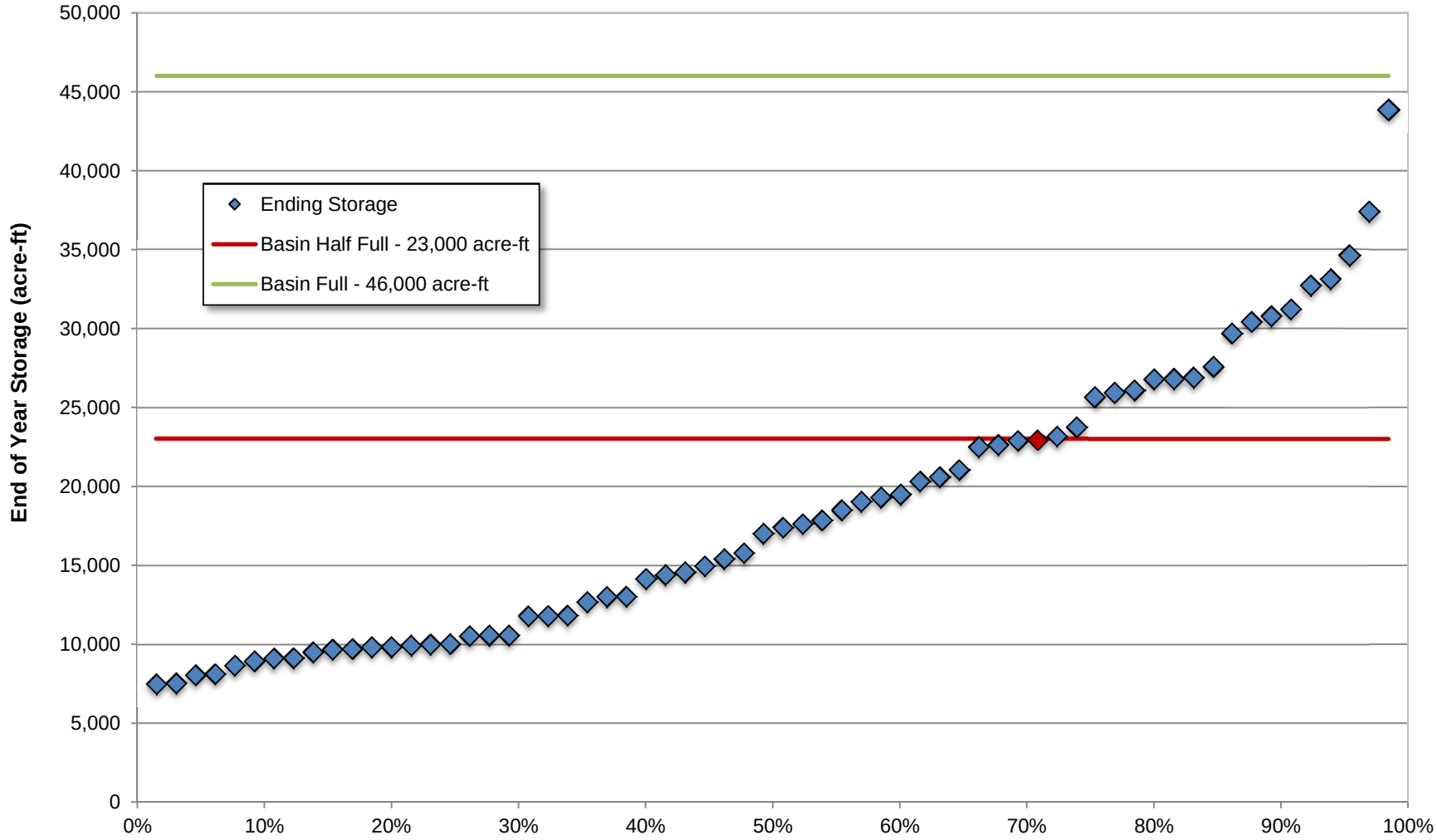
Figure 3-26 Frequency of End of Year Storage



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117°40'0"W

117°20'0"W

33°40'0"N

Hicks Canyon Wash
Santiago Creek
Temescal Wash
Toro Arroyo Del
San Diego Creek
Bee Canyon Wash
Agua Chinon Wash
Borrego Canyon Wash
Serrano Creek
Aliso Creek
Oso Creek
Arroyo Trabuco Creek
Riverside County
Orange County
Lake Elsinore
Holy Jim
TC @ Mine Adit
TC-2
TC-7
TC-8
TC @ Alder Spring
TC Below Mine Adit
TC @ RSMD
Bell Creek
TC @ Rising Groundwater
TC-3
Bell Canyon Creek 2
SJC above Lion Cyn
SJC - 5
SJC @ Cold Spring
SJC @ Caspers Park
OC @ Barrier
TC @ Oso
TC @ Crown Valley
OC @ Crown Valley
Sulphur Creek
TC @ Avery
CDM-8
OC - 3
TC-2A
Horno Creek @ Barrier
SJC @ Oda Nursery
CDM-10
CDM-11A
CDM-11
CDM-16
TC @ Camino Cap
TC- 5
Salt Creek
SJC at La Novia
PMS-Control
SJC below Hwy 74
PMS-04
PMS-03
TC @ Del Obispo
PMS-02
SJC above Trabuco
PMS-01
SJC below Trabuco
SJC 9
SJC @Treatment Plant
Pacific Ocean
Riverside County
San Diego County
Orange County
Cristianitos Creek
San Mateo Creek
Cottonwood Creek
Camps Creek
De Luz Creek
Fern Creek
Robar Creek

Stations by Monitoring Entity

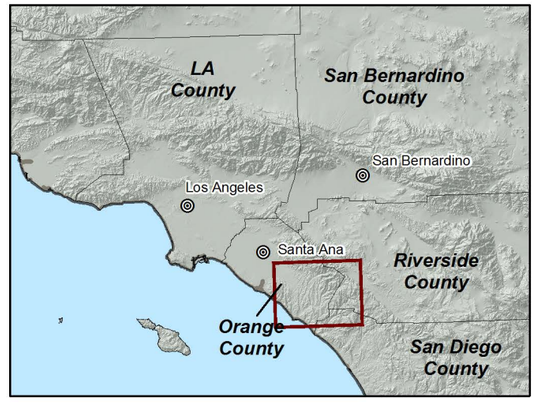
- San Juan Basin Authority
- County of Orange
- Santa Margarita Water District
- CDM
- Wildermuth Environmental Inc.
- San Diego RWQCB

- San Juan Groundwater Sub Basins
- San Juan Watershed Boundary

Geology

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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DRAFT

0 1 2 3 4 Miles
0 2 4 6 KM

SAN JUAN BASIN AUTHORITY

075-003
004

San Juan Watershed
Surface Water Quality Monitoring Stations

Figure 3-27

117°40'0"W

33°40'0"N

Santiago Creek
Bee Canyon Wash
Agua Chinon Wash
Borrego Canyon Wash
Serrano Creek
San Diego Creek
Aliso Creek
Oso Creek
Arroyo Trabuco
Riverside County
Orange County
Lake Elsinore
Cañada Chiquita
Cañada Gobernadora
Bell Canyon
Sulphur Creek
Salt Creek
Arroyo Salado
Horno Creek
San Juan Creek
Cristianitos Creek
San Mateo Creek
Riverside County
San Diego County
Orange County
Pacific Ocean

241
133
405
73
74
15
5
1

117°40'0"W

117°20'0"W

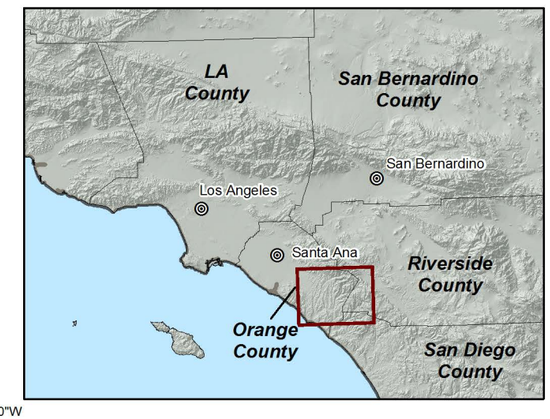
Well Type

- Monitoring
- Municipal - Desalter
- Municipal - Non Potable
- Private

Hydrologic Sub Areas

- Upper Trabuco
- Upper San Juan
- Oso
- Middle Trabuco
- Gobernadora
- Middle San Juan
- Ortega
- Lower San Juan

- San Juan Groundwater Sub Basins
- San Juan Watershed Boundary



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DRAFT

0 1 2 3 4 Miles
0 2 4 6 KM

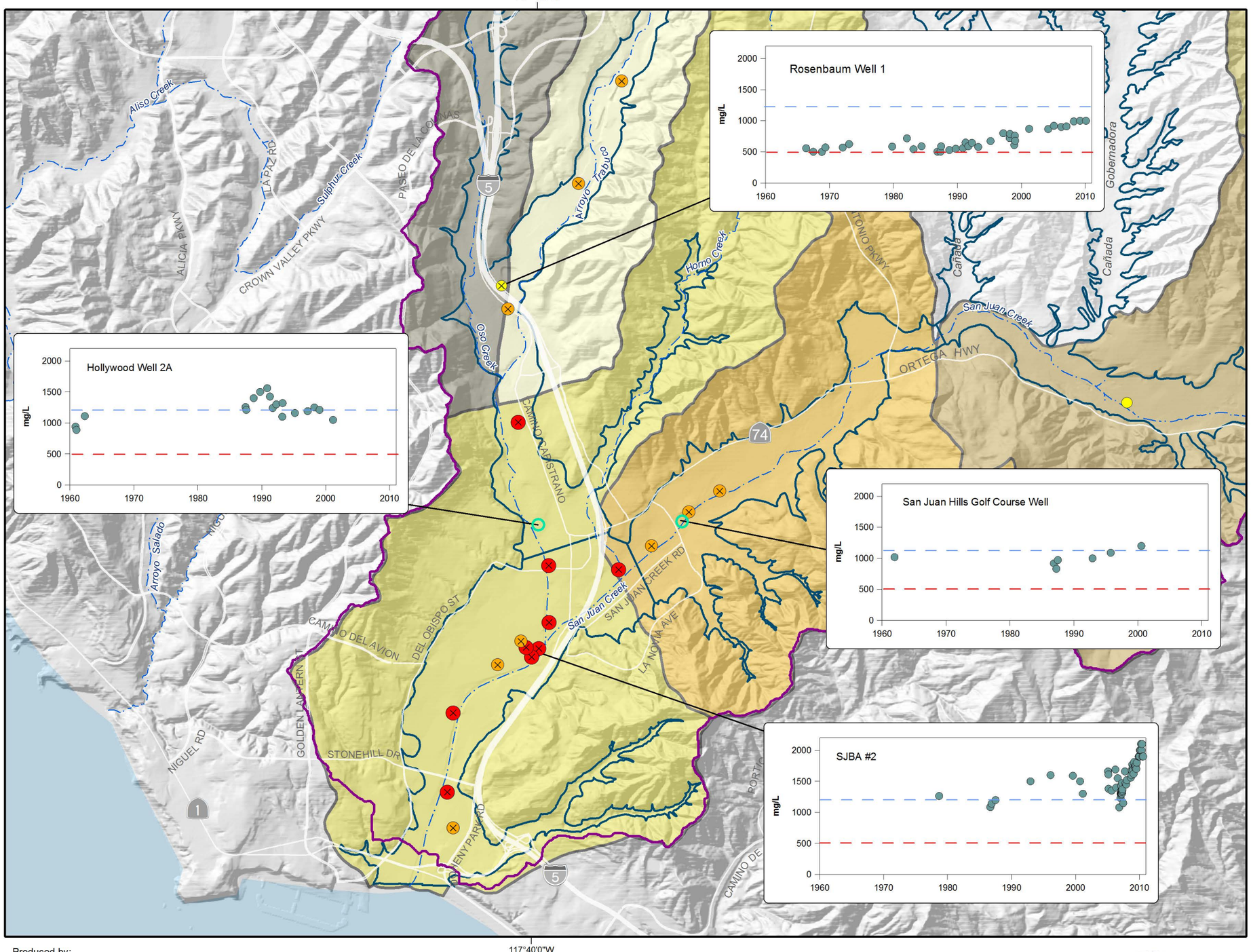
SAN JUAN BASIN AUTHORITY

075-003
004

San Juan Watershed
Wells with Water Quality Data

Figure 3-28

117°40'0"W



117°40'0"W

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DRAFT

0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

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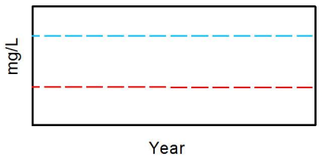
075-003
004

Total Dissolved Solids (TDS)



Basin Plan Objective
Specific to Sub Area

US EPA Secondary
MCL = 500 mg/L

Maximum TDS (mg/L) 2006 - 2010

- < 125
- 125 - 250
- 250 - 500
- 500 - 1,000
- 1,000 - 2,000
- > 2,000

Secondary US EPA MCL = 500 mg/L

Hydrologic Sub Area and Basin Plan Objective for TDS

- Lower San Juan - 1200 mg/L
- Ortega - 1100 mg/L
- Middle San Juan - 750 mg/L
- Middle Trabuco - 750 mg/L
- Oso - 1200 mg/L

× Maximum Concentration of TDS for 2006 to 2010 Exceeds the Basin Plan Objective

○ Well with Data Plotted in Graph but no Current Data for 2006 to 2010

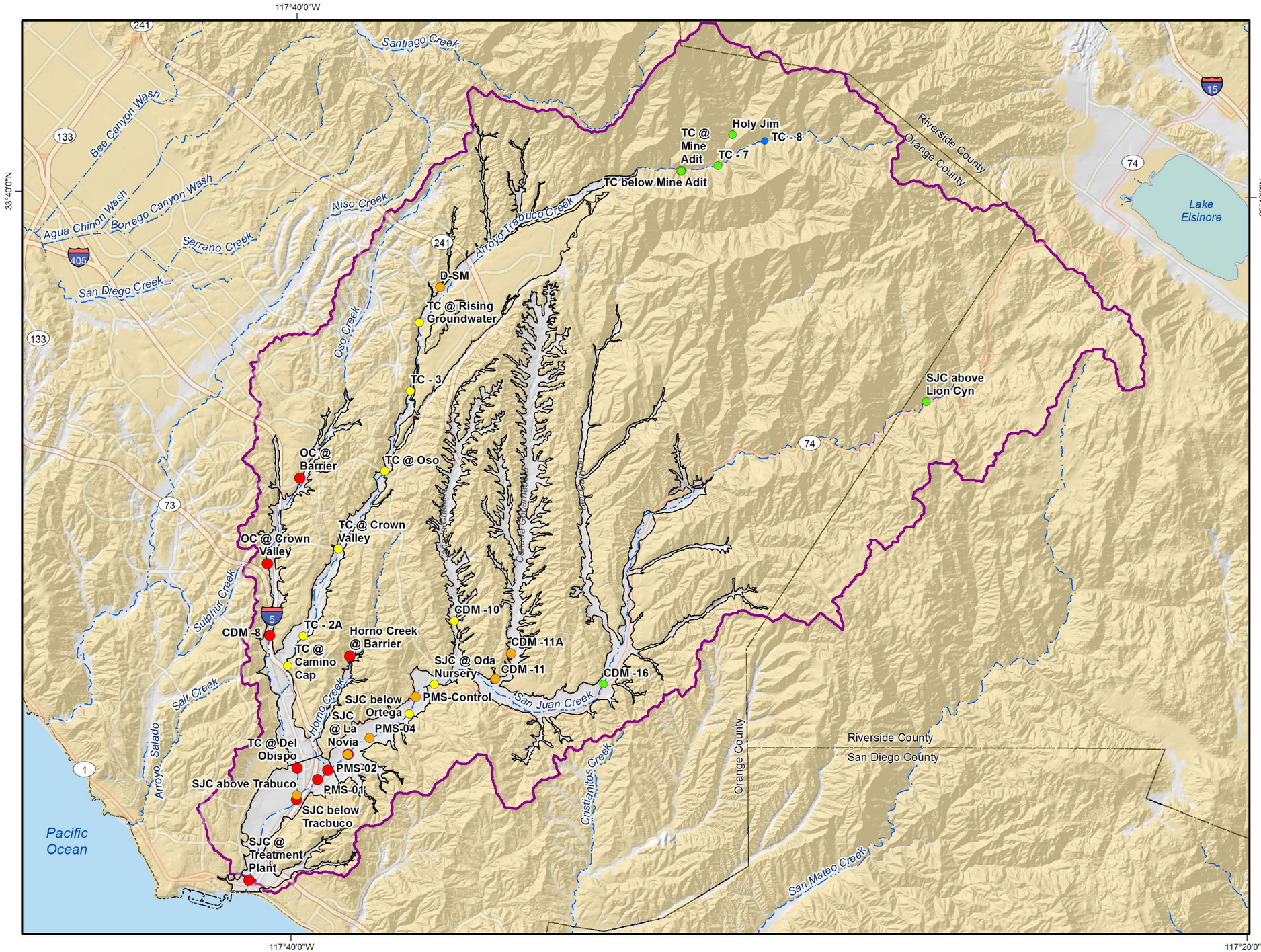
San Juan Watershed Boundary

San Juan Groundwater Sub Basins

Total Dissolved Solids in Groundwater

Maximum Concentration 2006 - 2010 and Historical Trends

Figure 3-29



Maximum TDS (mg/L)

- < 125
- 125 - 250
- 250 - 500
- 500 - 1,000
- 1,000 - 2,000
- > 2,000

Secondary US EPA MCL = 500 mg/L

Basin Plan Surface Water Objective = 500 mg/L

** Maximum concentration is based on all available data from the historical record. All surface water sites are monitored at different time periods and for different analytes. Refer to Table 3-5 in this report for a summary of the monitoring at the surface water stations.*

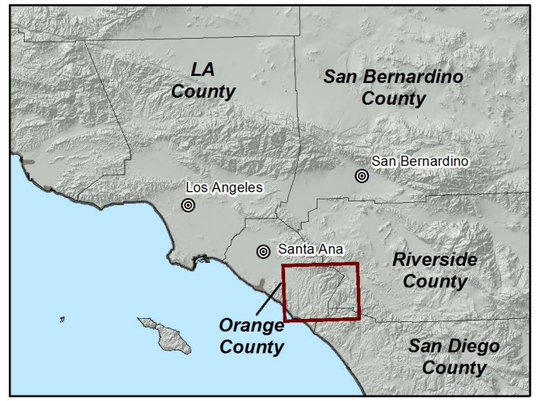
San Juan Groundwater Sub Basins

San Juan Watershed Boundary

Geology

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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DRAFT

0 1 2 3 4 Miles
0 2 4 6 KM

SAN JUAN BASIN AUTHORITY

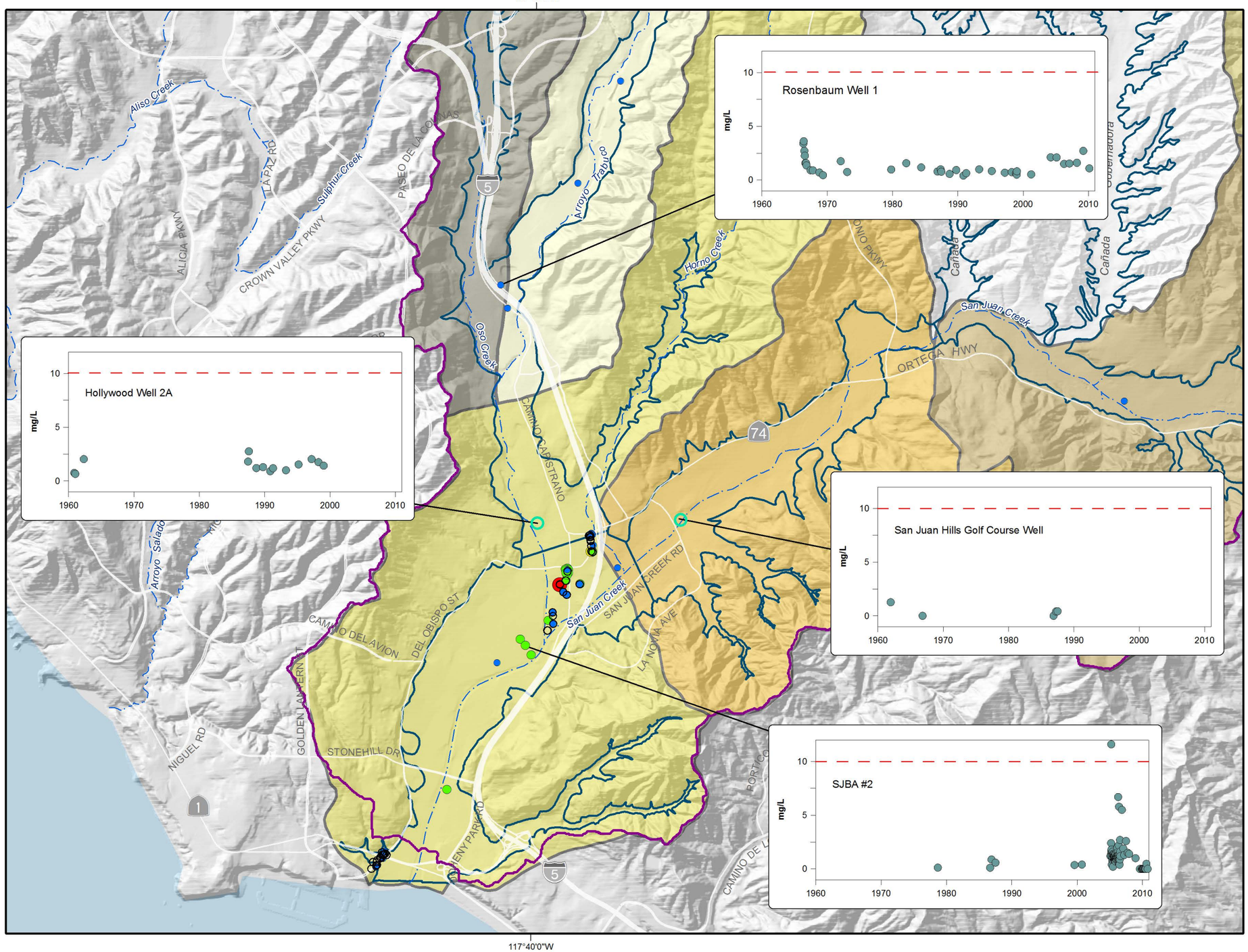
075-003
004

Total Dissolved Solids in Surface Water

Maximum Concentration for Historical Record

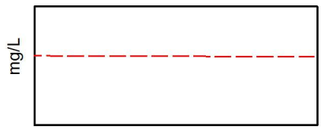
Figure 3-30

117°40'0"W



117°40'0"W

Nitrate as Nitrogen (NO3-N)



Maximum NO3-N (mg/L) 2006 - 2010

- ND
- < 5
- 5 - 10
- 10 - 20
- 20 - 40
- > 40

Primary US EPA MCL = 10 mg/L
Primary CA MCL = 10 mg/L

Hydrologic Sub Area and Basin Plan Objective for NO3-N

- Lower San Juan - 10 mg/L
- Ortega - 10 mg/L
- Middle San Juan - 10 mg/L
- Middle Trabuco - 10 mg/L
- Oso - 10 mg/L

- Well with Data Plotted in Graph but no Current Data for 2006 to 2010
- San Juan Watershed Boundary
- San Juan Groundwater Sub Basins

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DRAFT

0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

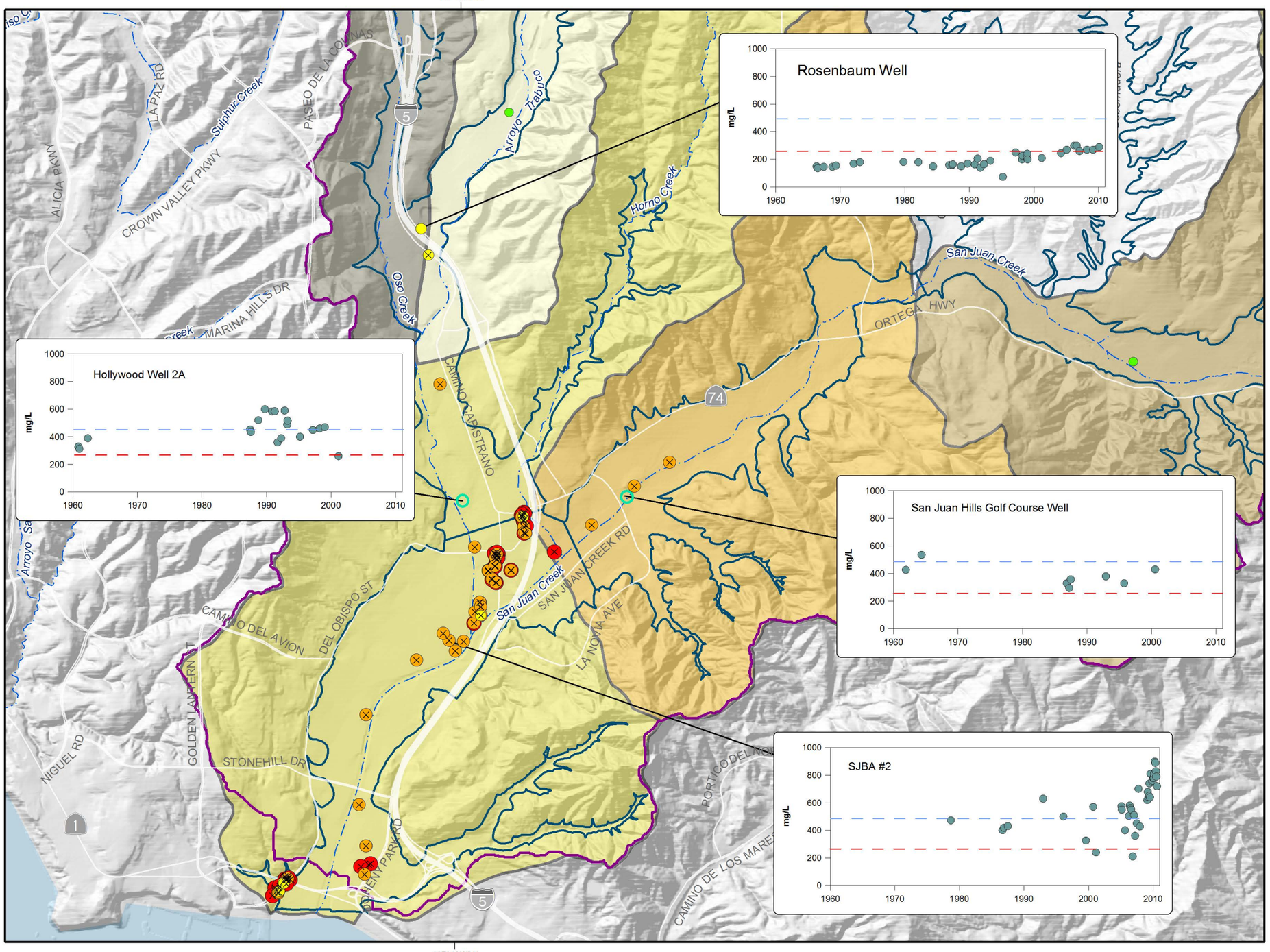
075-003
004

Nitrate as Nitrogen in Groundwater

Maximum Concentration 2006 - 2010 and Historical Trends

Figure 3-31

117°40'0"W



117°40'0"W

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DRAFT

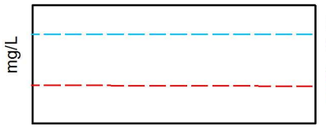
0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
004

Sulfate



Basin Plan Objective Specific to Sub Area

US EPA & CA Secondary MCL = 250 mg/L

Maximum Sulfate (mg/L) 2006 - 2010

- ND
- < 125
- 125 - 250
- 250 - 500
- 500 - 1,000
- > 1,000

Secondary US EPA MCL = 250 mg/L
Secondary CA MCL = 250 mg/L

Hydrologic Sub Area and Basin Plan Objective for Sulfate

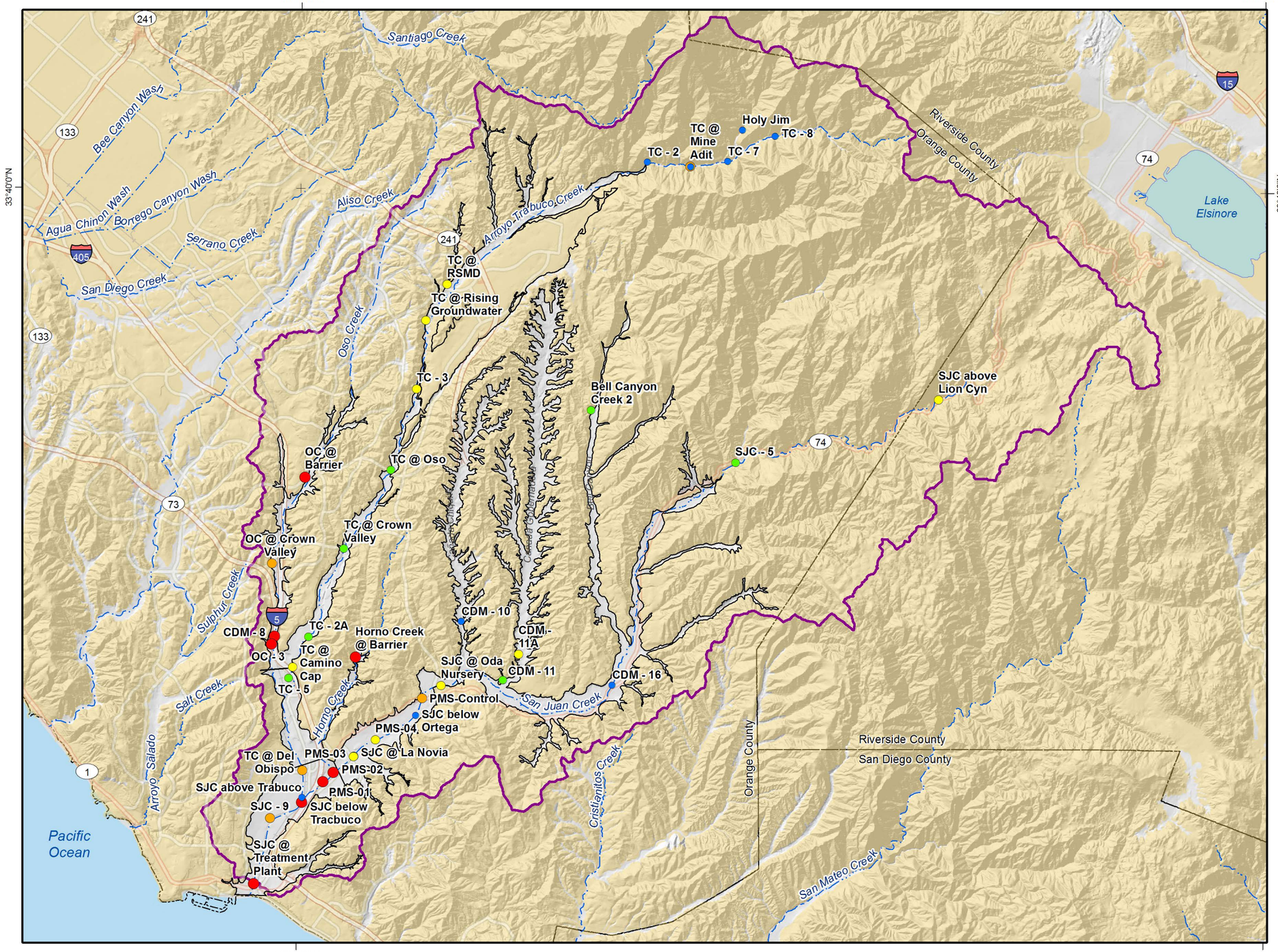
- Lower San Juan - 500 mg/L
- Ortega - 450 mg/L
- Middle San Juan - 375 mg/L
- Middle Trabuco - 375 mg/L
- Oso - 500 mg/L

- Maxmium Concentration of Sulfate for 2006 to 2010 Exceeds the Basin Plan Objective
- Well with Data Plotted in Graph but no Current Data for 2006 to 2010
- San Juan Watershed Boundary
- San Juan Groundwater Sub Basins

Sulfate in Groundwater

Maximum Concentration 2006 - 2010 and Historical Trends

Figure 3-32



Maximum Sulfate (mg/L)

- ND
- < 125
- 125 - 250
- 250 - 500
- 500 - 1,000
- > 1,000

Secondary US EPA MCL = 250 mg/L
Secondary CA MCL = 250 mg/L

Basin Plan Basin Plan Surface Water Objective = 250 mg/L

** Maximum concentration is based on all available data from the historical record. All surface water sites are monitored at different time periods and for different analytes. Refer to Table 3-5 in this report for a summary of the monitoring at the surface water stations.*

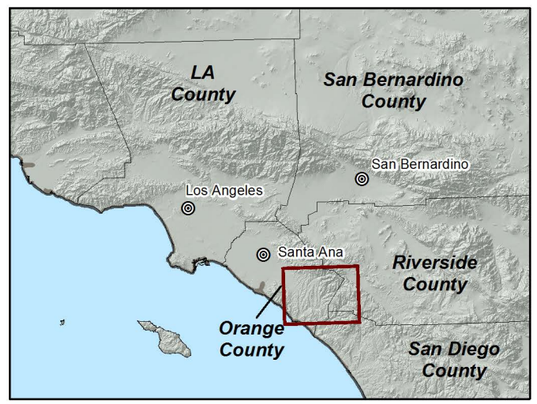
San Juan Groundwater Sub Basins

San Juan Watershed Boundary

Geology

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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DRAFT

0 1 2 3 4 Miles
0 2 4 6 KM

SAN JUAN BASIN AUTHORITY

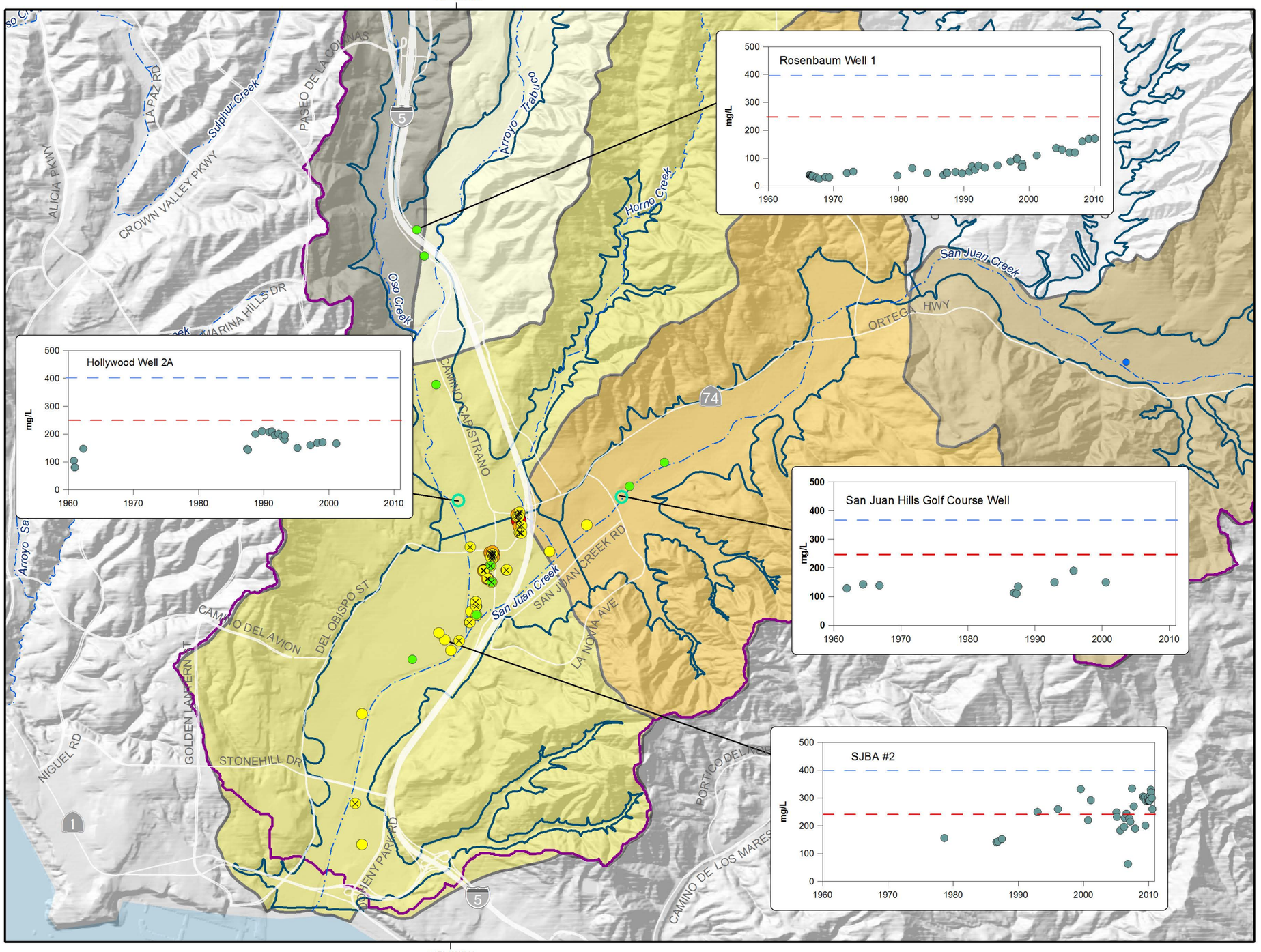
075-003
004

Sulfate in Surface Water

Maximum Concentration for Historical Record

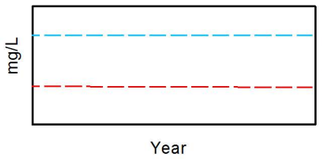
Figure 3-33

117°40'0"W



117°40'0"W

Chloride



Maximum Chloride (mg/L) 2006 - 2010

- ND
- < 125
- 125 - 250
- 250 - 500
- 500 - 1,000
- > 1,000

Secondary US EPA MCL = 250 mg/L
Secondary CA MCL = 250 mg/L

Hydrologic Sub Area and Basin Plan Objective for Chloride

- Lower San Juan - 400 mg/L
- Ortega - 375 mg/L
- Middle San Juan - 375 mg/L
- Middle Trabuco - 375 mg/L
- Oso - 400 mg/L

- Maximum Concentration of Chloride for 2006 to 2010 Exceeds the Basin Plan Objective
- Well with Data Plotted in Graph but no Current Data for 2006 to 2010
- San Juan Watershed Boundary
- San Juan Groundwater Sub Basins

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DRAFT

0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
004

Chloride in Groundwater

Maximum Concentration 2006 - 2010 and Historical Trends

Figure 3-34

117°40'0"W

117°20'0"W

33°40'0"N

Santiago Creek
Bee Canyon Wash
Agua Chinon Wash
Borrego Canyon Wash
Serrano Creek
San Diego Creek
Aliso Creek
Arroyo Trabuco Creek
Oso Creek
Sulphur Creek
Salt Creek
Horno Creek
San Juan Creek
Cristianitos Creek
San Mateo Creek
Arroyo Salado
Pacific Ocean
Lake Elsinore
Riverside County
Orange County
San Diego County

241
133
405
73
5
74
15
1

TC @ Mine Adit
Holy Jim
TC - 8
TC - 7
TC below Mine Adit
TC @ RSMD D-SM
TC @ Rising Groundwater
TC - 3
SJC above Lion Cyn
Oso Creek @ Barrier
TC @ Oso
TC @ Crown Valley
OC @ Crown Valley
TC - 2A
Horno Creek @ Barrier
CDM - 8
CDM -10
CDM -11A
CDM -11
CDM -16
SJC @ Oda Nursery
TC @ Camino Cap
PMS-Control
SJC below Ortega
PMS-04
SJC @ La Novia
PMS-03
PMS-02
PMS-01
TC @ Del Obispo
SJC above Trabuco
SJC below Tracbuco
SJC @ Treatment Plant

Maximum Chloride (mg/L)

- ND
- < 125
- 125 - 250
- 250 - 500
- 500 - 1,000
- > 1,000

Secondary US EPA MCL = 250 mg/L
Secondary CA MCL = 250 mg/L

Basin Plan Surface Water Objective = 250 mg/L

** Maximum concentration is based on all available data from the historical record. All surface water sites are monitored at different time periods and for different analytes. Refer to Table 3-5 in this report for a summary of the monitoring at the surface water stations.*

San Juan Groundwater Sub Basins

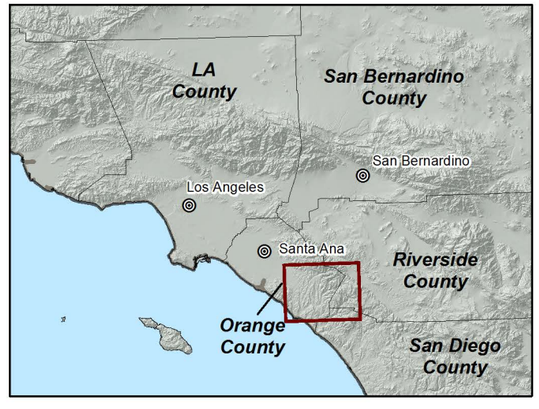
San Juan Watershed Boundary

Geology

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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DRAFT

0 1 2 3 4 Miles
0 2 4 6 KM

SAN JUAN BASIN AUTHORITY

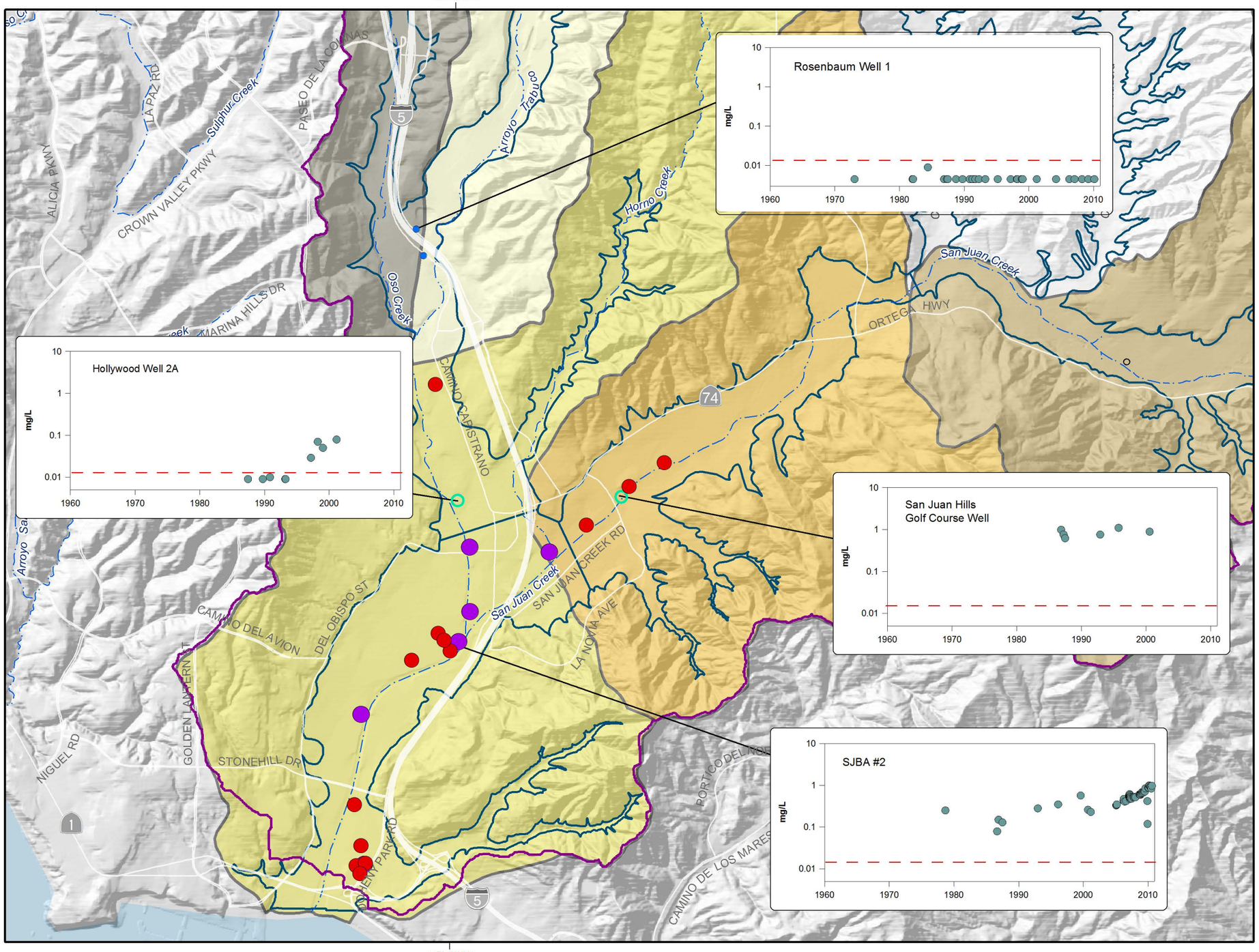
075-003
004

Chloride in Surface Water

Maximum Concentration for Historical Record

Figure 3-35

117°40'0"W



117°40'0"W

Manganese

mg/L

Basin Plan Objective = 0.05 mg/L

US EPA & CA Secondary MCL = 0.05 mg/L

Year

Maximum Manganese (mg/L) 2006 - 2010

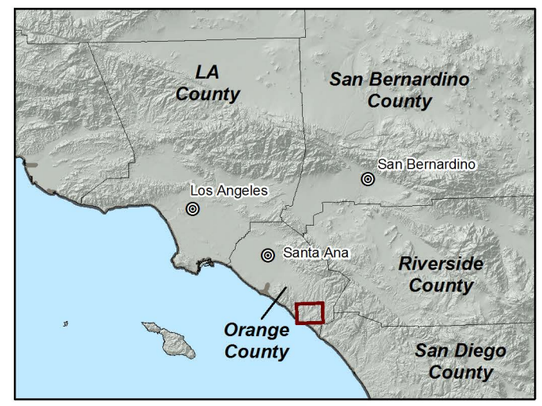
- ND
- < .025
- .025 - .05
- .05 - .1
- .1 - .2
- .2 - 2.0
- > 2.0

Secondary US EPA MCL = 0.05 mg/L
Secondary CA MCL = 0.05 mg/L

Hydrologic Sub Area and Basin Plan Objective for Manganese

- Lower San Juan - 0.05 mg/L
- Ortega - 0.05 mg/L
- Middle San Juan - 0.05 mg/L
- Middle Trabuco - 0.05 mg/L
- Oso - 0.05 mg/L

- Well with Data Plotted in Time-History but no Current Data for 2006 to 2010
- San Juan Watershed Boundary
- San Juan Groundwater Sub Basins



Manganese in Groundwater

Maximum Concentration 2006 - 2010 and Historical Trends

Figure 3-36

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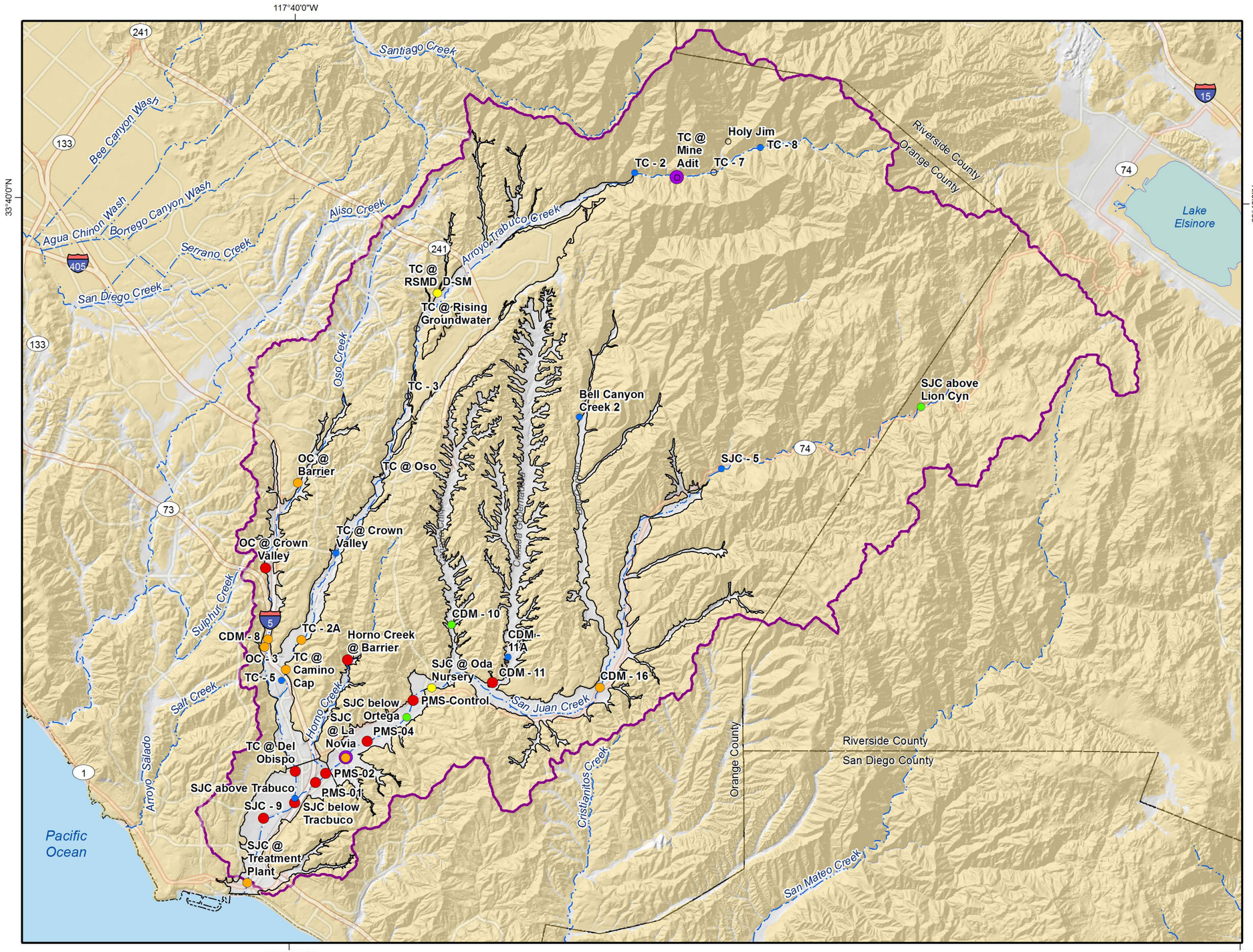
DRAFT

0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
004



Maximum Manganese (mg/L)

- ND
- < .025
- .025 - .05
- .05 - .1
- .1 - .2
- .2 - 2.0
- > 2.0

Secondary US EPA MCL = 0.05 mg/L
Secondary CA MCL = 0.05 mg/L

Basin Plan Surface Water Objective = 0.05 mg/L

** Maximum concentration is based on all available data from the historical record. All surface water sites are monitored at different time periods and for different analytes. Refer to Table 3-5 in this report for a summary of the monitoring at the surface water stations.*

San Juan Groundwater Sub Basins

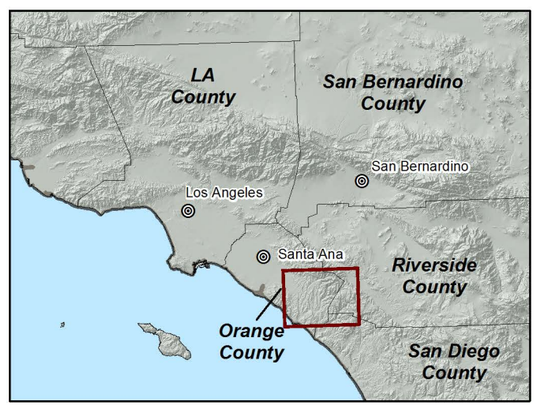
San Juan Watershed Boundary

Geology

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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DRAFT

0 1 2 3 4 Miles
0 2 4 6 KM

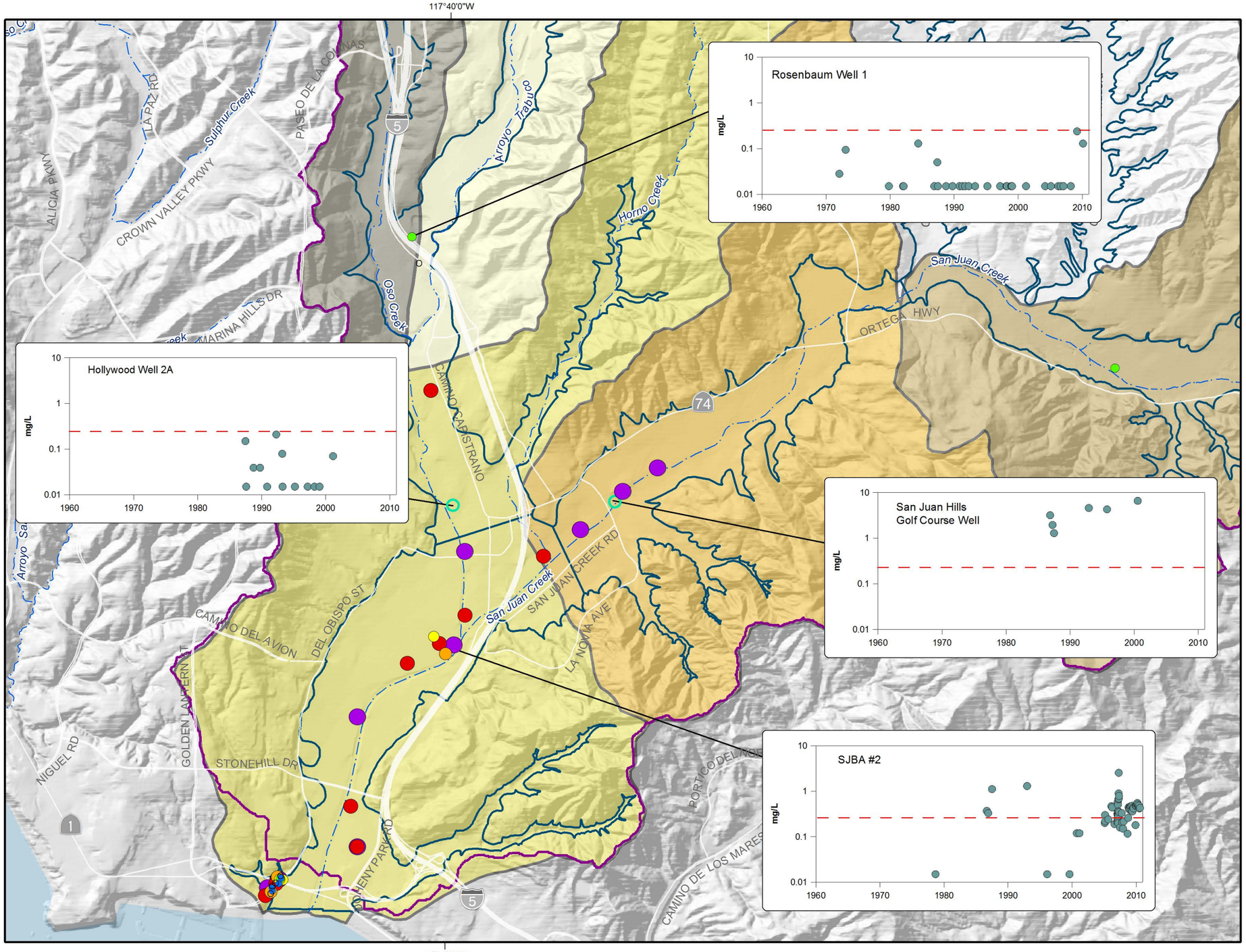
SAN JUAN BASIN AUTHORITY

075-003
004

Manganese in Surface Water

Maximum Concentration for Historical Record

Figure 3-37



Iron

Maximum Iron (mg/L) 2006 - 2010

- ND
- < .15
- .15 - .3
- .3 - .6
- .6 - 1.2
- 1.2 - 20
- > 20

Secondary US EPA MCL = 0.3 mg/L
Secondary CA MCL = 0.3 mg/L

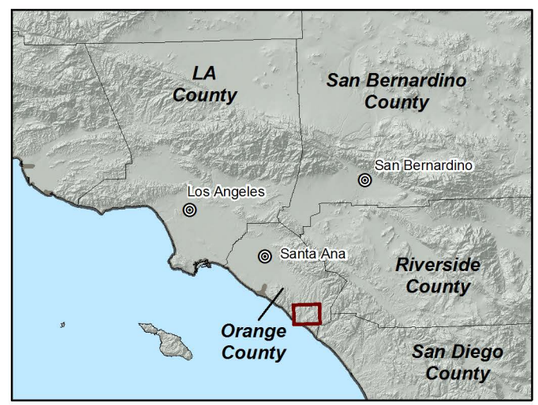
Hydrologic Sub Area and Basin Plan Objective for Iron

- Lower San Juan - 0.3 mg/L
- Ortega - 0.3 mg/L
- Middle San Juan - 0.3 mg/L
- Middle Trabuco - 0.3 mg/L
- Oso - 0.3 mg/L

Well with Data Plotted in Graph
but no Current Data for 2006 to 2010

San Juan Watershed Boundary

San Juan Groundwater Sub Basins



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DRAFT

0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
004

Iron in Groundwater

Maximum Concentration 2006 - 2010 and Historical Trends

Figure 3-38

117°40'0"W

117°20'0"W

33°40'0"N

Santiago Creek
Bee Canyon Wash
Agua Chinon Wash
Borrego Canyon Wash
Serrano Creek
San Diego Creek
Aliso Creek
Arroyo Trabuco Creek
Oso Creek
Sulphur Creek
Salt Creek
Horno Creek
San Juan Creek
Arroyo Salado
Cristianitos Creek
San Mateo Creek
Riverside County
Orange County
San Diego County
Lake Elsinore
Pacific Ocean

241
133
405
73
74
15
5
1

TC @ Mine Adit
Holy Jim
TC - 8
TC - 7
TC @ RSMD D-SM
TC @ Rising Groundwater
TC -3
SJC above Lion Cyn
OC @ Barrier
TC @ Oso
OC @ Crown Valley
TC @ Crown Valley
CDM - 10
CDM - 8
TC - 2A
TC @ Camino Cap
Horno Creek @ Barrier
CDM - 11A
SJC @ Oda Nursery
CDM - 11
CDM - 16
PMS-Control
SJC @ La Novia
SJC below PMS-04 Ortega
TC @ Del Obispo
PMS-02
PMS-01
SJC above Trabuco
SJC below Tracbuco
SJC @ Treatment Plant

Maximum Iron (mg/L)

- ND
- < .15
- .15 - .3
- .3 - .6
- .6 - 1.2
- 1.2 - 20
- > 20

Secondary US EPA MCL = 0.3 mg/L
Secondary CA MCL = 0.3 mg/L

Basin Plan Surface Water Objective = 0.3 mg/L

** Maximum concentration is based on all available data from the historical record. All surface water sites are monitored at different time periods and for different analytes. Refer to Table 3-5 in this report for a summary of the monitoring at the surface water stations.*

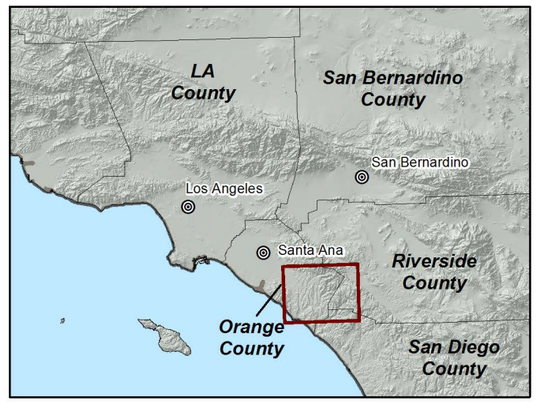
San Juan Groundwater Sub Basins

San Juan Watershed Boundary

Geology

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.



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0 1 2 3 4 Miles
0 2 4 6 KM

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075-003
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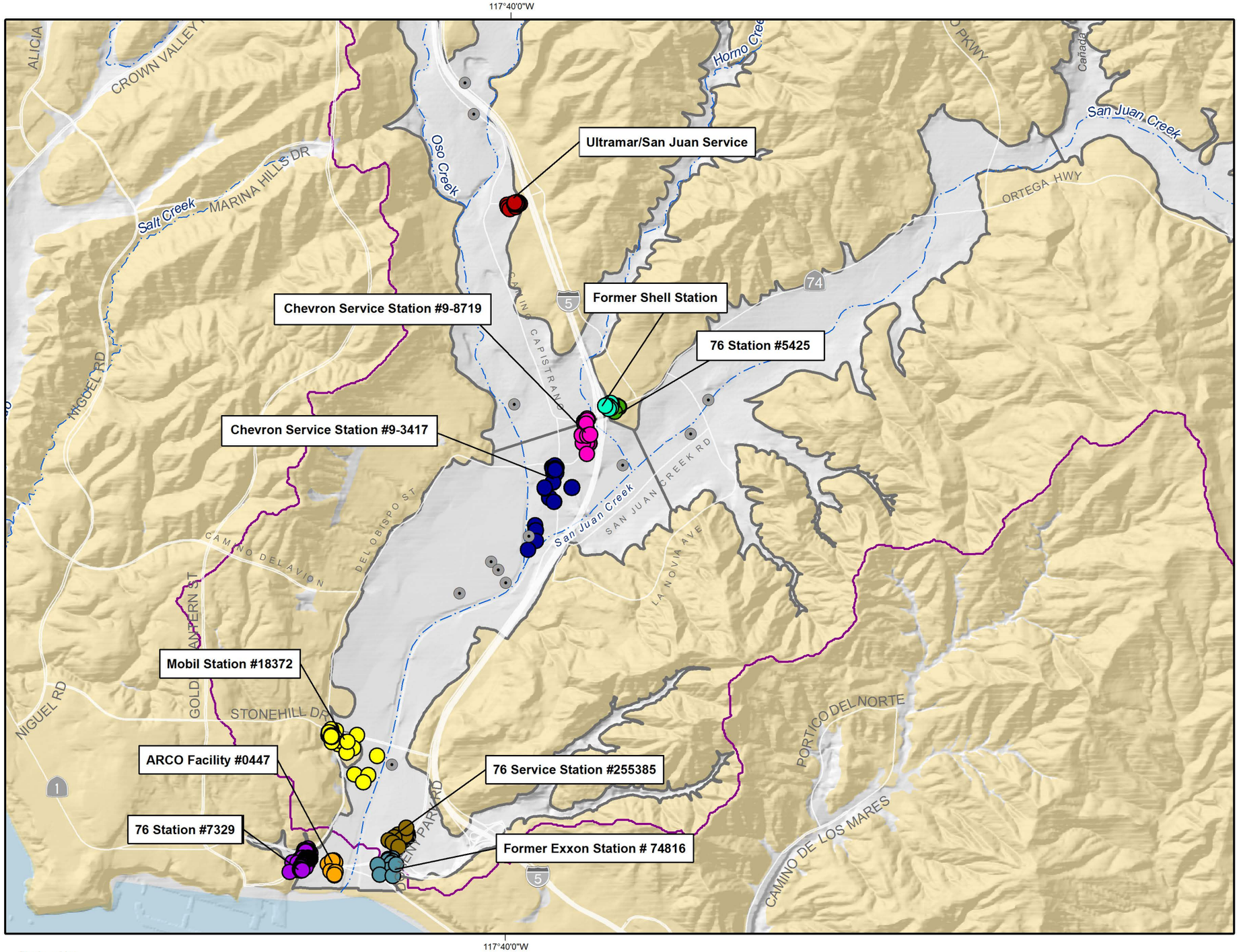
Iron in Surface Water

Maximum Concentration for Historical Record

Figure 3-39



Cleanup Site Monitoring Wells

- Ultramar/San Juan Sevice (ID # T0605902555)
- Former Shell Station -Closed (ID # T0605902592)
- 76 Station #5425 (ID # T0605902561)
- Chevron Service Station #9-8719 (ID # T0605902510)
- Chevron Service Station #9-3417 (ID # T0605902379)
- Mobil Station # 18372 (ID # T0605902502)
- 76 Service Station # 255385 (ID # T0605902362)
- Former Exxon Station 74816 (ID # T0605902575)
- ARCO Facility # 0447 (ID # T0605902526)
- 76 Station #7329 (ID # T0605902573)

** The ID # listed above is the Global ID # assigned for the State of California Water Resources Control Board*

- Active Production Wells
- San Juan Watershed Boundary
- San Juan Groundwater Sub Basins

Geology

- Younger Alluvial Deposits
- Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217

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0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
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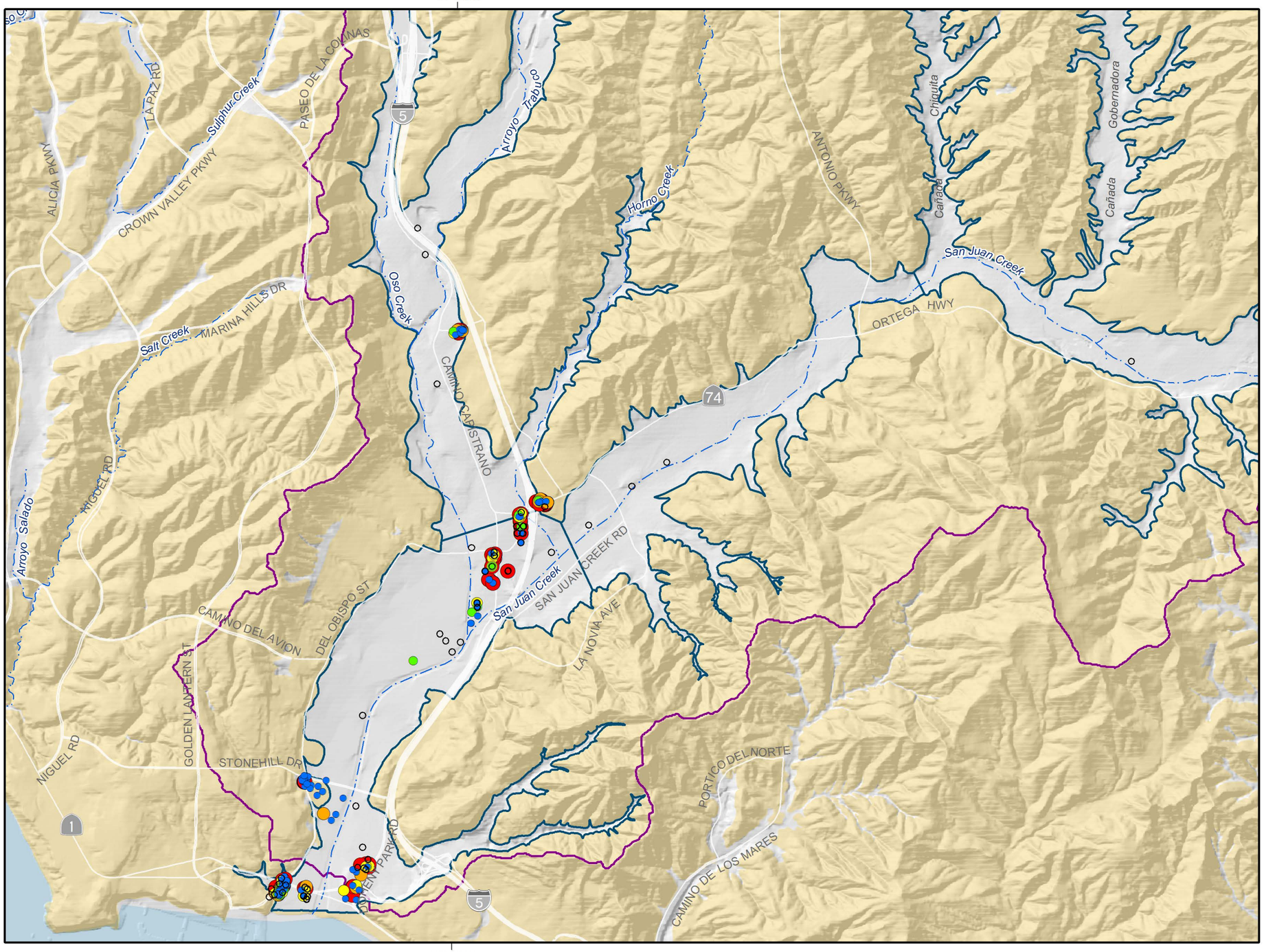
San Juan Basin Point Source Contamination Cleanup Sites and Monitoring Wells

Figure 3-40

117°40'0"W



117°40'0"W

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0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
004

Maximum MTBE (ug/L) 2006 - 2010

- ND
- < 2.5
- 2.5 - 5
- 5 - 10
- 10 - 20
- > 20

Primary CA MCL = 13 ug/L
Secondary CA MCL = 5 ug/L

San Juan Watershed Boundary

San Juan Groundwater Sub Basins

Geology

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

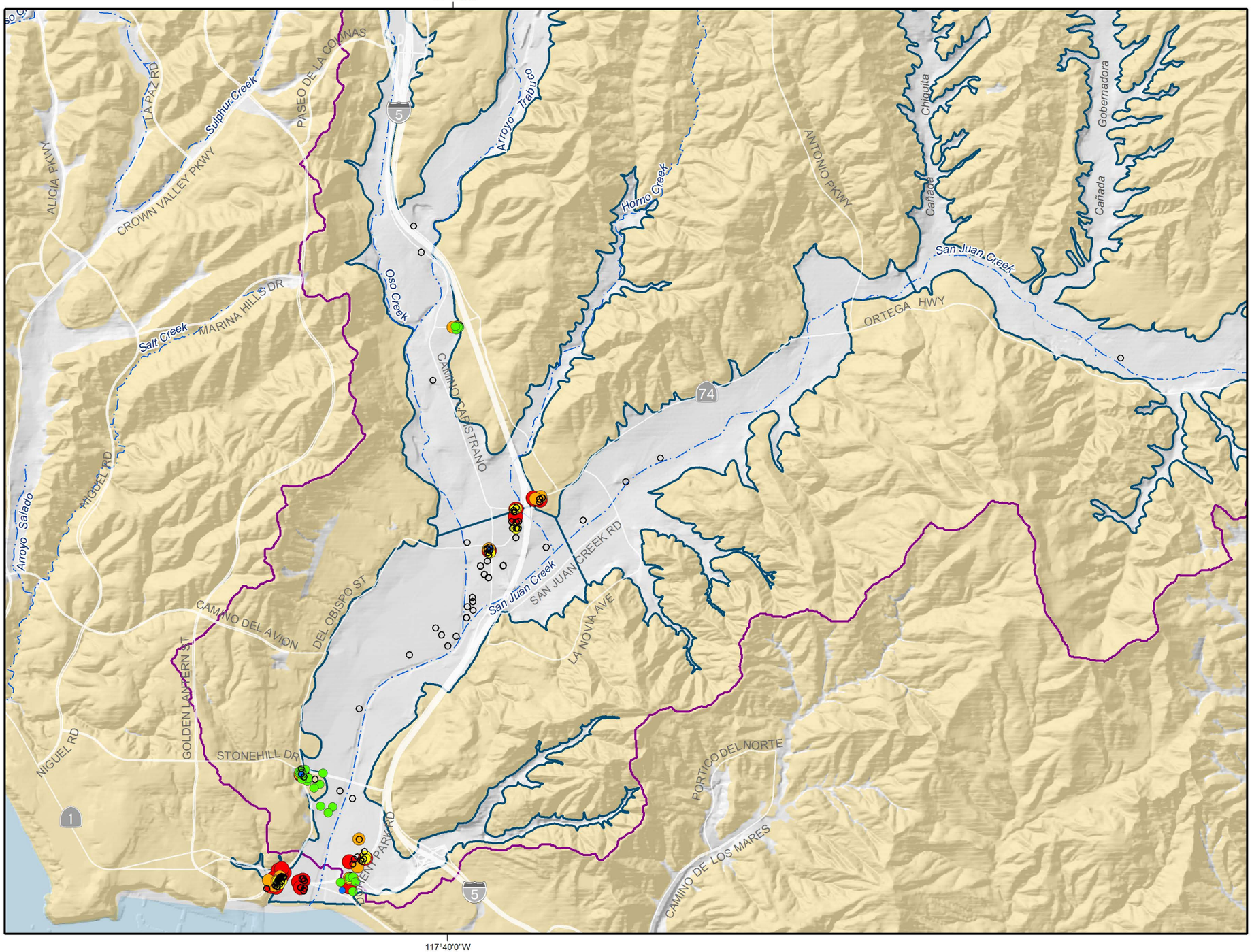
Source: CGS Special Report 217.

Methyl Tert-Butyl Ether in Groundwater

Maximum Concentration 2006 to 2010

Figure 3-41

117°40'0"W



117°40'0"W

Maximum TBA (ug/L) 2006 - 2010

- ND
- < 6
- 6 - 12
- 12 - 24
- 24 - 48
- > 48

CA Notification Level = 12 ug/L

San Juan Watershed Boundary

San Juan Groundwater Sub Basins

Geology

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

Source: CGS Special Report 217.

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DRAFT

0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

SAN JUAN BASIN AUTHORITY

075-003
004

Tert-Butyl Alcohol in Groundwater

Maximum Concentration 2006 to 2010

Figure 3-42

117°40'0"W

117°40'0"W

Maximum Benzene (ug/L) 2006 - 2010

- ND
- < 0.5
- 0.5 - 1
- 1 - 2
- 2 - 4
- > 4

Primary EPA MCL = 5 ug/L
Primary CA MCL = 1 ug/L

San Juan Watershed Boundary

San Juan Groundwater Sub Basins

Geology

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

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DRAFT

0 2,500 5,000 7,500 10,000 Feet

0 1,000 2,000 3,000 Meters

SANJUAN BASIN AUTHORITY

075-003
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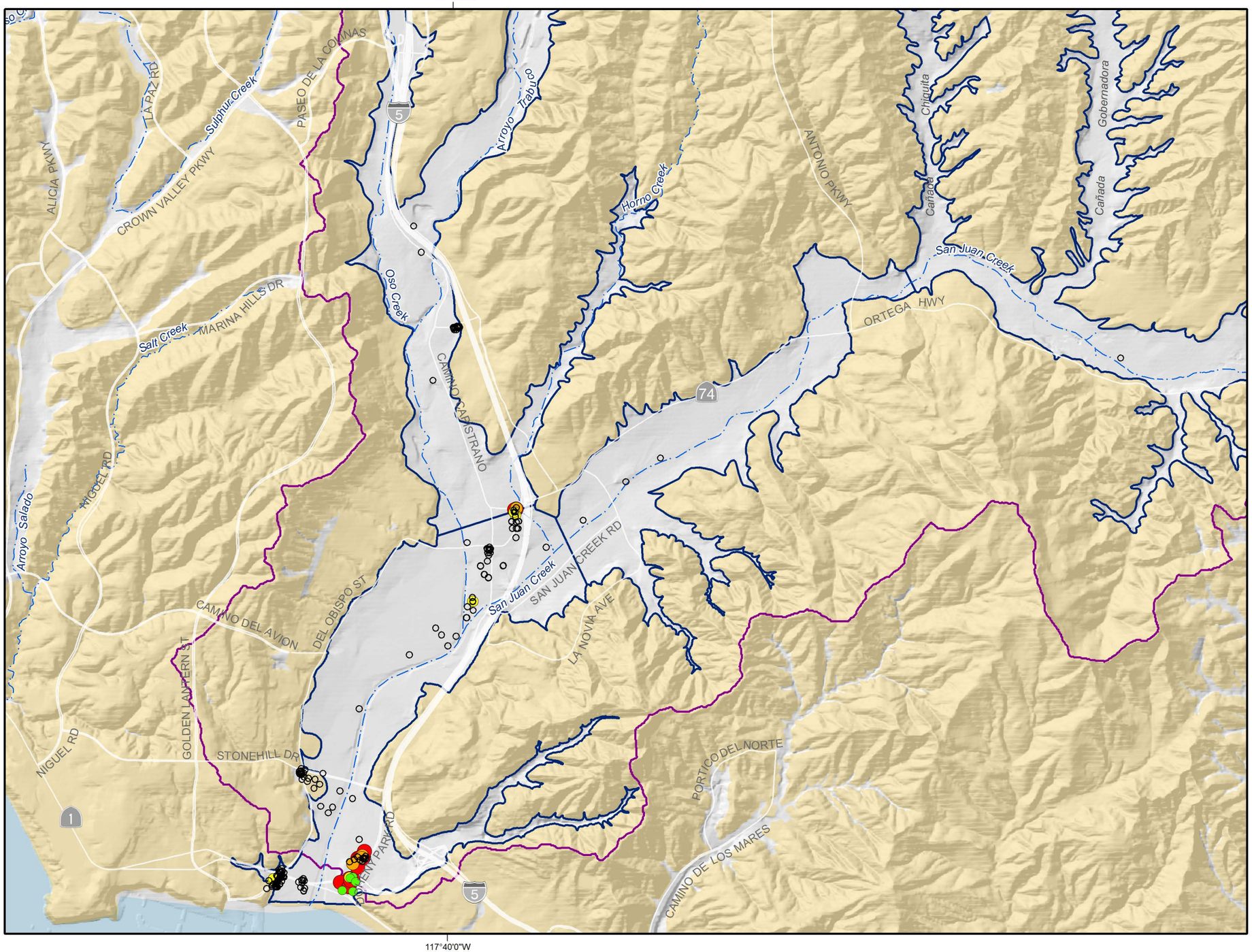
Benzene in Groundwater

Maximum Concentration 2006 to 2010

Figure 3-43

117°40'0"W



117°40'0"W

Maximum 1,2 DCA (ug/L) 2006 -2010

- ND
- < 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 2
- > 2

Primary EPA MCL = 5 ug/L
Primary CA MCL = 0.5 ug/L

San Juan Watershed Boundary

San Juan Groundwater Sub Basins

Geology

Younger Alluvial Deposits

Older Alluvial Deposits, Landslides, and Tertiary Sedimentary bedrock

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0 2,500 5,000 7,500 10,000 Feet
0 1,000 2,000 3,000 Meters

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075-003
004

1,2 - Dichloroethane in Groundwater

Maximum Concentration 2006 to 2010

Figure 3-44

Legend

- Groundwater Recovery Facility
- Junction Box
- Groundwater Well
- Reservoir
- Potable Water Transmission Mains
- MWD Feeders
- Groundwater Basin

Water Purveyors

- City of San Juan Capistrano
- Moulton-Niguel Water District
- Santa Margarita Water District
- South Coast Water District
- County Line

N

1 0 1 2 3

Miles

Figure 3-45
Native and Supplemental Potable Water Infrastructure
San Juan Basin Authority

carollo

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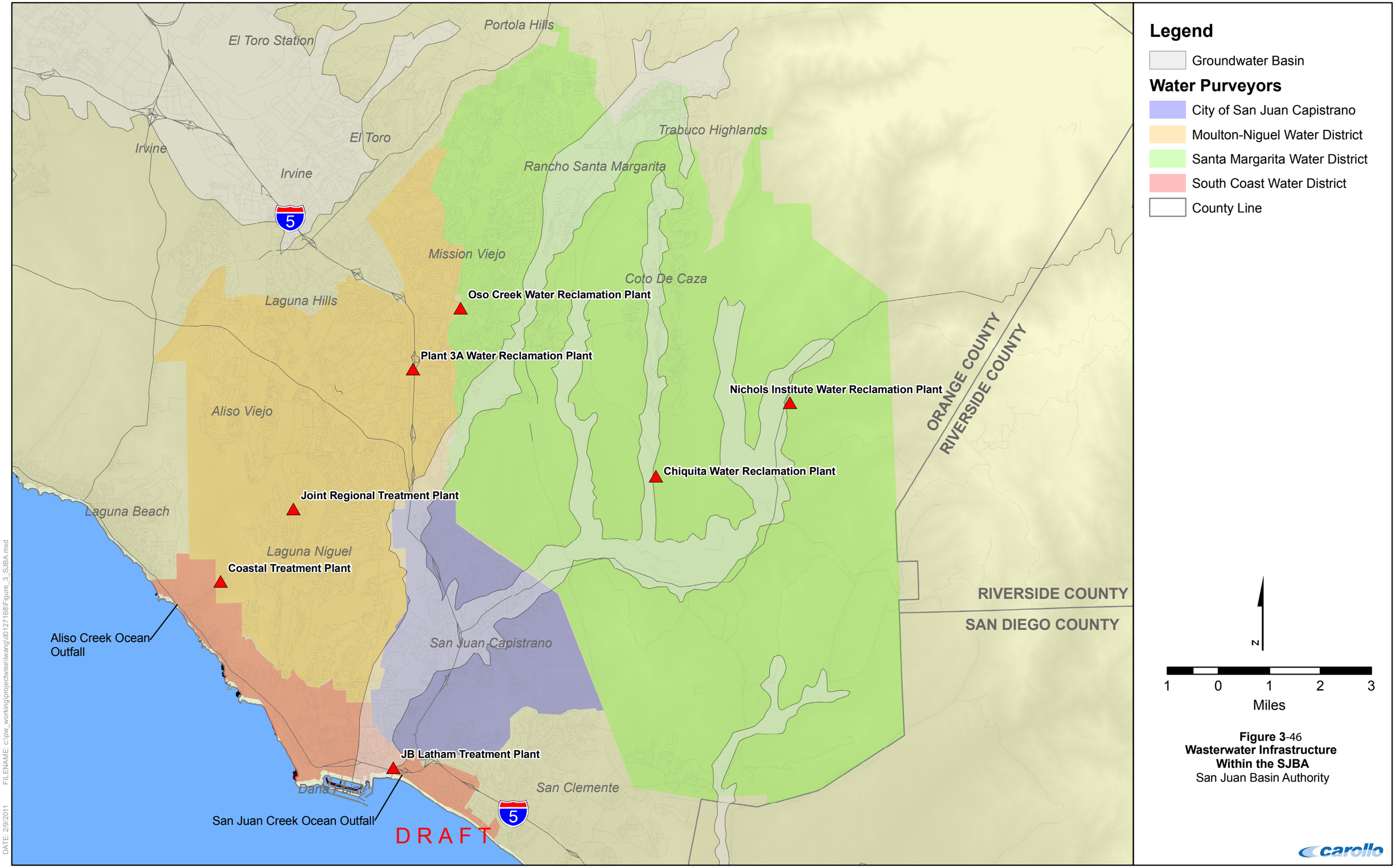

Figure 3-46
Wasterwater Infrastructure Within the SJBA
San Juan Basin Authority

carollo

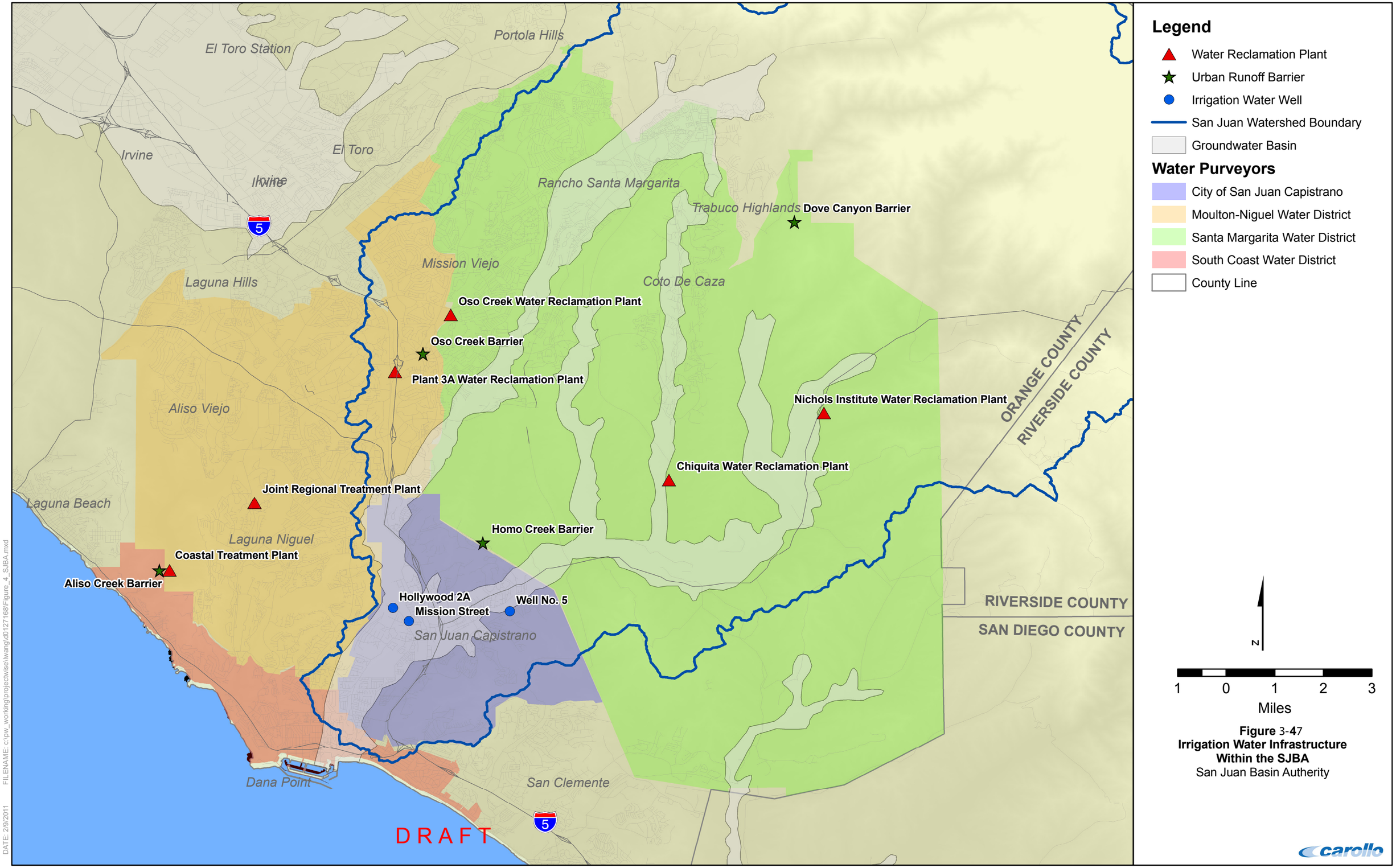

Figure 3-**4**7
Irrigation Water Infrastructure Within the SJBA
San Juan Basin Authority

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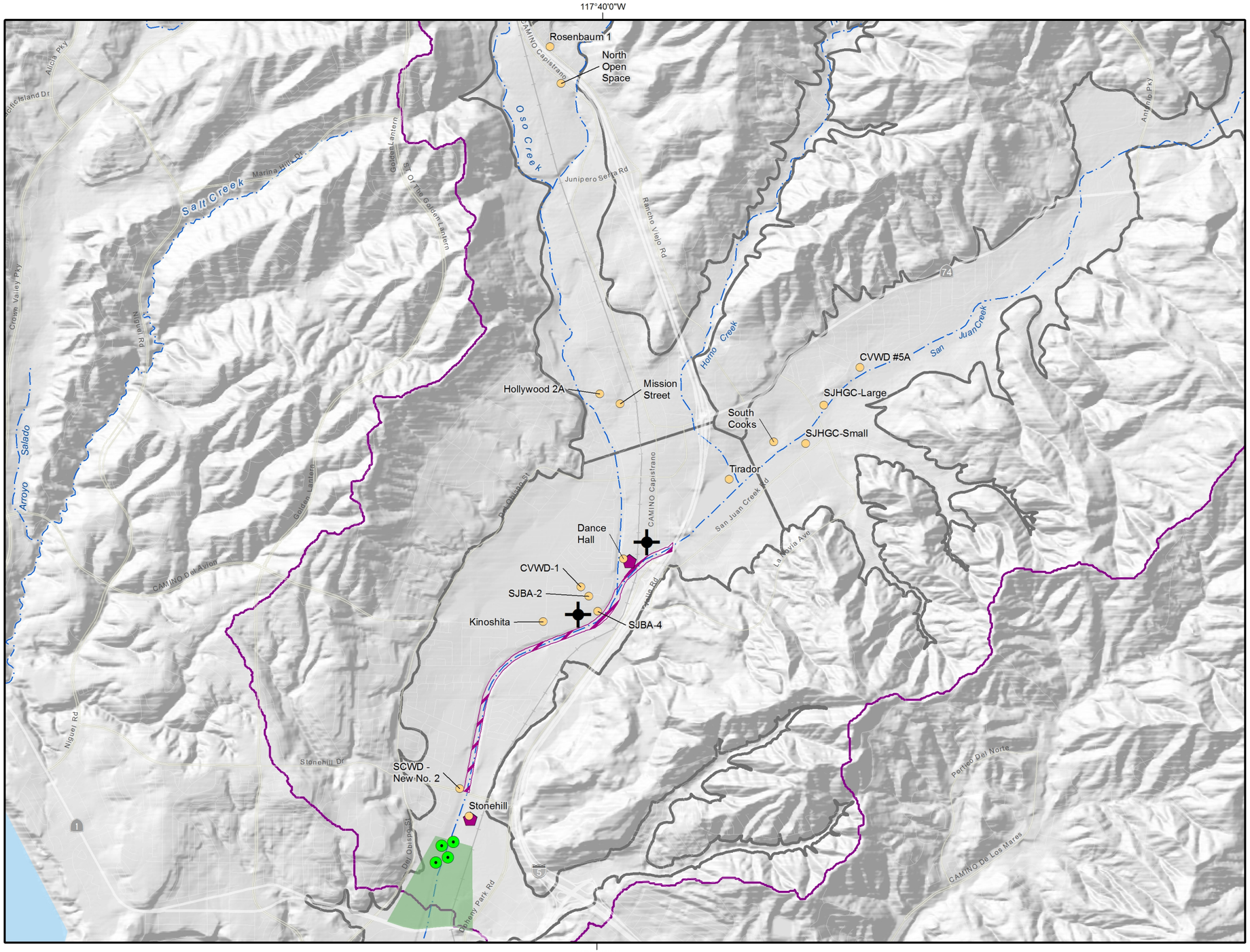

Main Features

- Proposed Instream Recharge Facilities
- Proposed Extraction Barrier Area
- Existing Well
- Proposed Injection Well
- Proposed Ranney Collector Well - (location shown is conceptual)
- Existing Desalter Facility

Hydrologic Features

- Groundwater Sub-basin
- San Juan Creek Watershed Boundary

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0 2,500 5,000 Feet
0 1,000 2,000 Meters

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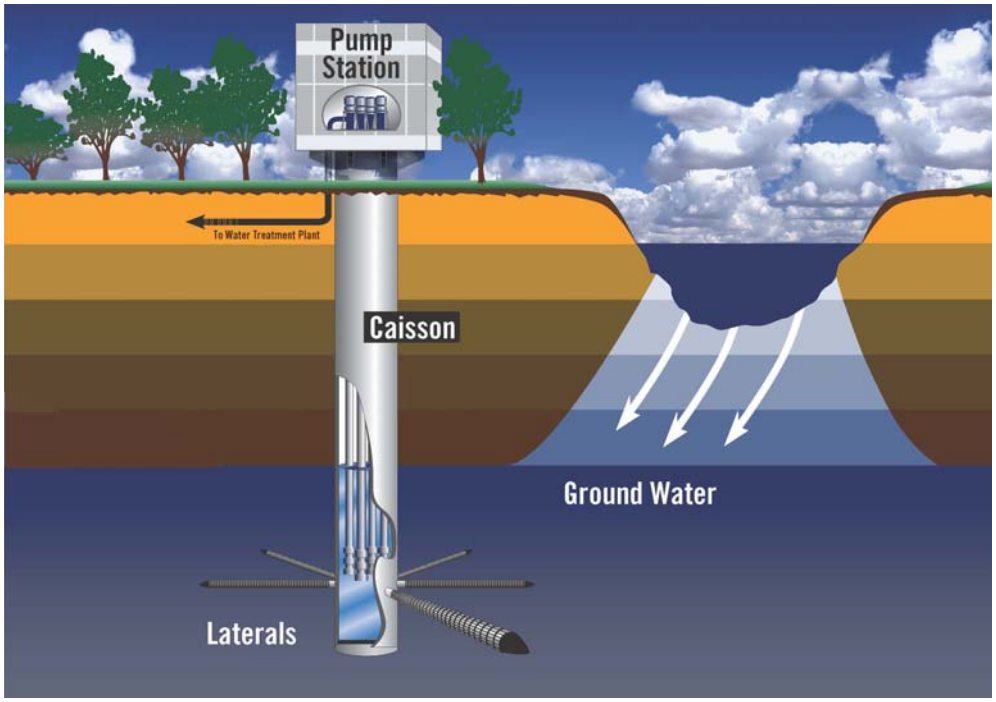
004

Management Components

Figure 6-1

Figure 6-2 - Schematic Illustration of a Ranney Collector Well



Source: Layne Christensen, 2013

Figure 6-3 - "T" Levees in the Santa Ana River

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APPENDIX J
Climate Change Analysis

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Climate Change and Vulnerability in the South Orange County IRWM Planning Region

Final Report, May 2013

Dana Point Harbor, Source: Wikipedia Commons

Prepared for:
County of Orange
300 N. Flower Street
Santa Ana, California 92703

Prepared through a contract with:
Tetra Tech, Inc.
17885 Von Karman Ave #500
Irvine, CA 92614

Authors:
Sujoy B. Roy, Whitney Kirkendall, and Patti Sexton

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Abbreviations

AOGCM: Atmosphere-Ocean General Circulation Model

BCSD: Bias correction-spatial downscaling

CARB: California Air Resources Board

CDEC: California Data Exchange Center

CEC: California Energy Commission

CT: Center of Timing (of streamflow)

DWR: (California) Department of Water Resources

ETWD: El Toro Water District

GCM: General Circulation Model, or more informally, Global Climate Model

GHG: Greenhouse Gas

IPCC AR4: IPCC Fourth Assessment Report

IPCC: Intergovernmental Panel on Climate Change

LBCWD: Laguna Beach County Water District

MNWD: Moulton Niguel Water District

MWD: Metropolitan Water District (of Southern California)

MWDOC: Municipal Water District of Orange County

PDO: Pacific Decadal Oscillation

PRISM: Parameter-elevation Regressions on Independent Slopes Model

SCWD: South Coast Water District

SMWD: Santa Margarita Water District

SWE: Snow Water Equivalent

TAR: (IPCC) Third Assessment Report

TCWD: Trabuco Canyon Water District

USGS: United States Geological Survey

VIC: Variable Infiltration Capacity Model

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EXECUTIVE SUMMARY

This document presents an assessment of the potential impacts of climate change on the water resources of South Orange County (South OC) in support of the Integrated Regional Water Management (IRWM) Plan being developed for the region.

Water supply in the planning region is largely obtained from imports. The Metropolitan Water District of Southern California (MWD) provides Orange County with the bulk of its water. According to its 2010 Urban Water Management Plan, approximately 55% of the water provided to the county is from the State Water Project (SWP), and 45% of the water is from the Colorado River Aqueduct. The Municipal Water District of Orange County (MWDOC) is the primary entity interfacing with local water agencies in the South Orange County region. MWDOC distributes water to the local water agencies including El Toro Water District (ETWD), Trabuco Canyon Water District (TCWD), Moulton Niguel Water District (MNWD), Laguna Beach County Water District (LBCWD), Santa Margarita Water District (SMWD), South Coast Water District (SCWD), San Juan Capistrano, and San Clemente. Irvine Ranch Water District (IRWD) also supplies a portion of water to the region. The total water demand for all 9 districts is 40,308 million gallons per year (or 110 million gallons per day), and 79% of it is imported from the Sacramento-San Joaquin and Colorado River basins.

Because of the role of imported water supply in South Orange County, potential impacts of climate change to water resources must be examined over a region broader than the IRWM planning area. Changes in observed climatic variables across this larger region representing the Western U.S. have been examined through data collected in the 20th century. Over this period, particularly in winter and spring, temperatures have risen across western North America. In the second half of the 20th century, the warming in the mountainous western North America has led to a higher rain-to-snow ratio, lower snow water content, decline in March snow cover, and a shift toward earlier annual snowmelt timing by 5 to 30 days. These observations support the need for incorporating climate change into long-term water resources planning efforts.

For estimating future climate conditions into the 21st century, global climate processes are represented using atmosphere-ocean general circulation models (AOGCMs or GCMs, also known as "global climate models"). Several published GCMs, developed by research groups worldwide, are in common use. GCMs are used to project future climate changes based on assumptions of different economic growth pathways and emissions of greenhouse gases, with A1b (medium), A2 (higher) and B1 (lower) being the most common named scenarios used in various climate impact studies. No one model or emission pathway is the best estimate of the future, and, typically, most climate assessments utilize an ensemble of GCM results for evaluating future conditions. In this work, sixteen candidate climate models were selected for evaluation. The primary greenhouse gas (GHG) emission scenarios used are A2 and B1, and bracket a range of conditions. GCM outputs are developed at a low resolution and need to be converted into a more spatially detailed form through downscaling, with

statistical downscaling being the most commonly used approach. Statistical downscaling is based on the development of relationships between local-scale observations and large scale GCM projections, which are then used to estimate spatially resolved future climate projections. Results from three 21st century periods, statistically downscaled to areas of 1/8 degree latitude by longitude, or about 12 km by 12 km, were analyzed for impacts in the early, mid, and late 21st century, defined as 2010–2039, 2040–2069, and 2070–2099 respectively. The projected data summary for the South OC IRWM planning region show a small decrease in precipitation of slightly over an inch per year by mid- to late-21st century periods (Table ES-1). They also show an increase in temperature from >2 to >5 ^{o}F over the same periods (Table ES-2). In general, climate models project more adverse conditions from the standpoint of water resources (i.e., warmer and drier) in the latter part of the 21st century compared to conditions observed in the second half of the 20th century.

Table ES-1
Average projected change in precipitation in the IRWM Region for 16 GCMs

Emission Scenario	Time period and average change		
	2010-2039	2040-2069	2070-2099
A2	-0.37 inches	-1.06 inches	-1.54 inches
B1	0.02 inches	-0.67 inches	-0.94 inches

Table ES-2
Average projected change in temperature in the IRWM Region for 16 GCMs

Emission Scenario	Time period and average change		
	2010-2039	2040-2069	2070-2099
A2	1.59 ^{o}F	3.37 ^{o}F	5.81 ^{o}F
B1	1.58 ^{o}F	2.70 ^{o}F	3.73 ^{o}F

Several major planning studies have been performed in the regions supplying water to South OC that consider the impacts of climate change. Projected climate change conditions, typically obtained from statistical downscaling of an ensemble of models, have been used for developing plants in in both regions. A key feature that stands out from the comprehensive analyses that have been performed is that both the California Delta and the Colorado Basin are severely water constrained, where it will be challenging to meet current allocations in future years. In both regions, planning model projections indicate years where deliveries will sometimes fall short of allocations, over planning horizons that range from 20 to 50 years into the future, under conditions where no changes are made to the existing operational infrastructure of the system. Because the regions jointly affected by these basins are continuing to experience relatively rapid population growth, and anticipated increased in municipal demands, water planners must address the dual challenge of reduced supplies and increased demand.

Although variable at different points along the coast due to regional factors, in general, sea levels are rising globally due climate warming including expansion of ocean water and melting of land ice. Along the Pacific Coast, the highest values of sea level rise in Southern

California have been reported at Newport Beach, near the study region, where the observed increase is 2.22 mm/year. These rates are projected to accelerate over the 21st century. A recent review of different calculation approaches by the National Academy of Sciences reported that global sea level is estimated to rise 8–23 cm (3-9 inches) by 2030 relative to 2000, 18–48 cm by 2050 (7-19 inches), and 50–140 cm (20-55 inches) by 2100. This review projects that sea level in Southern California is slightly higher than the global average because of land subsidence, and will rise 4–30 cm (2-12 inches) by 2030 relative to 2000, 12–61 cm (5-24 inches) by 2050, and 42–167 cm (17-66 inches) by 2100. Maps illustrating the effects of sea level rise to 2100 and a 100-year flood were developed for the IRWM planning region to identify areas that are vulnerable. An example map is shown in Figure ES-1.

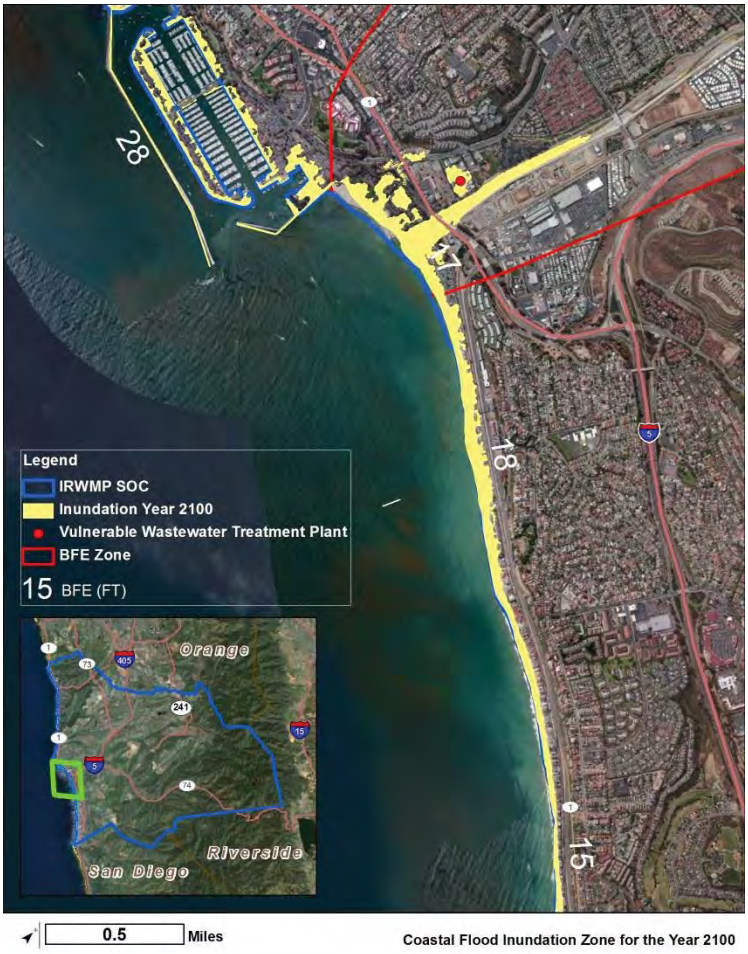

Figure ES-1. Zoomed-in area of South OC coastline, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's base flood elevation values in feet.

Greenhouse gas emissions associated with the water sector were estimated for the South OC planning region. The General Reporting Protocol, Version 3.1, developed by the California Climate Action Registry is used to calculate indirect emissions of greenhouse gases (GHG) from electricity used for the water system in South Orange County. The water sector is the

largest user of electricity in the state of California. The bulk of the water imported into southern California is transported over long distances up steep gradients and is therefore more energy expensive than local sources. Energy use for water is quantified via energy intensity, or the gross energy required for the water system to use a specific amount of water at a specific location. Under current conditions, the water sector in the region generates GHG emissions of over 93,000 metric tons in terms of carbon dioxide equivalent. Out of a list of 90 potential projects in the IRWM plan, seven high priority projects were evaluated for their relationship to climate change and greenhouse gas emissions. The projects identified for funding have the potential to save about 17,000 metric tons of CO_2-equivalent emissions annually, nearly 18% of the current total water sector emissions.

An overall assessment of vulnerability to climate change for South OC was performed following a checklist presented in the Climate Change Handbook for Regional Water Planning, and specifically recommended for IRWM climate change planning. As noted above, the major water supply system vulnerabilities in this region are not unique, but are tied to the water supply system in California and the Colorado River Basin that are being evaluated through statewide or regional efforts. Besides water supply, other areas of potential concern for this planning region are coastal flooding due to sea level rise, increase in fire risk, and impacts to ecosystems.

Looking forward, it is expected that climate change planning in support of the IRWM, as well as related activities, will be updated as better information on climate projections, including extreme events, become available, and impacts to other sectors, such as water quality and habitats will be similarly evaluated. Possible future work includes more detailed analysis of the effects of sea level rise in specific areas along the coastline and data collection on the wave climate (height, period, direction) in the region. From the standpoint of water supply and water quality, the impact of sea level rise on the Latham Wastewater Treatment Plant needs to be considered. The county may also interface with other research groups in the region that are evaluating the effects of large floods across California. These scenario runs show planners the extent of damage that may occur across the state, including in Orange County. This planning exercise informs local-level agencies to address the effects of major storm event, in a manner similar to that used for exercises related to earthquake preparedness in California. Longer-term planning studies, perhaps extending 50-75 years into the future may provide greater insight for planners in support of long-term infrastructure sustainability assessment and for investments with a lifetime greater than 20 years. Finally, the creeks and estuaries of the South OC region are home to several native fish species that are the focus of ongoing recovery efforts that may be affected adversely by climate change. A plan for continued monitoring of stream flows, water quality and temperature across the South OC region is recommended for understanding and managing these species impacts.

1. INTRODUCTION

Climate change, defined here as a long-term change in weather patterns, including temperature, precipitation, sea levels, and winds, driven by changes in anthropogenic greenhouse gas (GHG) emissions, has been a focus of scientific analysis over the past three decades. Global warming is a commonly used term to refer to the increase in the average temperature of air and oceans observed since the mid-20th century and is projected to continue. There is evidence in the scientific literature, particularly as synthesized in the work of the Intergovernmental Panel on Climate Change (IPCC AR4, 2007), that climate change is occurring and is likely to accelerate over the 21st century. Many climate related changes are already being seen in California and the Western United States through monitoring over the past decades. Although there is general agreement on some types of climatic changes (especially temperature), it is important to recognize that modeling of the climate system is very complex, and that there is uncertainty associated with projection of specific changes over the 21st century, especially when focused on a particular geographic region.

Given the direct dependence of water resources on climatic factors, the California Department of Water Resources (DWR) requires the evaluation of climate change as a component of the Integrated Regional Water Management (IRWM) process, as one of 16 required Plan Standards. The IRWM Plan Standards are components that must be part of an IRWM Plan and may be used to determine eligibility for specific projects (Draft IRWM Guidelines, DWR, 2012a). The intent of the Climate Change Standard is to ensure that IRWM Plans, describe, consider, and address the effects of climate change on their regions, and similarly, disclose, consider, and when possible, reduce GHG emissions. The goal of this document is to present an assessment of the potential impacts of climate change on the water resources of South Orange County (South OC) that addresses the IRWM plan standards.

A particular area of focus in this analysis is the water supply system in the IRWM planning region. South Orange County's sources of water include groundwater, supplies from the Municipal Water District of Orange County (MWDOC) via the Metropolitan Water District of Southern California (Metropolitan or MWD), and recycled water. Metropolitan water supplies constitute a large portion of South OC's water supply. In turn, water withdrawn in the Sacramento-San Joaquin Delta in Northern California, and conveyed through the State Water Project, and from the Colorado River system, and conveyed through the Colorado River Aqueduct, form the source of Metropolitan's water supplies. The future sustainability of the Northern California and Colorado River water supply sources are therefore of critical importance to the SOC's growing population and large economy. Figure 1-1 shows the South OC IRWM region and its topography.

Snowmelt, either from the Sierra Nevada or the Rockies, is a major component of the water supply to Metropolitan. A large fraction of the precipitation in western mountain regions falls on days with temperatures just a few degrees below freezing (Bales *et al.,* 2008). Thus,

warming by even a few degrees might result in a large shift from snowfall to rainfall, a result of great consequence to the Western US and California, where snowpack represents a significant component of water storage during the year. In addition to the shift in storage, there may be impacts caused by the change in the total quantity of precipitation, and in length and severity of droughts across the large region that supplies water to South OC.

Figure 1-1 Map showing the regional topography and relative locations and boundaries of the South Orange County IRWM planning region.

Changes in precipitation distribution as a result of climate change are anticipated to result in more extreme wet events, with higher precipitation intensities and stormwater volumes, thus increasing the flood risk potential in the highly urbanized South OC region. Because local precipitation is not a major component of the water supply in the region, the flood risks in stream channels flowing through urbanized areas must be evaluated separately from the water supply risks identified above. The South OC region must also consider the potential of coastal flooding as a result of winter storms superimposed on sea levels that are higher than current levels.

This document is organized into the following topics:

- Description of source waters of South OC planning region (Chapter 2).

- Changes in the climate of Western North America as inferred from data records on temperature, flow, and precipitation in the twentieth century (Chapter 3).
- Downscaled projections of future climate from global climate models for the South OC region (Chapter 4).
- Climate change planning studies applicable to the regions providing water supplies to the IRWM region (Chapter 5).
- Greenhouse Gas (GHG) emissions as a consequence of the water system requirements in the South OC area and a methodology to calculate savings in GHGs proportional to water savings for proposed projects in the region (Chapter 6).
- Evaluation of sea level rise and associated impacts (Chapter 7).
- Identification of projects proposed for funding and estimating associated GHG emissions (Chapter 8).
- A climate change vulnerability assessment for the South OC region following the checklist presented in the Climate Change Handbook for Regional Water Planning (DWR, 2011) (Chapter 9).

The IRWM climate change standard requirements and the information provided in this document are related for each major area of assessment below:

Regional Vulnerabilities

- **IRWM Standard:** A discussion of the potential effect of climate change on the IRWM region, including an evaluation of the IRWM region's vulnerabilities to the effects of climate change and potential adaptation responses to those vulnerabilities. The evaluation of vulnerabilities must, at a minimum, be equivalent to the vulnerability assessment contained in the Climate Change Handbook for Regional Water Planning (DWR, 2011)
- **Presentation in this report:** The pertinent information in presented in Chapters 3, 4, 7, and 9.

GHG Emissions

- **IRWM Standard:** A process that discloses and considers GHG emissions when choosing between project alternatives and mitigation strategy.
- **Presentation in this report:** GHG emissions associated with the water sector in the planning region and with the specific projects are presented in Chapters 6 and 8.

Vulnerability Assessment

- **IRWM Standard:** A list of prioritized vulnerabilities based on the vulnerability assessment and the IRWM's decision making process.
- **Presentation in this report:** Key vulnerabilities of climate change in the South OC region are discussed in Chapter 9.

Future Evaluation

- **IRWM Standard:** A plan, program, or methodology for further data gathering and analysis of the prioritized vulnerabilities.
- **Presentation in this report:** Because of the unique situation that almost all of the region's water supply is imported, the water supply vulnerability—a key concern from the standpoint of the IRWM—is addressed through the ongoing regional efforts in California and in the Colorado Basin as discussed in Chapter 5. Potential future actions are described in Chapter 10.

2. SOURCE WATERS OF SOUTHERN ORANGE COUNTY

Key Points: *Much of the water supply in South Orange County is imported from outside the region, with supplies from the State Water Project and the Colorado Aqueduct providing 55% and 45% of the total supply. The Municipal Water District of Orange County (MWDOC) distributes water to local water agencies in the South Orange County region. Recycled water and local groundwater and the two additional sources of water in the region.*

2.1 SOURCE WATERS

The Metropolitan Water District of Southern California (Metropolitan) provides Orange County with the bulk of its water. According to its 2010 Urban Water Management Plan, approximately 55% of the water provided to the county is from the State Water Project (SWP), and 45% of the water is from the Colorado River Aqueduct. The Municipal Water District of Orange County (MWDOC) is the entity interfacing with local water agencies in the South Orange County region. It distributes water to the local water agencies including El Toro Water District (ETWD), Trabuco Canyon Water District (TCWD), Moulton Niguel Water District (MNWD), Laguna Beach County Water District (LBCWD), Santa Margarita Water District (SMWD), South Coast Water District (SCWD), Irvine Ranch Water District (IRWD), San Juan Capistrano, and San Clemente. The water distribution organizational structure for South Orange County is shown in Figure 2-1. The Emerald Bay Service District, a small water agency, is not separately identified in this figure because it purchases its water from LBCWD.

2.2 LOCAL WATER AGENCIES

The nine local water agencies listed above receive the bulk of their water from MWDOC, although local sources also contribute to varying degrees. The service areas for the water agencies are shown in Figure 2-2. Table 2-1 presents the water demand for 2010 based on the Urban Water Management Plans for that year for each agency.

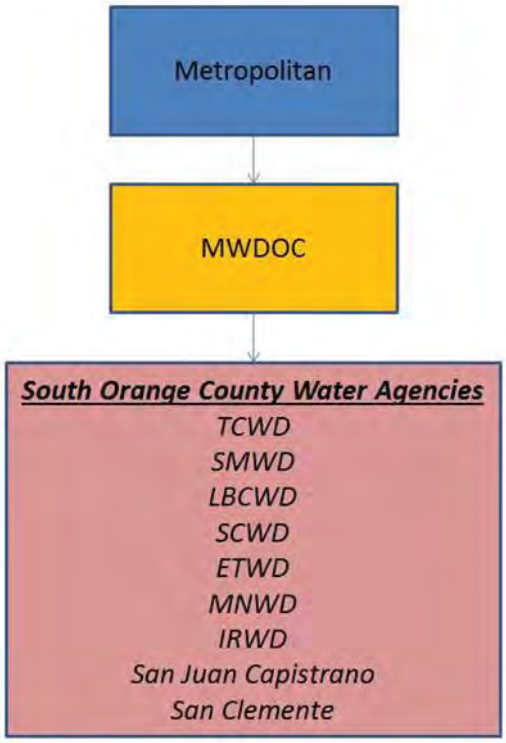

Figure 2-1 Organizational structure of water agencies.

Table 2-1
Annual Water Demand and Sources by Local South Orange County Water Agency, Obtained from the Corresponding 2010 Urban Water Management Plan for that Agency. All Units in Millions of Gallons (MG). Recycled Surface Water and Recycled Water Have Been Consolidated into "Recycled."

Water Agency	Water Demand	MWDOC	Groundwater	Recycled
El Toro Water District	3,210	3,063	0	147
Trabuco Canyon Water District	1,147	766	104	278
Moulton Niguel Water District	11,029	8,709	0	2,320
Laguna Beach County Water District	1,606	1,606	0	0
Santa Margarita Water District	11,134	9,149	21	1,964
South Coast Water District	2,278	1,814	207	257
Irvine Ranch Water District[1]	3,752	1,802	1,117	637
San Juan Capistrano	2,864	2,079	645	140
San Clemente	3,288	2,793	202	293
Total[2]	40,308	31,781	2,296	6,036

[1]Only a portion of the IRWD service area falls within South Orange County (8,658 acres out of 115,840 acres, or 7.5%). For the purpose of comparison to the South Orange County area, the total water demand and sources for IRWD were scaled by 7.5% for inclusion in this table.
[2]The Emerald Bay Service District is not separately listed in this table because it purchases its water from LBCWD and is too small to be required to prepare its own Urban Water Management Plan. The district purchased 305 AF (99 MG) from LBCWD in 2010, according to the LBCWD Urban Water Management Plan.

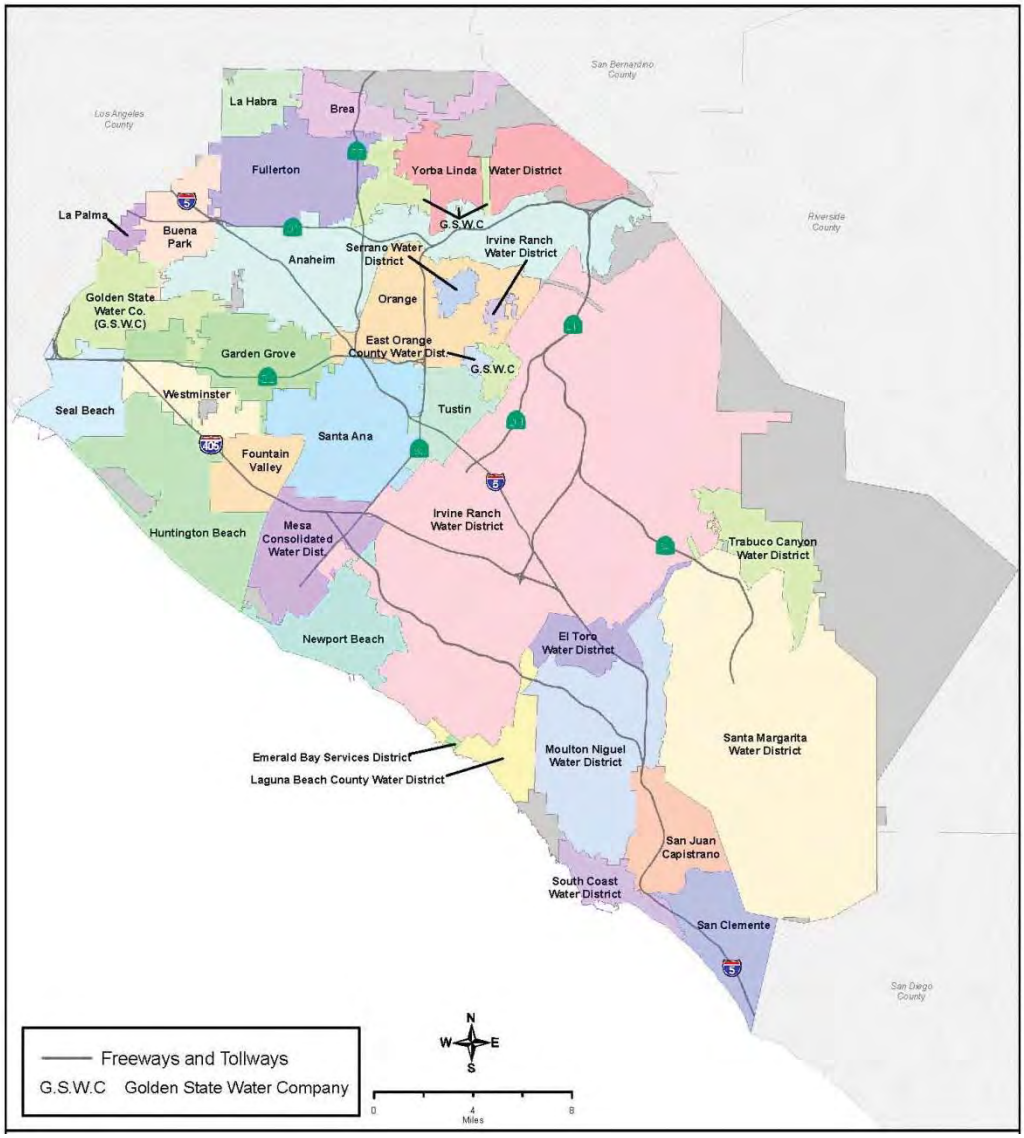

Figure 2-2 **Map showing the regional water agencies that are part of the MWDOC service area. This IRWM plan is focused on the water districts in the southern portion of Orange County and identified in Figure 2-1.**

Imported water from MWDOC accounts for an average of 79% of water demand in the South Orange County region. At the low end, IRWD imports 48% of its water, while on the opposite end of the spectrum, LBCWD imports 100% of its water. Just half of the water districts currently access groundwater to supplement their imported water. This includes TCWD (9%), SCWD (9%), San Clemente (6%), and San Juan Capistrano (23%) All but one district (LBCWD) count recycled water towards their total volume. This includes ETWD (5%), TCWD (24%), MNWD (21%), SMWD (18%), SCWD (11%), San Juan Capistrano (5%), and San Clemente (9%). Figure 2-3 provides a summary of the water sources for each of the South Orange County water agencies developed from their 2010 Urban Water

Management Plans. Note that water from the Colorado River and State Water Project is described above as "imported" water from MWDOC.

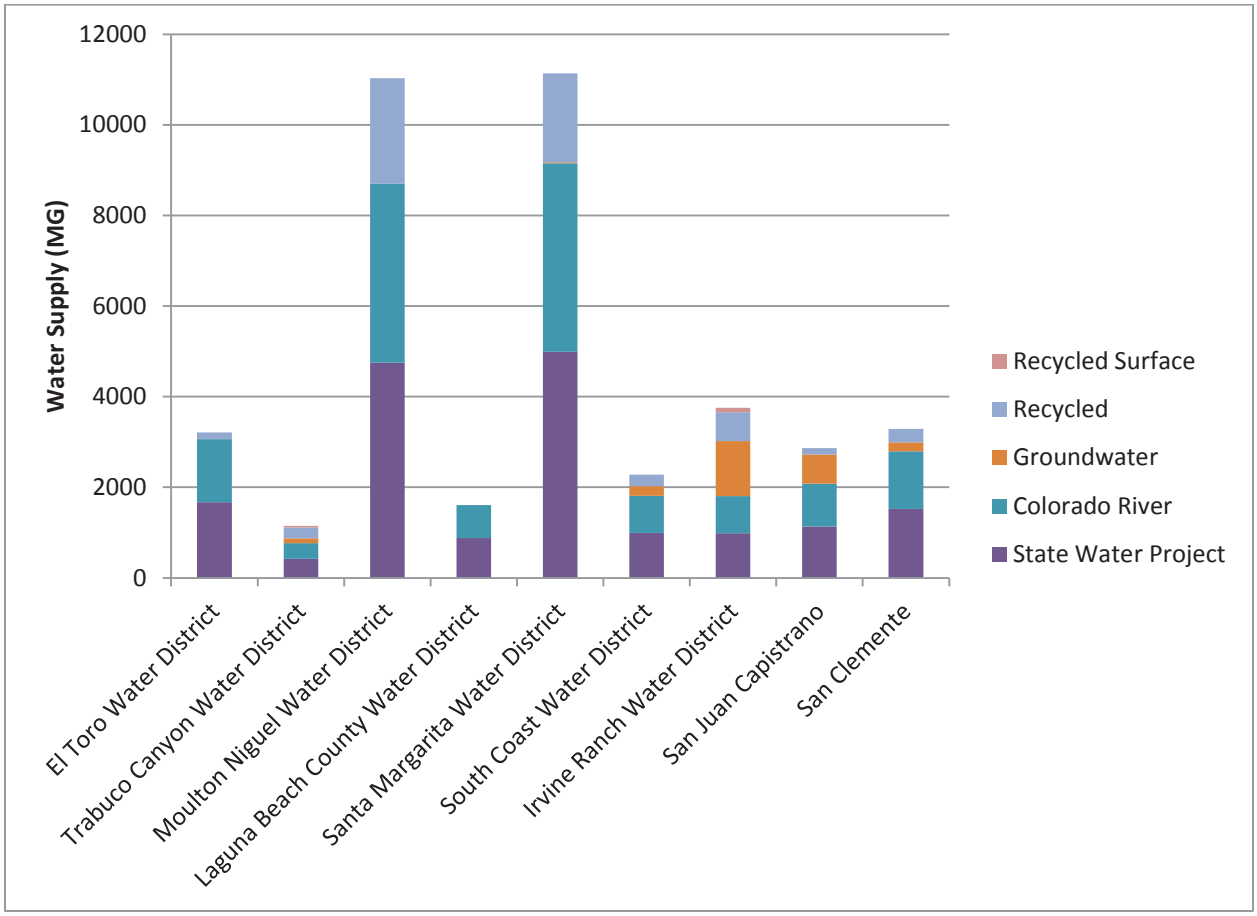

Figure 2-3 **The major sources of water supply for the water agencies of southern Orange County for 2010 based on their respective 2010 Urban Water Management Plans. Water from the Colorado River and the State Water Projected is distributed to the local water agencies by MWDOC and is designated as "imported" water.**

3. TWENTIETH CENTURY CLIMATE VARIABILITY IN THE WESTERN U.S. AND CALIFORNIA

Key Points: *Because of the importance of imported water supply to South Orange County from the Sacramento-San Joaquin and Colorado River basins, potential impacts of climate change to water resources must be examined over a region broader than the IRWM planning area. During the 20th century, particularly in winter and spring, temperatures have risen across western North America. In the second half of the 20th century, the warming in the mountainous western North America has led to a higher rain-to-snow ratio, lower snow water content, decline in March snow cover, a shift toward earlier annual snowmelt timing by 5 to 30 days, and changes in the timing of biological events, such as flower blooming. These changes illustrate the effects of climate change on the hydrology of California's mountains, and indicate the need to predict 21st century changes in order that appropriate adaptation strategies to protect regional water-supply sources can be developed.*

In California mean annual temperature increases of 0.6 °C, and winter and spring increases of 1.5 °C and 1 °C, have been documented, respectively, and these trends are unlikely to be solely due to natural variability. The late-spring and early-summer runoff fraction runoff of eight major rivers in the western Sierra Nevada in California have been decreasing since the mid-20th century. There is evidence of trends in climatic and hydrologic variables in western mountain environments in the second half of the 20th century – including temperature, precipitation, rain-to-snow ratio, snow water content, and snowmelt timing. It has been concluded that many of the changes already observed, are, to a high degree of confidence, attributable to climate change that has already occurred over the latter part of the 20th century.

Because of the wide region from which South Orange County obtains its water supplies, spanning the Sacramento-San Joaquin River basins and the Colorado River basin (Figure 3-1), it is important to examine evidence of climate change over this region, including the role of climate change on snow accumulation and snowmelt in the mountainous portions of the basins. This chapter presents an overview of observed trends in temperature and precipitation in the region supplying water to South Orange County.

During the twentieth century, temperatures, particularly in winter and spring, have risen significantly across western North America (Dettinger and Cayan, 1995; Folland *et al*., 2001; Karoly *et al*., 2003; Bonfils *et al.*, 2008a, b). In the second half of the 20th century, such warming in the mountainous western U.S. has led to:

- **a higher rain-to-snow ratio** (ACPI, 2004; Hamlet *et al.*, 2005; Knowles *et al.*, 2006),
- **a lower snow water content** (Mote, 2003; Mote *et al.*, 2005; Regonda *et al.*, 2005; Knowles *et al.*, 2006),
- **a decline in March snow cover** (Groisman *et al.*, 2004); and,
- **a shift towards earlier annual snowmelt timing** by 5 to 30 days (Gleick, 1987; Roos, 1987, 1991; Lettenmaier and Gan, 1990; Wahl, 1992; Aguado et al., 1992; Pupacko, 1993; Dettinger and Cayan, 1995; Brown, 2000; Cayan *et al.*, 2001; Mote *et al.*, 2005; Regonda *et al.*, 2005; Stewart *et al.*, 2005; Knowles *et al.*, 2006; Maurer *et al.*, 2007a).

Figure 3-1 **Map showing the Sacramento-San Joaquin and Colorado River basins relative to the area supplied by the Metropolitan Water District of Southern California (red border). (Source: Wikipedia Commons, http://en.wikipedia.org/wiki/File:SoCal_Watershed.jpg)**

The response of biological variables that are sensitive to climate have also been documented. These include:

- increasing tree mortality (Kelly and Goulden, 2008; van Mantgem et al., 2009);
- shifts in tree species (Thorne et al., 2008);
- earlier flower blooming (Cayan *et al.*, 2001);
- migration of small mammals to higher elevations (Moritz et al., 2008); and

- increased fire frequency (Westerling et al., 2009).

3.1 TRENDS IN TEMPERATURE AND PRECIPITATION

California has experienced a mean temperature rise of 0.6 °C, and winter and spring rises of 1.5 °C and 1 °C, respectively (Figure 3-2), which have been shown to be very unlikely due solely to natural variability (Cayan *et al.*, 2006).

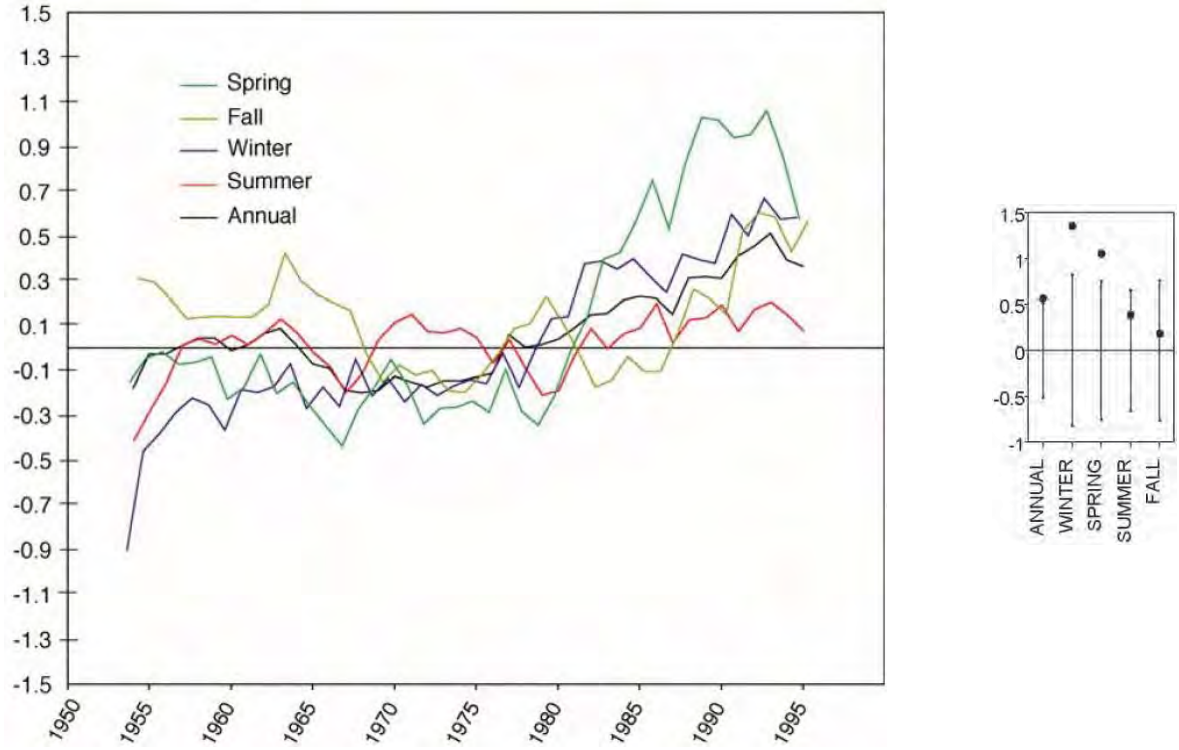

Figure 3-2 **Ten-year running average of temperature anomalies (°C) for California relative to the 1961-1990 base period average using annual (black), winter (blue), spring (green), summer (red), and fall (brown) means. The time-series are computed from the monthly 1/8-degree resolution gridded meteorological dataset from the University of Washington. Smaller inset plot shows estimated natural variability of California temperature without forcing (bars), and observed temperature change (dots) during the 1950-2000 historical record. Figure reproduced from Cayan *et al.* (2006, fig. 1).**

Mote *et al.* (2005) analyzed two separate temperature datasets covering western North America: A) A dataset combining the U.S. Historical Climatology Network (USHCN) with the Historical Canadian Climate Database (HCCD). The USHCN is a subset of the National Weather Service Cooperative (COOP) data. B) The widely used PRISM[1] dataset created at Oregon State University (www.prism.oregonstate.edu) by interpolating temperature and precipitation measured at climate stations. Mote *et al.* (2005) found particularly strong temperature trends for the period 1950-1997 over the entire western region (Figure 3-3(a)). Also using the PRISM data set as well as from NOAA Climate Division averages, Stewart *et*

[1] PRISM stand for Parameter-elevation Regressions on Independent Slopes Model.

al. (2005) also found rising temperature trends in the range 0.5-2.0 °C (33-35.5 °F) for 1948-2002. For precipitation, Mote *et al.* (2005) found increasing trends over most of the west, excepting western Washington, western Oregon, and a portion of the Northern Rockies. These trends are shown in Figure 3-3 (b).

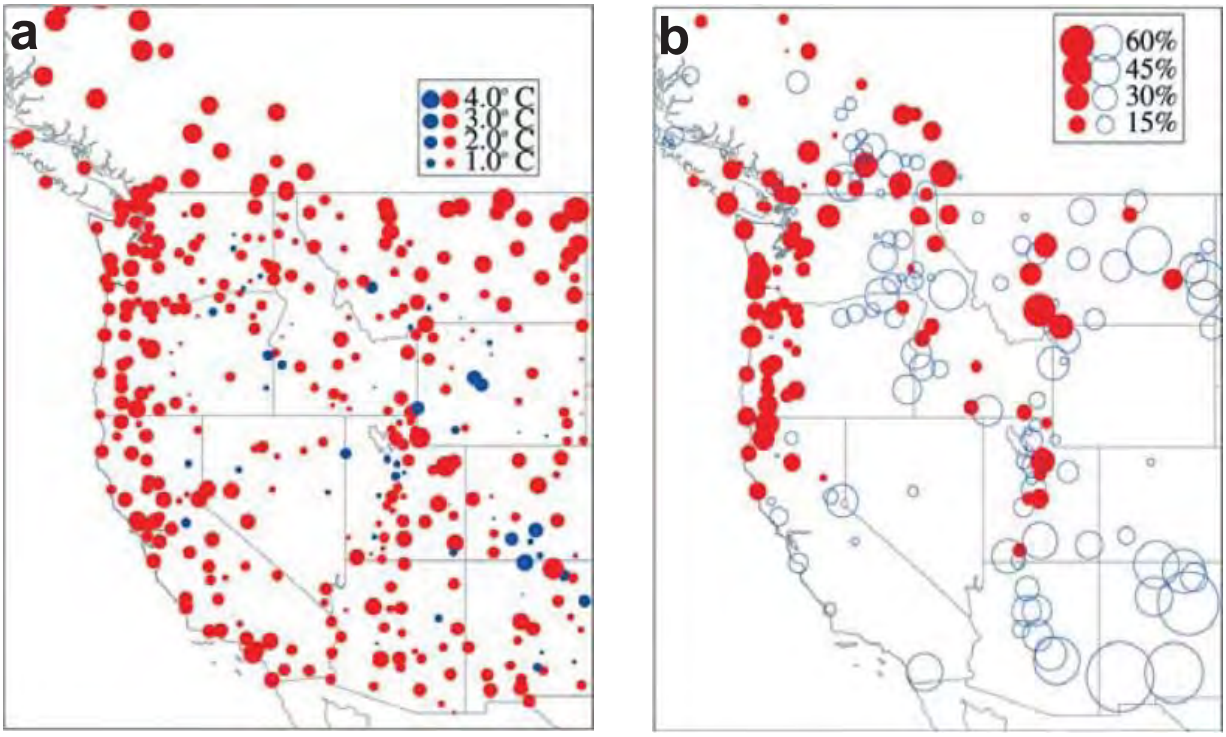

Figure 3-3 **Linear trends for 1950–1997 in winter (November-March) (a) temperature and (b) precipitation. For temperature, negative trends are indicated by blue circles, and positive trends by red circles; and values are expressed as degrees per century. For precipitation, trends are given as a percentage of the starting value (1950): positive trends are shown as blue circles, while negative trends are shown as red circles. Figure reproduced from Mote *et al.* (2005, fig. 6).**

Regonda *et al.* (2005) analyzed the 1950-1997 COOP stations records for springtime warm spells. They defined a warm spell as a sequence of seven consecutive days with temperatures above 12 °C (53 °F). They found trends for earlier occurrence of warm spells at an overwhelming majority of COOP stations throughout the West (Figure 3-4 (a)). These trends were statistically significant over the entire Pacific Northwest and over most of Colorado, Utah, and Wyoming. Although present, the trend was not statistically significant for most stations in California, Arizona, or New Mexico. The exceptions were a few high-elevation stations (above 2,500 m, or 8,200 ft) in Sierra Nevada, as well as some in Colorado and Utah. In the case of these stations, the trend was towards later warm spells rather than earlier; however, such trends were rarely statistically significant. For precipitation, Regonda *et al.* (2005) showed a distinct north-south demarcation in the statistically-significant trends of winter precipitation in the coastal west (Figure 3-4 (b)). They suggest that these correspond to different influences of the ENSO and PDO cycles.

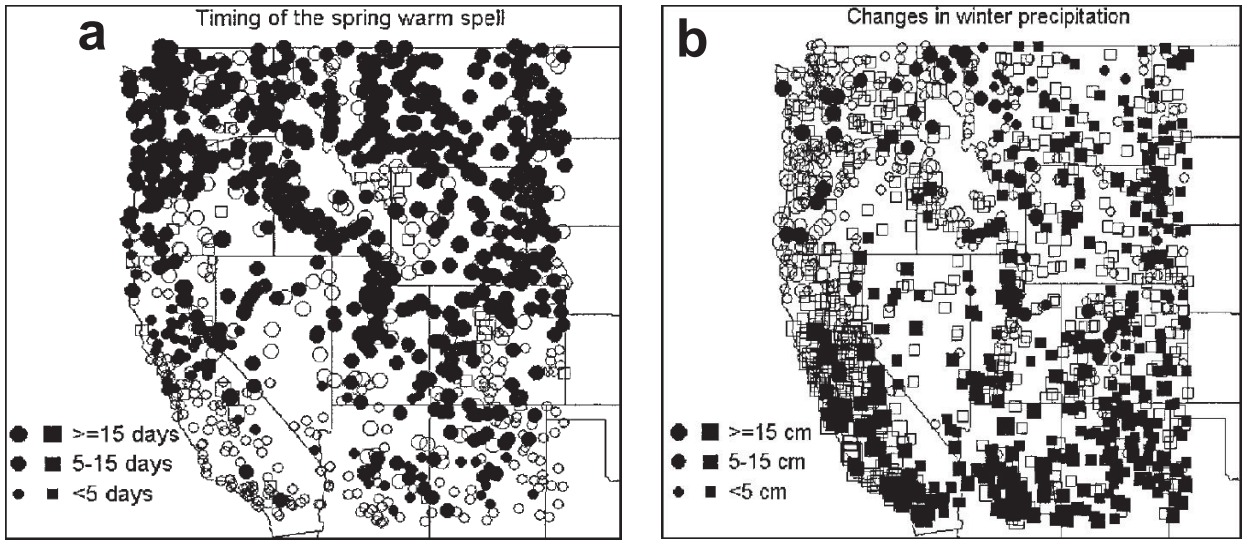

Figure 3-4 **a) Changes in the timing of the spring warm spell (day) for each station location. Circles indicate earlier timing and squares indicate later timing of spring warm spells. b) Changes in winter (November-March) precipitation (cm). Filled and open symbols respectively indicate stations passing and failing two-tailed *t* tests of significance. Figure reproduced from Regonda *et al.* (2005, fig. 6a and b).**

3.2 TRENDS IN THE RAIN-TO-SNOW RATIO

Trends in the rain-to-snow ratio were analyzed by ACPI (2004), Hamlet *et al*. (2005), and by Knowles *et al.* (2006). The specific variable computed by Knowles *et al.* (2006) was the ratio of snowfall liquid water equivalent (SFE) to total winter precipitation (P), i.e., the ratio SFE/P. SFE is similar in definition to Snow Water Equivalent (SWE) but it differs from SWE in that it is a running total of daily snowfall, rather than an accumulated total for snow on the ground. Using COOP station records for 1949-2004, Knowles *et al.* (2006) found decreasing trends in SFE/P for the majority of stations throughout the coastal West (Figure 3-5 (a)), a trend that was unrelated to changes in total precipitation. SFE declines in the coastal West led to declines in the SFE/P ratio, implying an increase in the total amount of (liquid) rainfall, and a rise in the rain-to-snow ratio. Knowles *et al.* (2006) analyzed the minimum daily temperatures of days with precipitation ("wet days"). They found that "the largest reductions (in SFE) were shifts from snowfall to rainfall driven by warming and occurred at relatively warm, low to moderate elevations." The rise in the proportion of rain versus snow was most pronounced at lower elevation watersheds (below about 2000 m) as shown in Figure 3-5 (b).

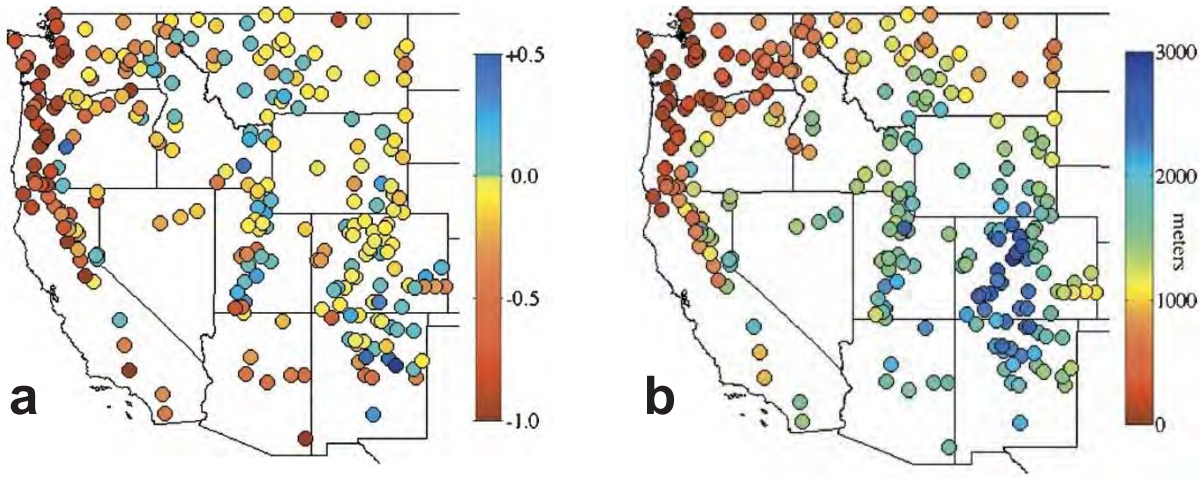

Figure 3-5 **a) Change, from water year 1949 to 2004, in the ratio of snowfall liquid water equivalent to total winter precipitation (SFE/P ratio), after removing the effects of trends in precipitation. Three-quarters of all stations experienced snowfall reductions as a result of widespread warming. b) Stations' elevations. Figures reproduced from Knowles *et al.* (2006, figs. 7 and 2b, respectively).**

3.3 TRENDS IN SNOW WATER EQUIVALENT

Trends in Snow Water Equivalent (SWE) in the West were studied by Mote (2003), Mote *et al.* (2005), Regonda *et al.* (2005), Hamlet *et al.* (2005), and Knowles *et al.* (2006). The studies by Mote (2003), Mote *et al.* (2005) and Regonda *et al.* (2005) looked at observed historical trends, and the study by Hamlet *et al.* (2005) used a simulated SWE dataset using the Variable Infiltration Capacity (VIC) distributed hydrological model. The study by Mote *et al.* (2005) used the records from 824 snow stations belonging to the Natural Resources Conservation Service (NRCS), the California Department of Water Resources, and the Ministry of Sustainable Resource Management for British Columbia. It was found that, in the period 1950–1997, April 1 SWE declined at most snow stations (Figure 3-6). In the coastal West, strong declines were found for western Washington, Oregon, and northern California. In the southern Sierra Nevada, however, the opposite trend was found at high-elevation stations. Mean winter temperature was found to be closely related to the identified SWE trends, the largest declines in SWE being associated with the warmest snow-dominated watersheds.

Regonda *et al.* (2005) analyzed snow records at NRCS snow stations containing at least 80% of data for 1950–1999 for March 1 SWE (469 stations), April 1 SWE (501 stations), and May 1 SWE (239 stations). However, this study did not include California snow survey data. Statistically-significant declines in SWE were found throughout the West for all three dates (shown for April 1 in Figure 3-7 (a)), with the lower-elevation stations (below about 2,500 m, or 8,200 ft) showing the greatest SWE losses (Figure 3-7 (b)).

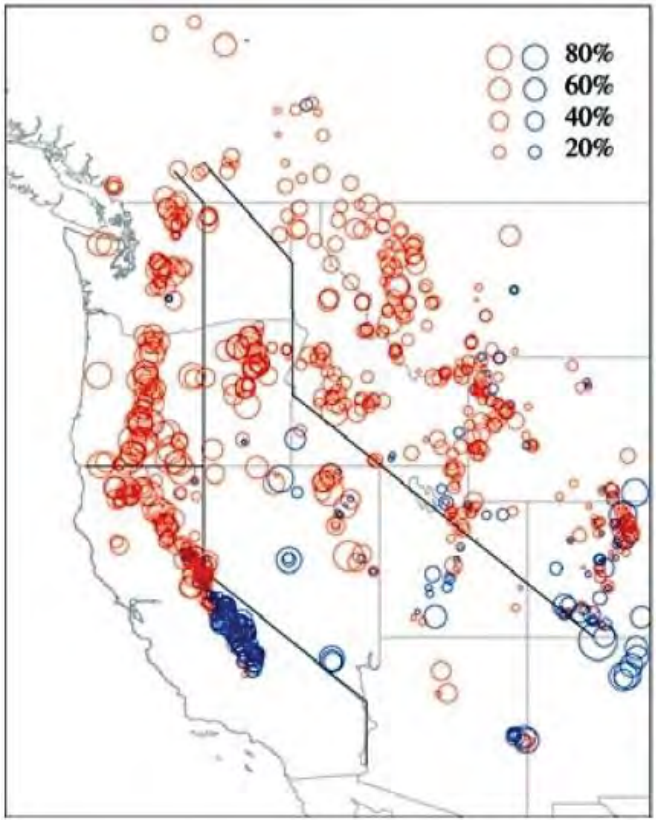

Figure 3-6 **Linear trends in April 1 Snow Water Equivalent for 824 snow stations from 1950 to 1997, relative to the starting (1950) value. Negative trends are indicated in red, positive trends are in blue, and the size of the circle is proportional to trend size. Figure reproduced from Mote *et al.* (2005, fig. 1). Lines on the map divide the west into sub-regions for additional analysis in the original paper.**

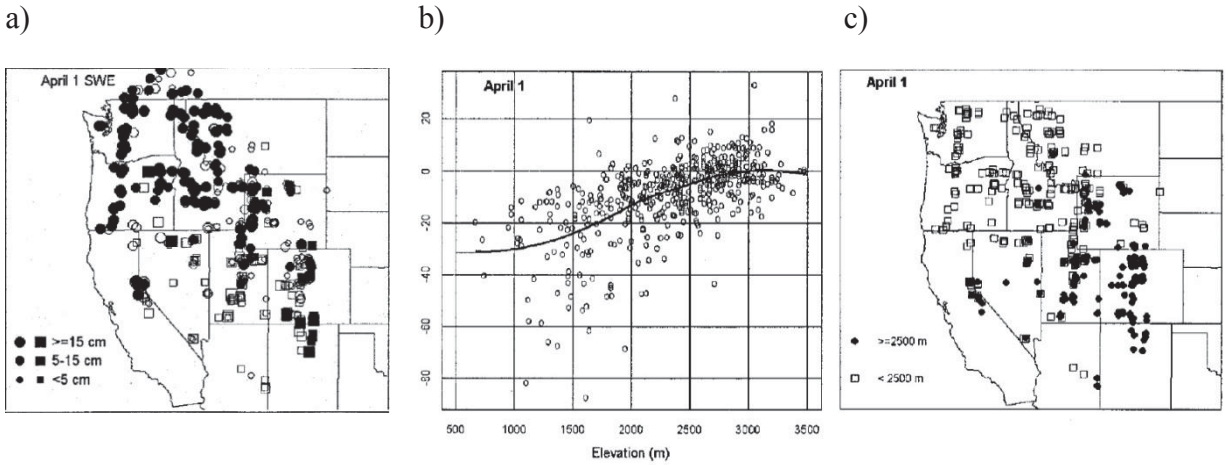

Figure 3-7 **a) Trends in Snow Water Equivalent in accumulated snow pack for April 1. Circles and squares indicate decreasing and increasing values, respectively. Filled and open symbols respectively indicate stations passing or failing two-tailed *t* tests of significance. b) Scatterplot comparing the trends in SWE (cm) against snow-course elevation (m) for measurements taken on April 1. c) Map illustrating the spatial distribution of stations where the elevation is above or below 2,500 m. Figures reproduced from Regonda *et al.* (2005, figs. 4b and 5c,d).**

Hamlet *et al.* (2005) took a different approach, and rather than analyzing observed datasets, they created a simulated historical (1915-2003) dataset of hydrologic variables, including SWE, using the VIC model. The reasons given for the modeling approach were that A) most snow data was collected only after the 1950s, B) most snow data was collected only for a limited fraction of the West, and C) the ENSO and PDO generate a high degree of natural variability which confounds the analysis of observed data alone. Hamlet *et al.* (2005) concluded that *"(w)idespread warming has occurred in the western U.S. from 1916-2003, resulting in downward trends in 1 April SWE over large area of the domain"* and that *"results show that almost all the upward trends in SWE are due to modest upward precipitation trends and that many of the downward trends in SWE are caused by widespread warming"*.

3.4 TRENDS IN SNOWMELT TIMING AND STREAMFLOW TIMING

Of all the effects associated with warming in the West, the shift towards earlier annual snowmelt timing and earlier streamflow timing may have the most immediate and severe implications to water managers. These topics have been the focus of several recent studies (Gleick, 1987; Roos, 1987, 1991; Lettenmaier and Gan, 1990; Wahl, 1992; Aguado et al., 1992; Pupacko, 1993; Dettinger and Cayan, 1995; Brown, 2000; Cayan *et al*., 2001; Mote *et al*., 2005; Regonda *et al*., 2005; Stewart *et al.*, 2004, 2005; Knowles *et al*., 2006; Maurer *et al*., 2007a). The magnitude of the shift is estimated in the above studies to vary between 5 and 30 days.

Different measures of streamflow timing have been used in these studies. Roos (1991), Dettinger and Cayan (1995), and USGS (2005) analyzed the fraction of total annual streamflow represented by spring and summer streamflow – the seasons when in the West streamflow can be distributed for immediate use, or easily stored without interfering with flood-control concerns. Cayan *et al.* (2001) analyzed the date, termed the "spring-pulse date," separating low wintertime streamflows from high springtime streamflows resulting from snowmelt. In addition to the spring-pulse date, Stewart *et al.* (2004, 2005) analyzed other measures of streamflow timing: A) the *"center of mass of annual flow (CT)*" of each year's hydrograph, defined as the date by which half of the annual streamflow has passed; and B) the fraction of total annual streamflow contributed by each month of the year.

The U.S. Geological Survey (USGS) has maintained streamflow gages in the West since the late 19th century. Datasets are available at http://waterdata.usgs.gov/usa/nwis/sw. Based on these long records, significant declines in the fraction of annual runoff represented by spring runoff were found, including in the (western) Sierra Nevada (Figure 3-8).

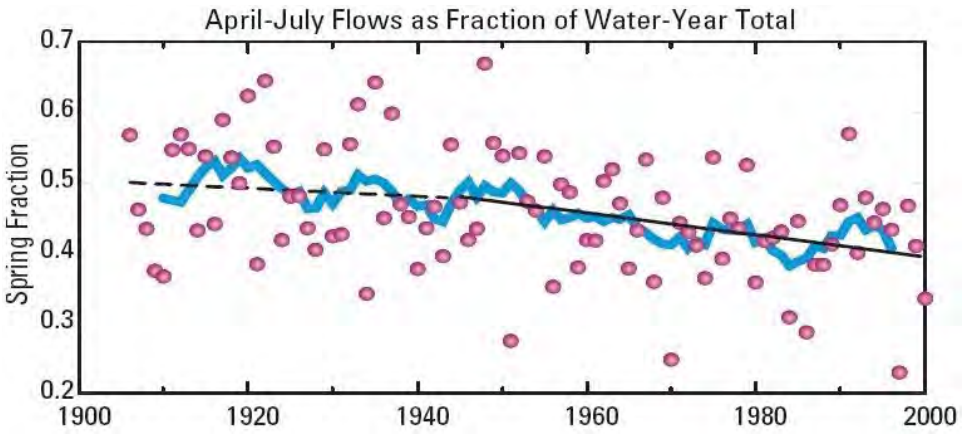

Figure 3-8 **April-July streamflow in eight major rivers of the western Sierra Nevada, California, as a fraction of water-year (October through September) total streamflow. Dots indicate yearly values, blue curve is 9-year moving averages, and dashed line is linear trend prior to 1945 and solid line is trend after 1945. Figure and legend reproduced from USGS (2005).**

Stewart *et al.* (2005) used records from 241 U.S. and 53 Canadian stream gages selected for representing approximate natural conditions (i.e., free from streamflow regulation and other human interference) in snowmelt-dominated watersheds, and having at least 30 years of data within 1948-2002. The U.S. gages are from the USGS Hydro Climate Data Network (HCDN), and the Canadian gages are from Environment Canada. Two-thirds of all stream gages, located throughout the West, revealed a shift in center of timing (CT) from the period 1950-1970 to the period post-1970 in the form of a shift to 1-4 weeks earlier (Figure 3-9). Over the period studied (1948-2002), there have been no significant trends in mean annual streamflows.

The center of mass of annual flow was also studied by Regonda *et al.* (2005) and several subsequent publications, receiving the simpler name "center of timing" in several of them (e.g., Maurer *et al.*, 2007a). Regonda *et al.* (2005) analyzed streamflow records for 89 gages (from the same, HCDN dataset) snowmelt-dominated watersheds with continuous records in 1950-1999. A shift towards earlier timing by 10-20 days was identified but was only statistically significant for the Pacific Northwest. The largest shifts occurred for the lowest-elevation stations; and stations located about 2,500 m (8,200 ft) revealed no trends.

Consistently across the west, there was an elevational dependence to the change in snowmelt timing, with a longer time shift observed at lower elevations (Dettinger *et al.*, 2004; Stewart *et al.*, 2005). Snow extent (Robinson, 1999) and depth (e.g., Groisman et al., 1994, 2003) have also decreased throughout the west, but mostly in valleys and plains which, since snow at such locations melts much earlier, are less crucial to water resources than mountain snowpack (Mote, 2005).

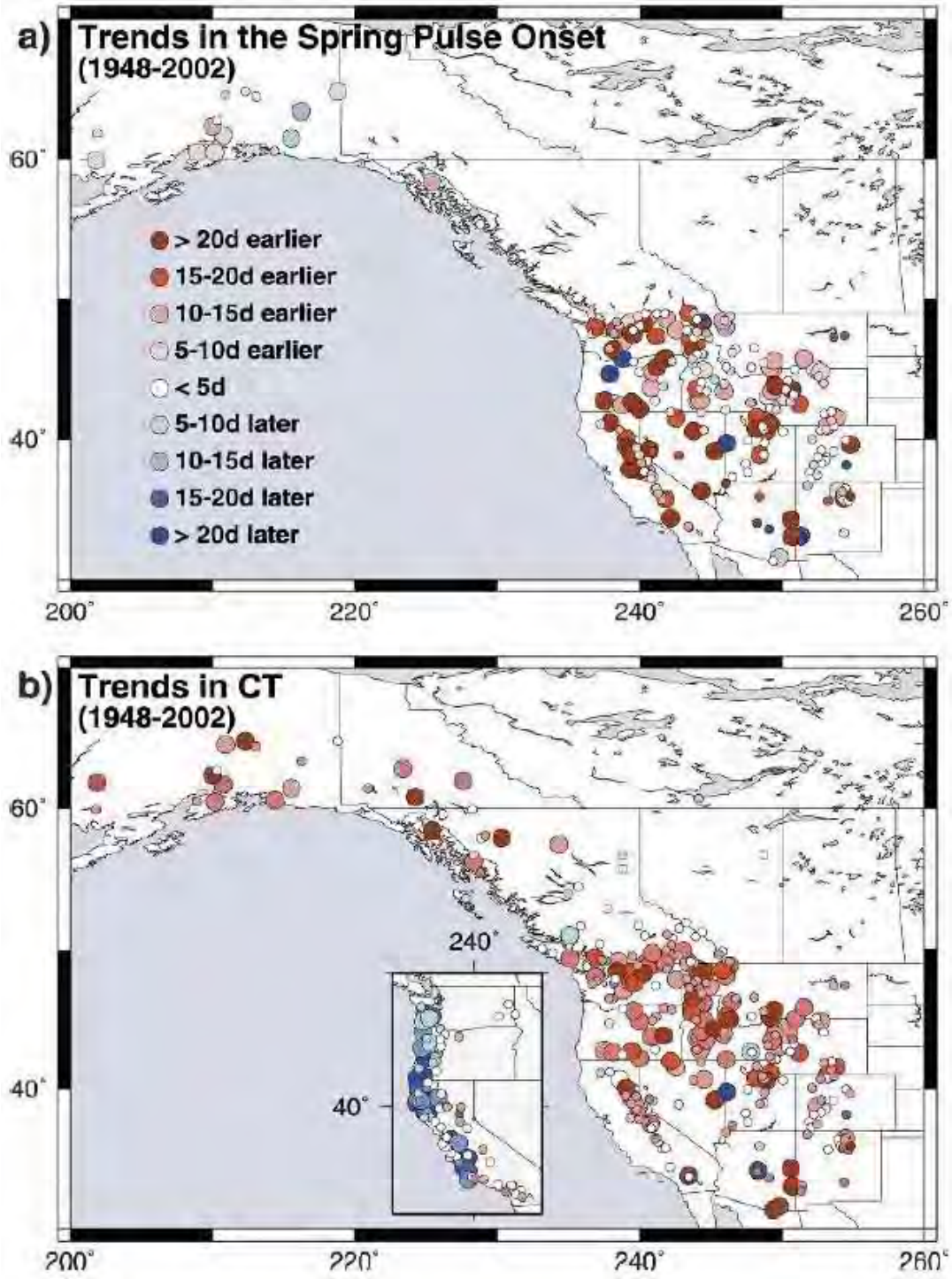

Figure 3-9 **Trends in a) spring pulse onset and b) date of center of mass of annual flow (CT) for snowmelt- and (inset) non-snowmelt-dominated stream gages. Shading indicates magnitude of the trend expressed as the change (days) in timing over the 1948-2000 period. Larger symbols indicate statistically significant trends at the 90% confidence level. Figure and (slightly edited) legend reproduced from Stewart *et al.* (2005, fig. 2).**

Along with a temperature rise, the Sierra also saw a precipitation rise in the 20th century – possibly an indirect effect of warming. At the lowest elevations (below about 2,300 m), the direct effects of warming – a partial shift from snow to rain, and increased winter snowmelt – have dominated the 20th century response to warming, resulting in diminished SWE. At elevations higher than about 2,600 m, however, it was the heightened snowfall that dominated, resulting in increased SWE instead. The increase at higher elevations in some areas partially offset and in others even surpassed the loss at lower elevations. The rise in high-altitude precipitation made it possible for the southern Sierra to experience the largest 20th century positive SWE trend, despite having had the largest temperature rise in California (Howat and Tulaczyk, 2005b).

Warmer air may need to rise up farther in order to produce snow, but on the other hand it can carry more moisture, hence warmer air can sometimes produce higher snowfall volumes. Such a gain in SWE during warming due to enhanced wintertime orographic precipitation has been termed the "snow gun effect" (Prentice and Matthews, 1991). Warmer air is more likely to retain considerable moisture as it passes over the Sierra's summit. Given that the southern Sierra has the steepest gradient of the western side of the Sierras, enhancement of orographic precipitation there can offset increased winter melt due to warming (Howat and Tulaczyk, 2005a, b).

Howat and Tulaczyk (2005a, b; see also Mote, 2006) concluded that, in the 20th century, snowpack trends have been mostly positive at high altitudes (generally above 2,600 m), due to an observed increase in precipitation (possibly a side-effect of warming); and that the 20th century snowpack of the southern Sierra Nevada (its highest altitude region) presented itself as a precipitation-dominated, rather than temperature-dominated, regime where trends in precipitation positively contributed on average 85% to trends in snow water equivalent (SWE). Knowles *et al.* (2006), using an observational dataset with greater distribution of elevations, examined the dependence of snow loss, specifically due to more winter precipitation falling as rain instead of snow, and found the largest impacts close to the snow line, where average minimum winter temperatures were above -5 °C. Most snow loss over recent decades has occurred at elevations below 2,000 m.

3.5 ATTRIBUTION OF TRENDS TO CLIMATE CHANGE

Studies have focused on the formal detection and attribution of change in hydrologic quantities to climate change. A recent research collaboration effort between the Scripps Institution of Oceanography at the University of California, San Diego, the Lawrence Livermore National Laboratory, and the U.S. Geological Survey produced a series of five published manuscripts describing detection and attribution – abbreviated as D&A for this discussion – of the causes of hydro-climatological change in the western United States. The first manuscript in the D&A series, by Barnett *et al.* (2008), used the output of GCM simulations for the historical period 1950–1999 to force a distributed hydrologic model. From the simulated results of the hydrologic model, three variables were studied representing some of the most important metrics of western hydrology: A) the snow pack's water content, B) the timing of runoff of the major western rivers, and C) the average January through March daily minimum temperature in the mountainous regions of the West. It was shown that the simultaneous changes in variables (A), (B), and (C) over the period 1950–1999 differed significantly in duration and strength from what would be expected as a

result of natural variability. Furthermore, the changes agreed with those simulated under scenarios of human-induced changes in atmospheric composition (attribution).

The second manuscript in the D&A series, by Pierce *et al.* (2008), looked specifically at the Western snowpack. The detection variable used was the ratio of April 1 SWE to water-year-to-date precipitation (P), chosen to minimize the effect of inter-annual *P* variability on the results. To obtain estimates of natural internal climate variability, two control simulations using fully coupled ocean-atmosphere climate models over a simulation period of 1,600 years. These simulations were used to force a hydrologic model, producing estimates of the SWE/P. It was thus possible to characterize the (simulated) of SWE/P to anthropogenically-altered atmospheric composition (enhanced concentrations of greenhouse gases, ozone, and some aerosols). The D&A method showed that both the observed SWE/P and the simulated SWE/P with anthropogenically-altered atmospheric composition have greater reductions than can be explained by natural internal climate variability alone.

The third manuscript in the D&A series, by Bonfils *et al.* (2008b) focused on hydrologically relevant temperature variables from late winter to early spring. It was shown that the changes in mountain regions' observed temperature-based indices are unlikely, at a high statistical confidence, to represent natural variations; and it was concluded that anthropogenic climatic changes (i.e., changes resulting from to anthropogenic GHG, ozone, and aerosols) are partially responsible for those recent changes.

The fourth manuscript in the D&A series, by Hidalgo *et al.* (2009), uses an optimal detection method for trends in streamflow center timing (CT). A trend in CT over the U.S. West was detected at the $p<0.05$ (i.e., at the 95% confidence) level for the second half of the 20th century, which cannot be explained solely by natural variability. However, the western signal was dominated by the Columbia River Basin, and was found to be much weaker for Sierra Nevada watersheds (and not detected for the Colorado River Basin). Therefore, the authors made no definite statement regarding the attribution of trends in Sierra Nevada watersheds, and limited to the Columbia River Basin their statement of "very high confidence" of attribution of earlier streamflows in part to anthropogenic climate change (Hidalgo *et al.*, 2009, p. 3852).

The fifth and final manuscript in the D&A series, by Das *et al.* (2009) addresses the geographic structure (i.e., dependence on latitude, altitude, and geographical region) of observed trends in key hydrologic variables, including: A) late-winter and spring temperature, B) winter-total snowy days as a fraction of winter-total wet days, C) April 1 SWE as a fraction of October-March precipitation total (SWE/Precip(ONDJFM)), and D) March-March accumulated runoff as a fraction of water-year accumulated runoff. Observed changes were compared to natural internal climate variability simulated by an 850-yr control run of a GCM used to force a hydrologic model. Das *et al.* (2009) concluded that *"The strongest changes in the hydrologic variables, unlikely to be associated with natural variability alone, have occurred at medium elevations--750-2500m for JFM runoff fractions and 500-3000 m for SWE/Precip(ONDJFM)--where warming has pushed temperatures from slightly below to slightly above freezing."*

Taken together, these five recent studies provide strong evidence of the linkage of climate change to observed hydroclimatic quantities in the Western U.S. over the 20th century. While some of the changes are small, many cannot be explained by natural variability alone. Data and analysis of this kind provide scientific support for considering climate change for future planning.

3.6 HISTORICAL EXTREME EVENTS

Besides the shifts in temperature, snowmelt, and runoff discussed above, there is great interest in the potential impact of climatic extremes, such as large, intense winter storms and long term droughts.

Geologic evidence in the form of sediment deposits shows that extremely large floods caused by rainfall have occurred in California every 200 years or so (Dettinger and Ingram, 2013). The last such event was in 1861, which was a 43-day storm along the Pacific coast from Northern Mexico to British Columbia, that flooded the entire Central Valley and led to the loss of thousands of lives. It is thought that major rainstorms of this nature are the result of what are termed atmospheric rivers, narrow bands of moisture, which in the case of the California coast, bring heavy rain and snow from the tropics (often termed the "pineapple express"). Atmospheric rivers of this nature are thought to have been responsible for 80% of the flooding in California rivers and 81% of the best-documented levee breaks in the Central Valley between 1950 and 2010 (Dettinger and Ingram, 2013).

Long-term records such as tree rings and sediment deposits are also used to evaluate the historical occurrence of droughts over time frames longer than the direct observational record. The main finding from long-term tree-ring records from California is that decade-long dry periods are the rule rather than the exception, and that these dry periods tend to be relatively widespread, reflecting their link to larger scale atmospheric circulation established by ocean temperature and pressure patterns (Meko et al., 2001; Cook et al., 2004). Were one of these naturally occurring decadal droughts to recur, the consequences for water supply and other important ecosystem services would be significant.

3.7 SUMMARY OF OBSERVED CHANGES

The work summarized here presents the best current understanding of observed data and trends on variables of interest to water resource planners: temperature, precipitation, rain-to-snow ratio, snow water equivalent, timing of snowmelt and streamflow. In most cases, the data are consistent with a pattern of warming and earlier snowmelt and runoff, although the precipitation and snow water equivalent data are mixed with some regions showing increases and others decreases. These observations are consistent with future climate projections, presented in the next chapter, that indicate agreement among models with regard to temperature increases, but with greater uncertainty with regard to future precipitation. Observed hydroclimatic data in the Western U.S. have also been examined to determine whether they could be explained by background variability alone. It has been concluded that many of the changes already observed, are, to a high degree of confidence, attributable to climate change that has already occurred over the latter part of the 20th century. In addition to the recent trends in average conditions, studies focused on geologic evidence have demonstrated that extreme floods and droughts, beyond the range observed

over the last 50 years of rapid growth and development in the Southwest, have occurred at a regular frequency, even in the absence of recent human-induced climate change.

4. Climate Projections for South Orange County from Downscaled GCM Results

Key Points: *Global climate processes are represented using atmosphere-ocean general circulation models (AOGCMs or GCMs, also known as "global climate models"). Several published GCMs, developed by research groups worldwide, are in common use. GCMs are used to project future climate changes based on assumptions of different economic growth pathways and emissions of greenhouse gases, with A1b (medium), A2 (higher) and B1 (lower) being the most common scenarios used in various climate impact studies. It is widely understood in the climate science community that no one model or emission pathway is the best estimate of the future, and, typically, most climate assessments utilize an ensemble of GCM results for evaluating future conditions.*

In this analysis, sixteen candidate climate models were selected for evaluation. The primary greenhouse gas (GHG) emission scenarios to be used for the climate projections are A2 and B1. GCM outputs are presented in spatially more detailed form through downscaling, with statistical downscaling being the most commonly used approach. Statistical downscaling is based on the development of relationships between local-scale observations and large scale GCM projections, which are then used to estimate spatially resolved future climate projections. Results from three 21st century periods, statistically downscaled to areas of 1/8 degree longitude by latitude or about 12 km by 12 km, were analyzed for impacts in the early, mid, and late 21st century, defined as 2010–2039, 2040–2069, and 2070–2099 respectively.

The projected data summary for the South OC IRWM planning region show a small decrease in precipitation of slightly over an inch per year by mid- to late-21st century periods. They also show an increase in temperature from >2 to >5 ^{o}F over the same periods. In general, climate models project more adverse conditions (i.e., warmer and drier) in the latter part of the 21st century compared to conditions observed in the second half of the 20th century.

While observations can be used to infer the sensitivity of the climate system to perturbations in atmospheric composition, changes in land use and other conditions, incomplete spatial and temporal coverage of measurements, and a limited database of observed variables makes conclusive statements about causes and feedbacks in past climate difficult. For these reasons, atmosphere-ocean general circulation models (or more informally, global climate models, GCMs) are employed to provide a more complete picture of the climate response to emission changes. Several published GCMs, developed by research groups worldwide, are in common use. In recent climate impacts assessment, these models are used to develop

projections for 21st century climatic conditions using various greenhouse gas emission scenarios as the driver (IPCC AR4, 2007). This chapter presents an overview of the emission scenarios and GCMs appropriate for developing a set of climate projections for South Orange County.

4.1 SELECTION OF EMISSION SCENARIOS

The Intergovernmental Panel on Climate Change (IPCC) developed a set of benchmark GHG emission scenarios for applying with different GCMs. Each emission scenario is a projection based on assumptions regarding population, economic growth, energy use and other variables. Three scenarios are used in this analysis, A2 (higher) and B1 (lower), and an intermediate scenario termed A1b, as described in detail by Nakicenovic et al. (2000). These scenarios have been used widely in climate impacts assessments similar to the current effort. Each scenario produces different atmospheric concentrations of future greenhouse gases, with CO_2 concentrations in B1 reaching 550 parts per million by volume (ppmv) by 2100 and in A2 reaching about 830 ppmv. The A2 emissions scenario represents a differentiated world in which economic growth is uneven and the income gap remains large between now-industrialized and developing parts of the world, and people, ideas, and capital are less mobile so that technology diffuses more slowly (Cayan et al., 2009). While A2 does not represent the highest CO_2 emissions (at least through 2100) of the SRES scenarios (IPCC, 2001), and 21st century emissions to date appear to be above this projection (Raupach et al., 2007), it is the highest emission scenario for which most modeling groups have completed simulations, and represents the higher emission case for most climate change impact studies using an ensemble of GCMs. The B1 emissions scenario presents a future with a high level of environmental and social consciousness, combined with a globally coherent approach to more sustainable development (Cayan et al., 2009). B1 generally represents the best case of the SRES scenarios through the 21st century (Houghton et al., 2001). Figure 4-1 shows the atmospheric CO_2 concentrations resulting from each emissions scenario. Given the availability of model runs for multiple GCMs, the A2 and B1 scenarios, and the intermediate scenario A1b, represent a reasonable range to evaluate future impacts, and are the primary focus of this evaluation. Other emission scenarios are only available for a subset of models and cannot be tested in the same robust fashion.

4.2 SELECTION OF GCMS

In selecting GCMs for use in a particular regional climate change impacts study, there are many factors to consider. They can be selected on the basis of their ability to simulate important regional climate features (e.g., Cayan et al., 2008), though most GCMs represent large-scale climate features such as El Niño (AchutaRao and Sperber, 2006). However, as has been noted in prior research (Christensen et al., 2007; Reichler and Kim, 2008) better predictive skill (in general, regardless of predicted variable) is obtained by using an ensemble of GCMs than using any individual GCM (Brekke et al., 2008; Pierce et al., 2009).

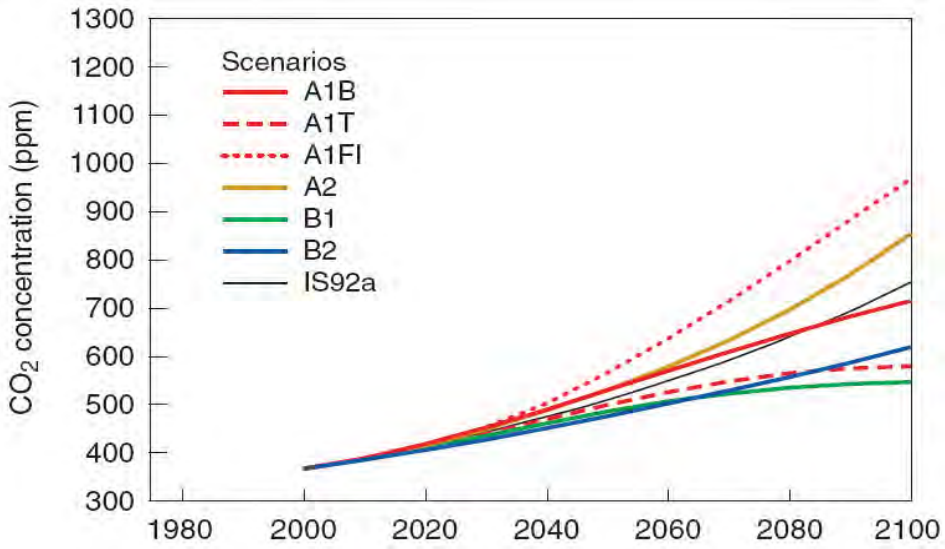

Figure 4-1 **Atmospheric CO2 concentrations resulting from different emissions scenarios through the 21st century (IPCC, 2001).**

This analysis includes results from a set of 16 models that have been archived and downscaled for similar climate impacts studies (Table 4-1) through an international effort called the Coupled Model Intercomparison Project 3 (CMIP3), housed at Lawrence Livermore National Laboratory. All 16 models have been statistically downscaled for the A2, B1, and A1b emission scenarios, and are available online at *http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html#Data%3A%20Complete%20Archives.* Furthermore, individual models have been run multiple times with slightly different initial conditions to develop a larger ensemble of inputs. The number of model runs available for specific models are shown in Table 4-1.

Table 4-1
Table of 16 GCMs Used for the Evaluation of 21st Century Climate Change in South Orange County. These Models are Coupled with the Emission Scenarios Identified Earlier (A2 and B1) to Develop Climate Projections. For Some Models, Multiple Runs are Available.

	Modeling Group, Country	IPCC Model I.D.	Primary Reference	Number of Model Runs Available
1.	Bjerknes Centre for Climate Research	BCCR-BCM2.0	(*Furevik et al.*, 2003)	1
2.	Canadian Centre for Climate Modeling & Analysis	CGCM3.1 (T47)	(*Flato and Boer*, 2001)	5
3.	Météo-France / Centre National de Recherches Météorologiques, France	CNRM-CM3	(*Salas-Mélia et al.*, 2005)	1
4.	CSIRO Atmospheric Research, Australia	CSIRO-Mk3.0	(*Gordon et al.*, 2002)	1
5.	US Dept. of Commerce / NOAA / Geophysical Fluid Dynamics Laboratory, USA	GFDL-CM2.0	(*Delworth et al.*, 2006)	1
6.	US Dept. of Commerce / NOAA / Geophysical Fluid Dynamics Laboratory, USA	GFDL-CM2.1	(*Delworth et al.*, 2006)	1
7.	NASA / Goddard Institute for Space Studies, USA	GISS-ER	(*Russell et al.*, 2000)	1
8.	Institute for Numerical Mathematics, Russia	INM-CM3.0	(*Diansky and Volodin*, 2002)	1
9.	Institut Pierre Simon Laplace, France	IPSL-CM4	(*IPSL*, 2005)	1
10.	Center for Climate System Research (The University of Tokyo), National Institute for Environmental Studies, and Frontier Research Center for Global Change (JAMSTEC), Japan	MIROC3.2 (medres)	(*K-1 model developers*, 2004)	3
11.	Meteorological Institute of the University of Bonn, Meteorological Research Institute of KMA	ECHO-G	(*Legutke and Voss*, 1999)	3
12.	Max Planck Institute for Meteorology, Germany	ECHAM5/MPI-OM	(*Jungclaus et al.*, 2006)	3
13.	Meteorological Research Institute, Japan	MRI-CGCM2.3.2	(*Yukimoto et al.*, 2001)	5
14.	National Center for Atmospheric Research, USA	PCM	(*Washington et al.*, 2000)	4
15.	National Center for Atmospheric Research, USA	CCSM3	(*Collins et al.*, 2006)	7
16.	Hadley Centre for Climate Prediction and Research / Met Office, UK	UKMO-HadCM3	(*Gordon et al.*, 2000)	1

4.3 DIFFERENCES BETWEEN GCMS

Climate model evaluation and intercomparison provides quantitative evaluations of model and process performance using observations and other models as standards for comparison. It allows for model advancements, leading to improved model performance. Climate model intercomparisons are essential for understanding how model-simulated projections of the future compare with the present. Improved model performance will facilitate better decision

making of the actions needed for climate change mitigation, adaptation, and coping strategies.

Since 1989, the U.S. Department of Energy's (DOE's) Program for Climate Model Diagnostics and Intercomparison (PCMDI) has led the intercomparison of AOGCMs. The PCMDI mission is to develop and apply improved methods and tools for the diagnosis and intercomparison of AOGCMs, and this effort represents a quality control gatekeeper for the AOGCMs that are part of the IPCC. While these models provide an important understanding of the climate on subcontinental and larger scales, they are unable to resolve fine-scale climate features and forcings that are of importance at local-to-regional scales; hence, downscaling techniques have and will continue to be an essential element of climate change impacts analysis.

The differences between GCM simulations of future climate are evident in all past assessments of simulations. Figure 4-2 and Figure 4-3, from the most recent IPCC assessment report (Christensen et al., 2007) illustrate the variability of projections between different GCMs. While these show the changes from 1980–1999 to 2080–2099 for the midrange A1b emissions scenario, the variability in patterns is comparable for other emissions scenarios. Also note that there are six GCM versions shown in these figures that do not appear in our list of 16. These clearly demonstrate that warming is a large-scale phenomenon, with warming projected everywhere by nearly all GCMs. The anomalous cooling in the North Atlantic projected by some GCMs is attributed to a reduction in the thermohaline circulation in this region, and thus reduced heat transport to near surface waters (Holland and Bitz, 2003). The thermohaline circulation changes have been connected to changes in high latitude hydrology, especially accelerated ice melt in a warming climate (Arnell, 2005; Rahmstorf, 2002; Wu et al., 2005). Most GCMs also show greater warming over land areas, further from the moderating influence of oceans.

For precipitation, much greater spatial variability is evident between GCMs. In North America, high latitude regions are generally projected to see an increase in annual precipitation, while mid-latitudes in the southwest are projected to be drier. For California, where precipitation falls in winter as a result of cyclonic activity in the Pacific, a poleward shift in storm tracks is projected (Yin, 2005). The physical drivers for precipitation shifts have been explored in GCM-based sensitivity studies, with important factors including increases in water vapor associated with warming sea surface temperatures (Meehl et al., 2005a) and subsequent changes in moisture convergence, but also modified in synoptic circulation and an expansion of the descending branch of the Hadley circulation. The increase in tropical SST may result in changes to ENSO occurrences and other teleconnections (Meehl et al., 2007b). Additionally, the North-South temperature difference in storm generating regions, such as the Gulf of Alaska, where the Aleutian low is known to develop pacific storms (Favre and Gershunov, 2009), and is well correlated with Western U.S. hydrology (Lins, 1997). Thus, as GCMs vary in their ability to represent these features (and the amount by which these features change under a warming climate), the degree to which storm tracks shift under a warming climate, and hence the projected precipitation change simulated by each GCM, will likewise vary, which is demonstrated by the variability in precipitation projections for California in Figure 4-3.

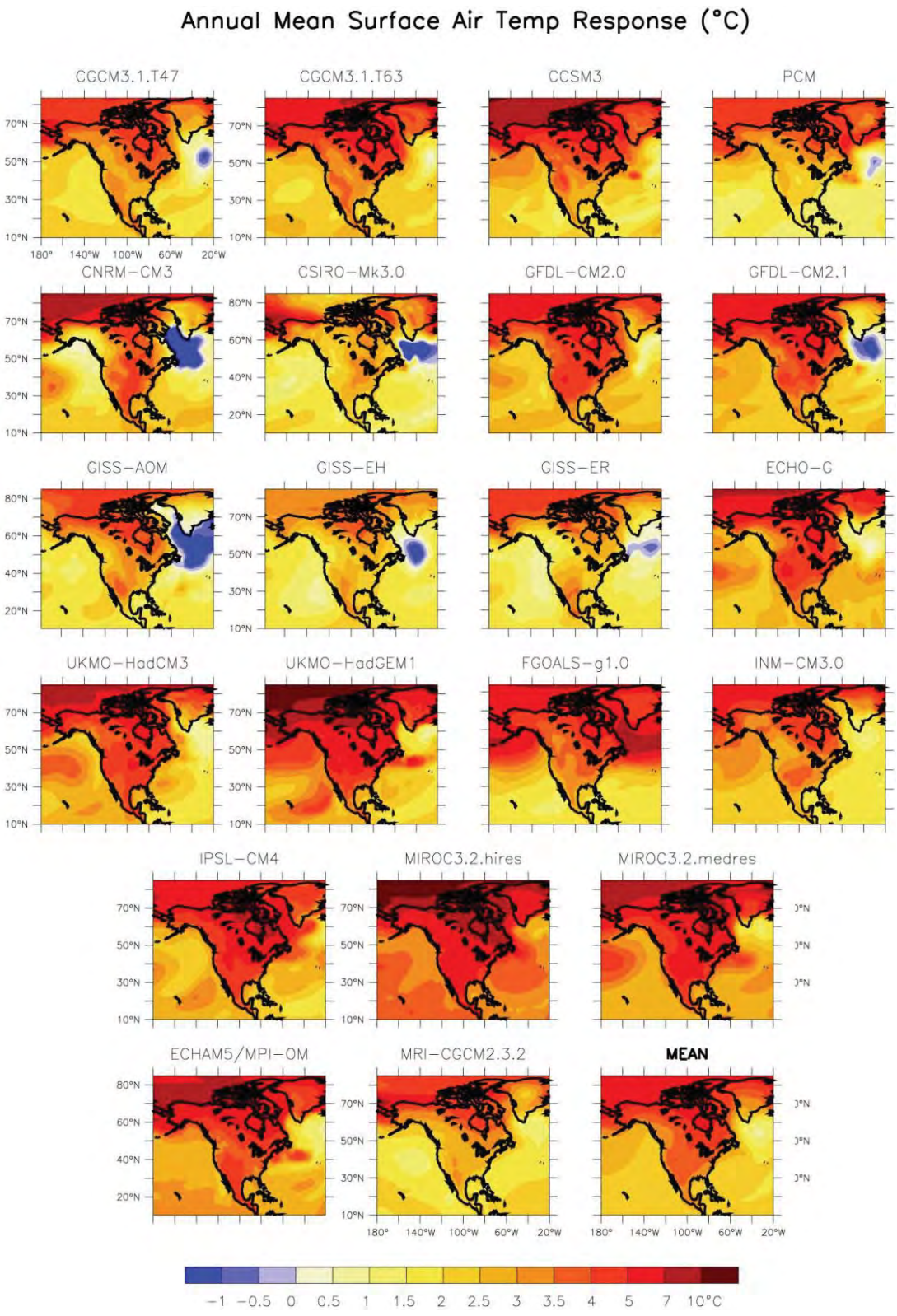

Figure 4-2 **From Christensen et al. (2007), supplementary material, Figure SM11.8. Shown is the change in mean surface air temperature, °C, for different GCM projections, between 1980-1999 and 2080-2099, under the mid-range A1b emissions scenario.**

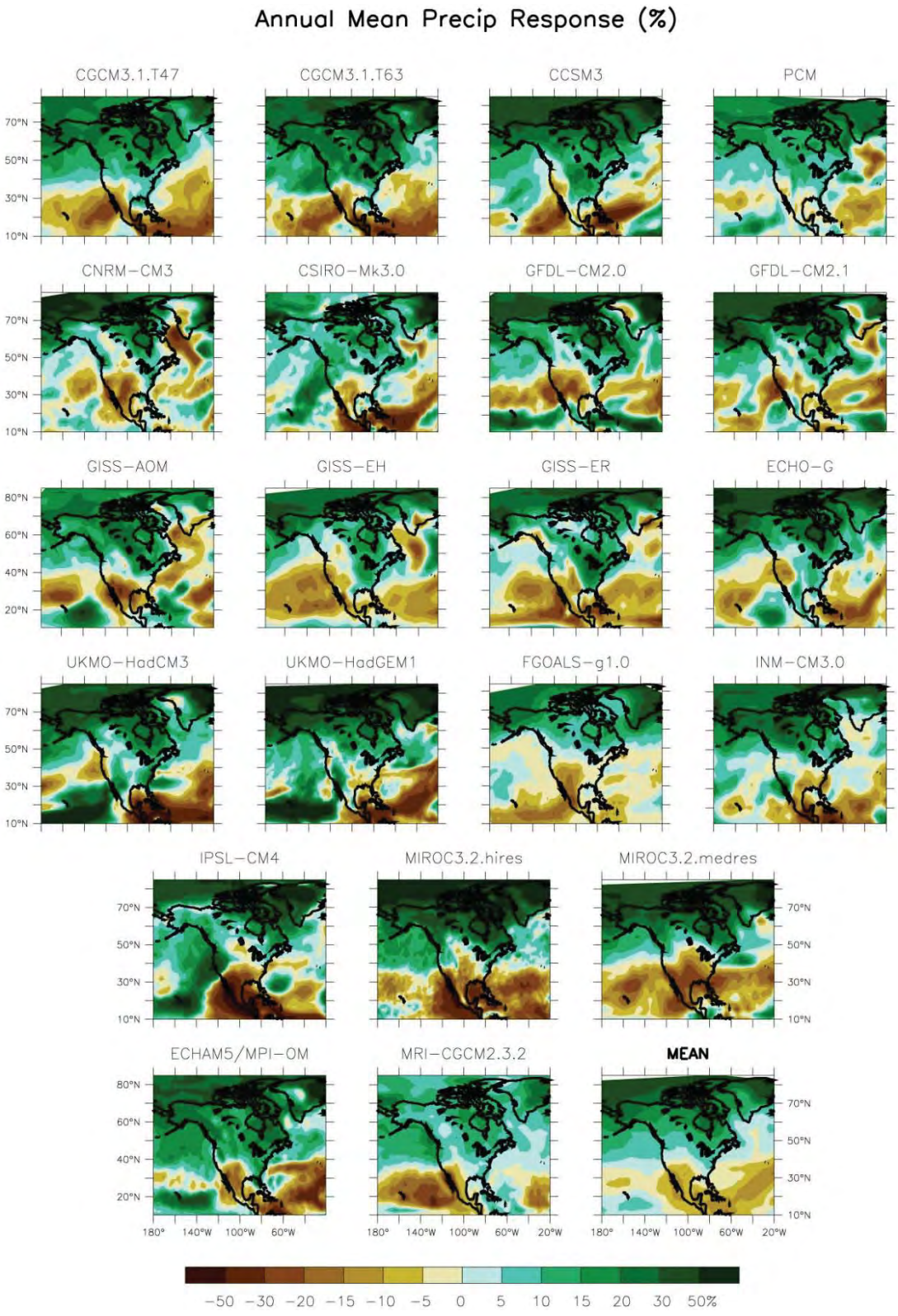

Figure 4-3 **From Christensen et al. (2007), supplementary material, Figure SM11.16. Shown is the change in precipitation, expressed as a percentage, for different GCM projections, between 1980-1999 and 2080-2099, under the mid-range A1b emissions scenario.**

California falls in the middle of the zones where precipitation is more confidently projected to increase, and where it will more likely decrease. About half the models show wetter conditions and half show drying. This does not mean the projection is for no change, but that the variability is high relative to the projected change, making it difficult to identify any specific change with high confidence. It should be noted that these are raw GCM projections, and at their native resolution the Sierra Nevada essentially do not exist. This means that the precipitation variability only represents that due to large-scale circulation patterns, and no representation of localized pressure patterns or orography will appear. As explained below, local scale effects are incorporated through downscaling of GCM output, by either relating statistically to local meteorological stations (statistical downscaling), or by performing additional higher resolution and geographically focused climate model runs (dynamic downscaling).

4.4 DOWNSCALING OF GLOBAL CLIMATE MODELS

Because the spatial scale of GCM output, typically 200–500 km, is too large to characterize climate over small areas such as South Orange County, some type of downscaling is necessary. This can take two general forms: statistical and dynamical downscaling (Benestad, 2001; Mearns et al., 2001). While dynamical downscaling has the advantage of simulating fine-scale physical processes, and therefore being in theory capable of capturing non-linear feedbacks, it suffers from the disadvantage of requiring intensive computational effort, which renders its use impractical for extended transient simulations of multiple emissions scenarios. Statistical downscaling, while very computationally efficient, has the principal drawback of assuming stationarity in the relationship between large- and fine-scale climate features, the validity of which becomes less certain as the climate warms to levels not observed in the historical record. This document employs statistically downscaled values, where the GCM results are downscaled to a $1/8^{o}$ by $1/8^{o}$ grid (Maurer et al., 2007b).

Maps of median projected climate across multiple models for the A1b scenario are shown for the lower 48 states (Roy et al., 2012). Projected precipitation changes between 1961-1990 and 2040-2059 indicate decreases in precipitation in the west and parts of the Gulf states and increases in the northeast and parts of the Midwest: there are decreases in the Gulf states (Texas) of more than 1 inch/yr and increases in the northeast by 2-4 inches/yr (Figure 4-4). The median change in California is small, although, as will be shown for the study region, some models project substantial decreases and increases in precipitation. Projected temperature increases between 1961-1990 and 2040-2059 range from 1.5 to 3 °C. The highest temperature increases are in the Midwest and Mountain regions of the West (Figure 4-5).

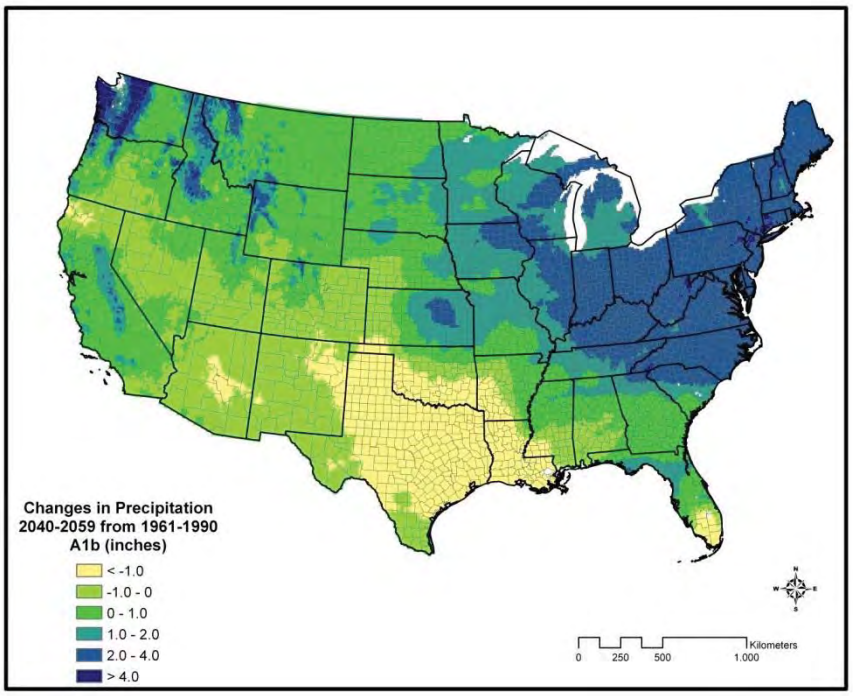

Figure 4-4 **Predicted changes in mean annual precipitation from 1961-1990 to 2040-2059 (median of 20-year means for the A1b emission scenario computed from the 16 GCMs in Table 4-1) (Source: Roy et al., 2012).**

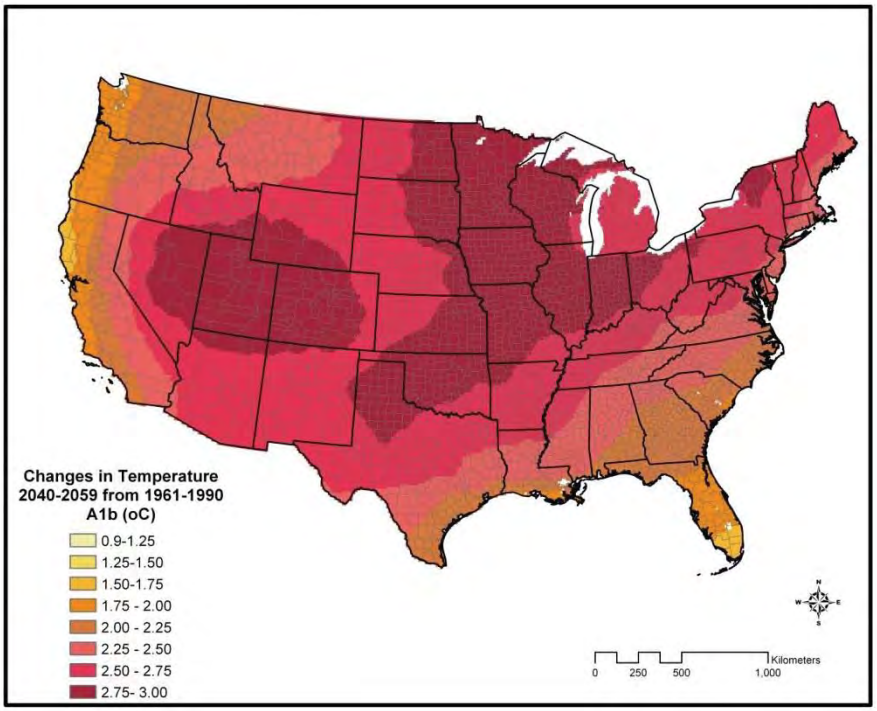

Figure 4-5 **Predicted changes in mean annual temperature from 1961-1990 to 2040-2059 (median of 20-year means for the A1b emission scenario computed from the 16 GCMs in Table 4-1) (Source: Roy et al., 2012).**

4.5 DOWNSCALED RESULTS FOR THE IRWM PLANNING AREA

Using the GCMs identified in Table 4-1described above, average projected changes in temperature and precipitation in the IRWM planning area in South Orange County are summarized for the A2 and B1 scenarios (Table 4-2 and Table 4-3). Three different time periods are summarized: early, mid, and late 21st century, defined as 2010–2039, 2040–2069, and 2070–2099 respectively. The projected data averages show a small decrease in precipitation of slightly over an inch per year by mid- to late-century periods. They also show an increase in temperature from >2 to >5 ^{o}F over the same periods.

Table 4-2
Average projected change in precipitation in the IRWM Region for 16 models identified in Table 4-1.

Emission Scenario	Time period and average change		
	2010-2039	2040-2069	2070-2099
A2	-0.37 inches	-1.06 inches	-1.54 inches
B1	0.02 inches	-0.67 inches	-0.94 inches

Table 4-3
Average projected change in temperature in the IRWM Region for 16 models identified in Table 4-1.

Emission Scenario	Time period and average change		
	2010-2039	2040-2069	2070-2099
A2	1.59 ^{o}F	3.37 ^{o}F	5.81 ^{o}F
B1	1.58 ^{o}F	2.70 ^{o}F	3.73 ^{o}F

Changes in precipitation and temperature in the South OC IRWM region are presented in different forms in Figure 4-6 through Figure 4-14 to highlight the projected differences from the 20th century baseline conditions (1950-1999). Precipitation shows no consistent pattern when plotted as a time series and compared to the baseline for either of the two emission scenarios (Figure 4-6 and Figure 4-8); however, there are periods when the precipitation is much greater than and much less than baseline values. Temperature, on the other hand, shows a clear increase for both emission scenarios, with a greater increase toward the latter part of the 21st century and for the A2 emission scenario (Figure 4-7 and Figure 4-9). When the changes in precipitation and temperature are considered simultaneously for a different models, emission scenarios, and time periods, there is a pattern of some models indicating drier and warmer conditions, which taken together, are more adverse from the standpoint of water resources (Figure 4-10). The distribution of annual temperature and precipitation can also be examined to identify changes between baseline and future time periods. In general, the change in precipitation signal over the 21st century is smaller than for temperature, although there is a trend toward drier conditions and warmer temperatures (Figure 4-11 through Figure 4-14).

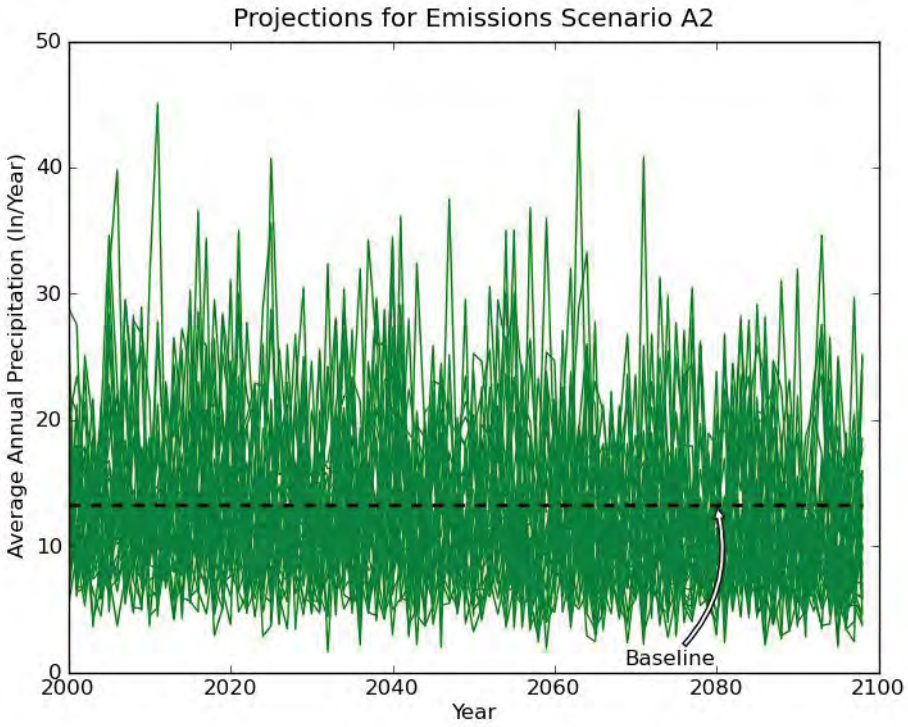

Figure 4-6. **Projected change in precipitation for an ensemble of 16 GCMs for the South OC region (A2 emission scenario). The 20th century baseline is for 1950-1999. Each line represents the projection for a single model run.**

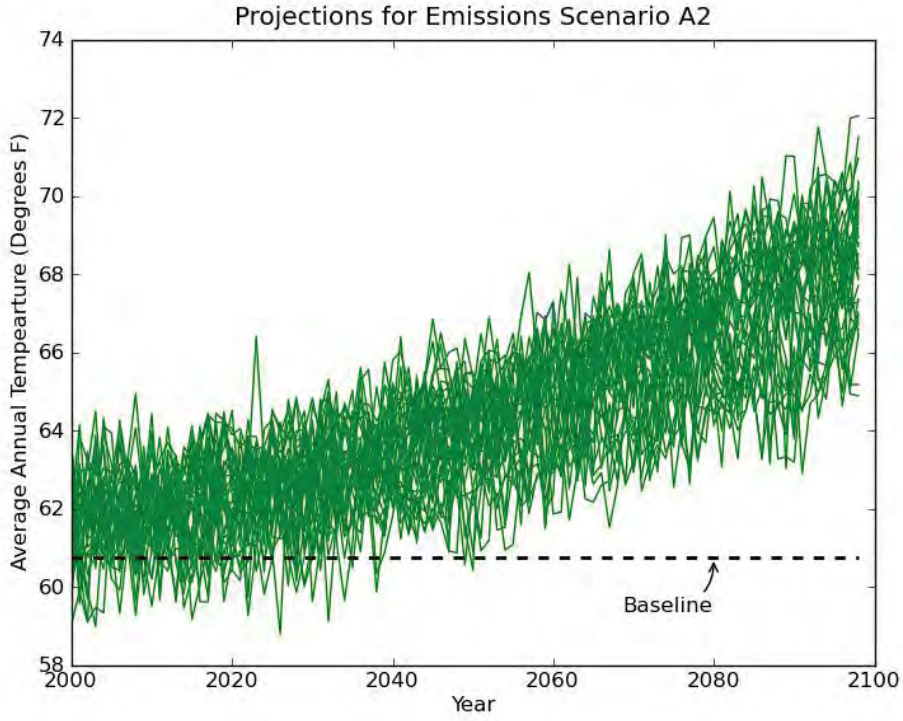

Figure 4-7 **Projected change in temperature for an ensemble of 16 GCMs for the South OC region (A2 emission scenario). The 20th century baseline is for 1950-1999. Each line represents the projection for a single model run.**

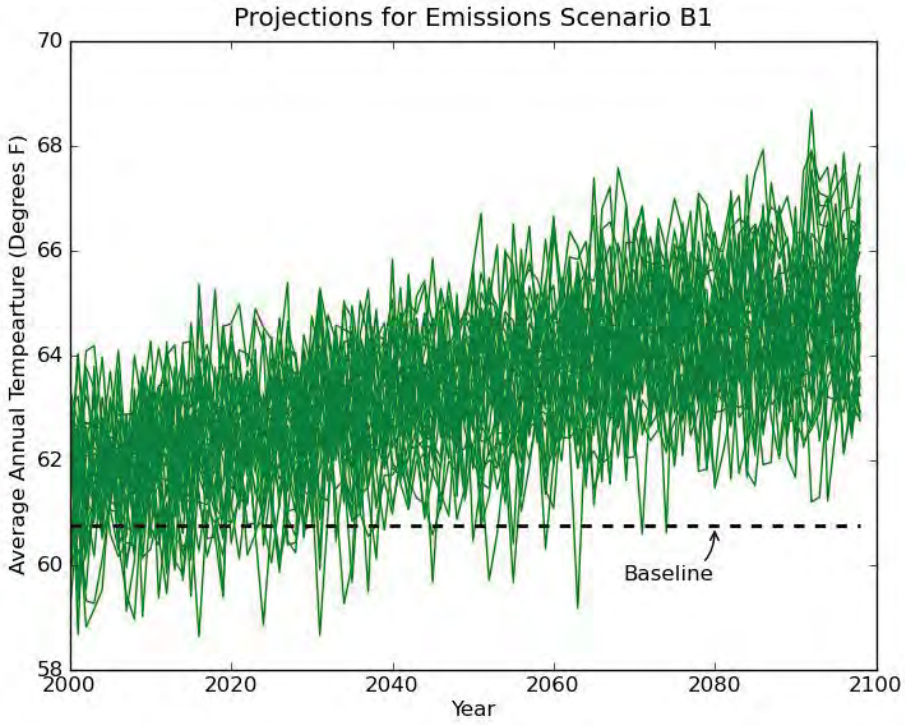

Figure 4-8 **Projected change in temperature for an ensemble of 16 GCMs for the South OC region (B1 emission scenario). The 20th century baseline is for 1950-1999. Each line represents the projection for a single model run.**

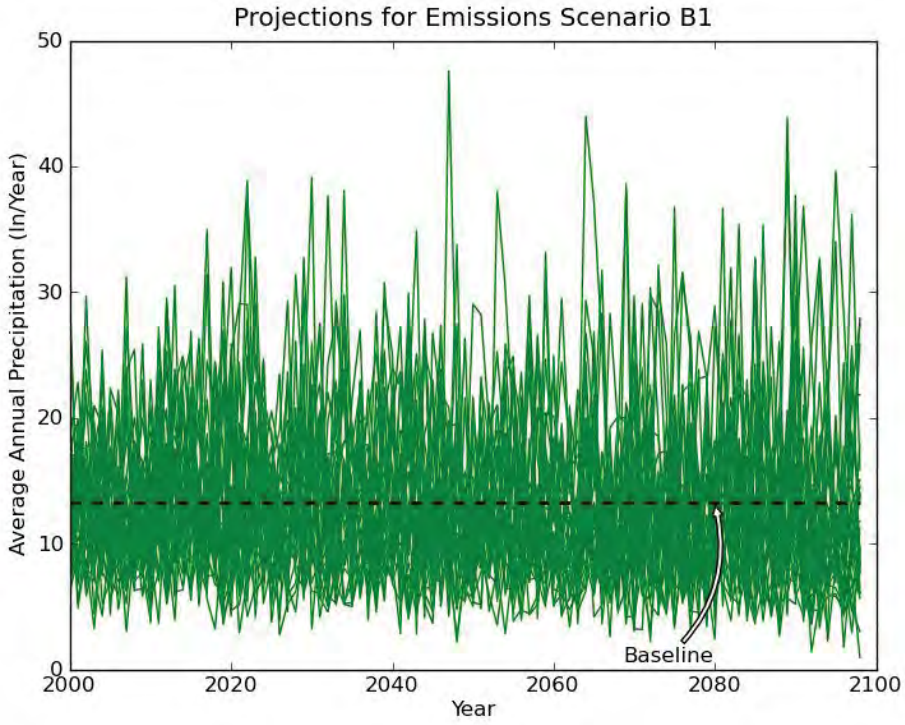

Figure 4-9 **Projected change in precipitation for an ensemble of 16 GCMs for the South OC region (B1 emission scenario). The 20th century baseline is for 1950-1999. Each line represents the projection for a single model run.**

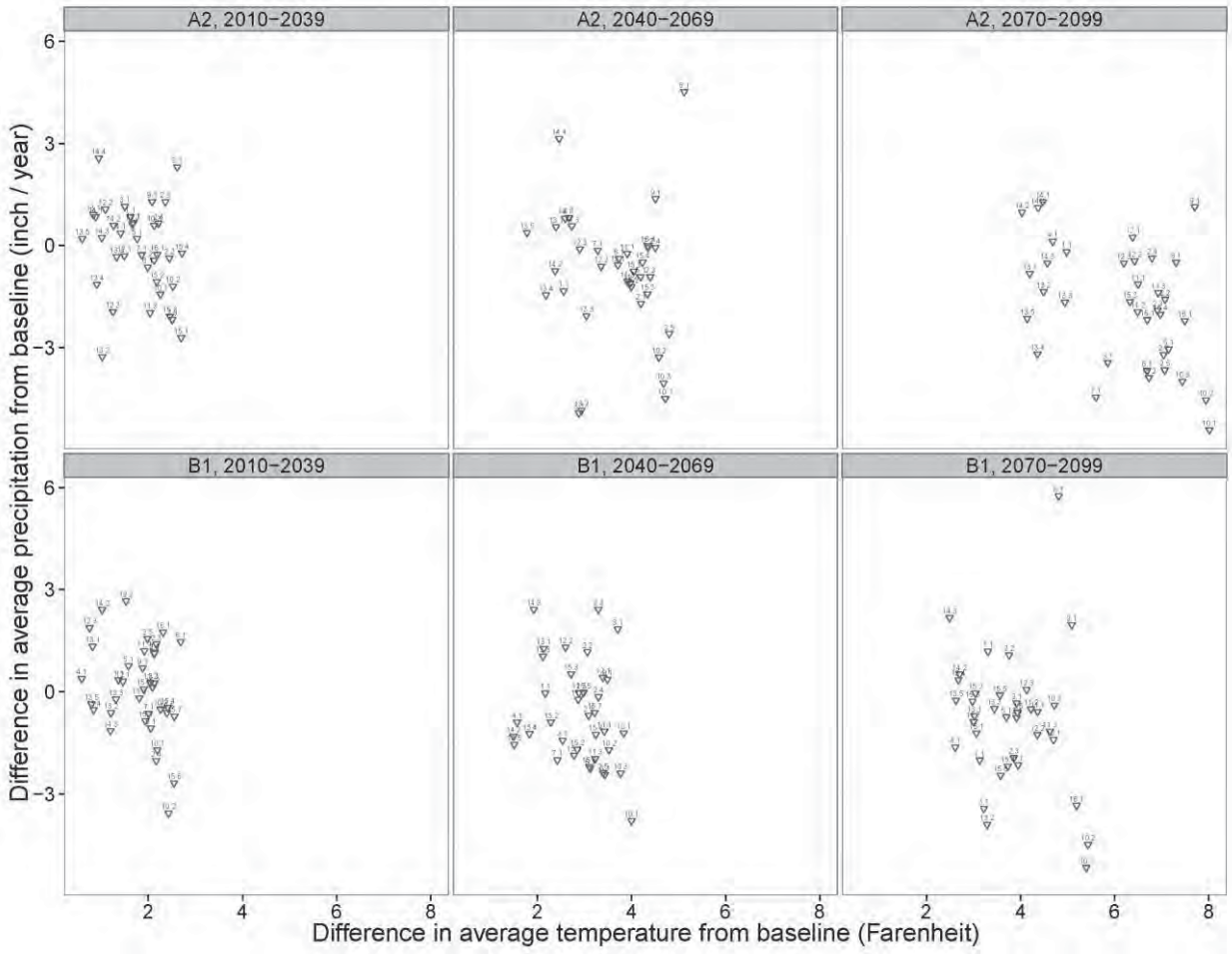

Figure 4-10 **Comparison of change in temperature and precipitation for different GCMs for the A2 and B1 emission scenario for 2010–2039, 2040–2069, and 2070–2099. Each point represents the average projection for a single model run over the period identified.**

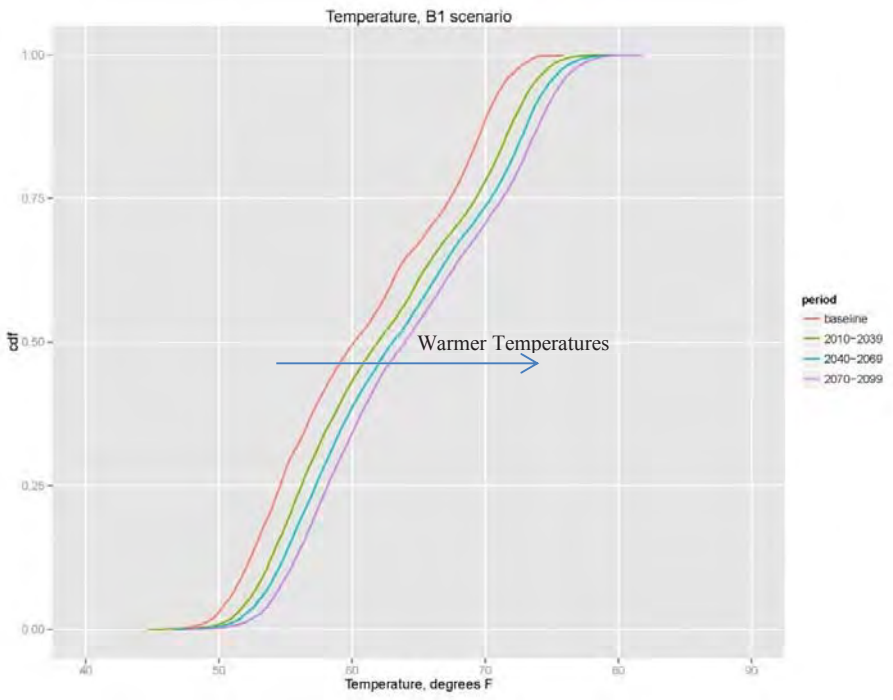

Figure 4-11 **Distribution of mean annual temperature for the B1 emission scenario for the South OC IRWM planning region for the 20th century baseline (1950-1999) and the following 21st century periods: 2010–2039, 2040–2069, and 2070–2099. Median conditions are shown where the value on the y-axis is 0.5.**

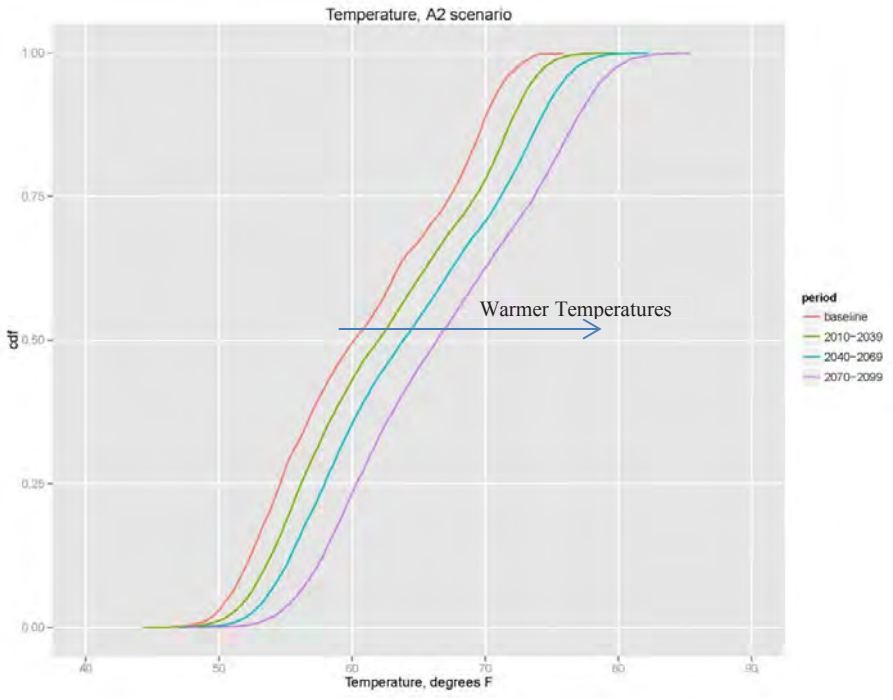

Figure 4-12 **Distribution of mean annual temperature for the A2 emission scenario for the South OC IRWM planning region for the 20th century baseline (1950-1999) and the following 21st century periods: 2010–2039, 2040–2069, and 2070–2099.**

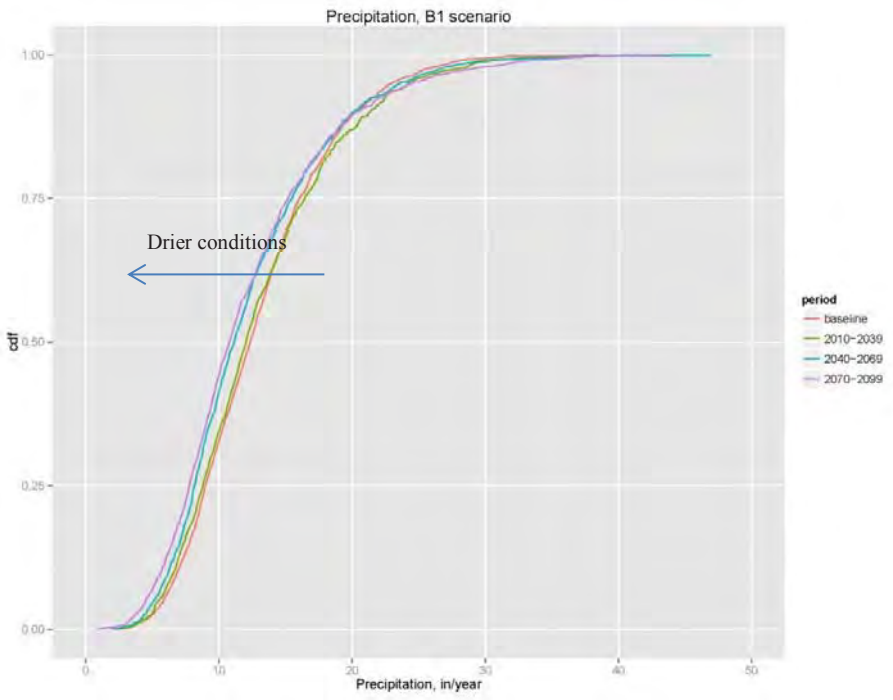

Figure 4-13 **Distribution of mean annual precipitation for the B1 emission scenario for the South OC IRWM planning region for the 20th century baseline (1950-1999) and the following 21st century periods: 2010–2039, 2040–2069, and 2070–2099.**

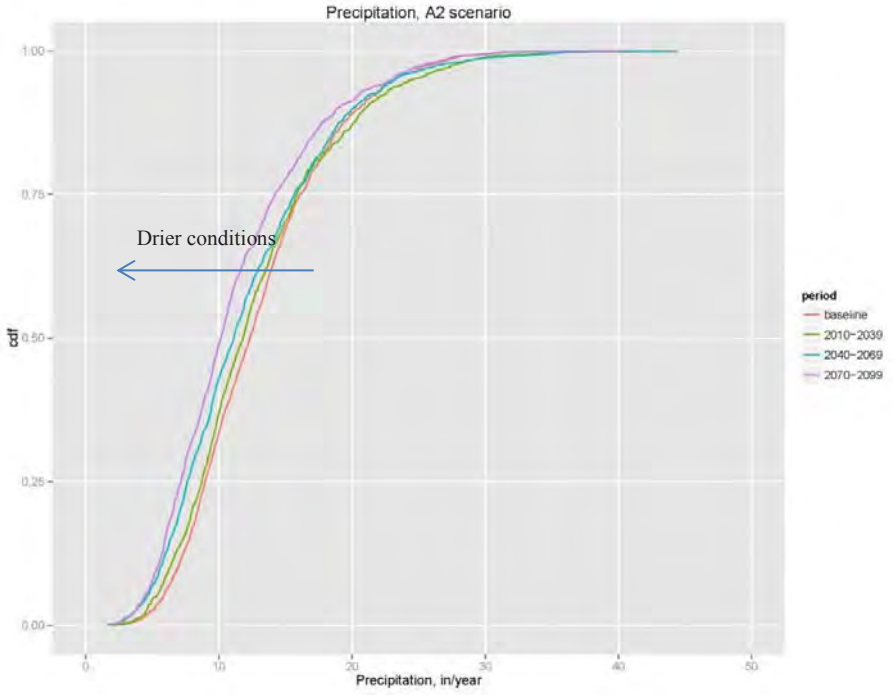

Figure 4-14 **Distribution of mean annual precipitation for the A2 emission scenario for the South OC IRWM planning region for the 20th century baseline (1950-1999) and the following 21st century periods: 2010–2039, 2040–2069, and 2070–2099.**

4.6 PROJECTED STREAMFLOWS

Using downscaled climate data the Bureau of Reclamation has projected streamflow into the 21st century at major locations throughout the western United States developed through its West-Wide Climate Risk Assessment effort. These calculations were made using the Variable Infiltration Capacity (VIC) hydrologic model. Projections of streamflows at three major locations of interest for water supply to Southern California, Colorado River at Lees Ferry, Sacramento River at Freeport, and San Joaquin River at Vernalis are shown in Figure 4-15. These values, shown as 30-year rolling averages, illustrate the variability in streamflow as related to variability in precipitation across different models. In general, all three locations show a small decline in average streamflow over the 21st century, although there are individual model runs (single lines in the plots) that show flows much higher or much lower than the baseline values in the latter half of the 20th century. The emission scenarios, although related to temperature projections (A2 shows higher temperatures), do not have a consistent effect on streamflow projections.

4.7 EXTREME WEATHER EVENTS

Much of the climate modeling described above focuses on changes in average or annual conditions, although it is the extremes in the future that are of greatest consequence to human and natural systems. Trends in extreme events are hard to discern because they do not occur often. The scientific literature generally suggests an increase in the likelihood of extreme events in a warmer climate, including heat waves, large winter storms, and floods (Congressional Budget Office, 2009), and the topic is an active area of research (National Academy of Sciences, 2010).

An assessment of extreme conditions derived through climate change model projections (Mastrandrea et al., 2011) suggests the following changes are possible in California: severity of hot spells (both in length and intensity), increases in intensity and duration of heat waves, and decreases in frost days. The downscaled climate models do not produce strong signals with respect to extreme precipitation events. However, other GCM analysis of atmospheric rivers responsible for creating the heaviest storms in California (introduced in Section 3.6) suggests that the intensity and frequency of these extreme precipitation events may increase over the course of the 21st century (Dettinger, 2011, Dettinger and Ingram, 2013). Wildfires are also expected to continue to increase in frequency and severity (CCSP 2009, SNA 2010; Krawchuck and Moritz, 2012).

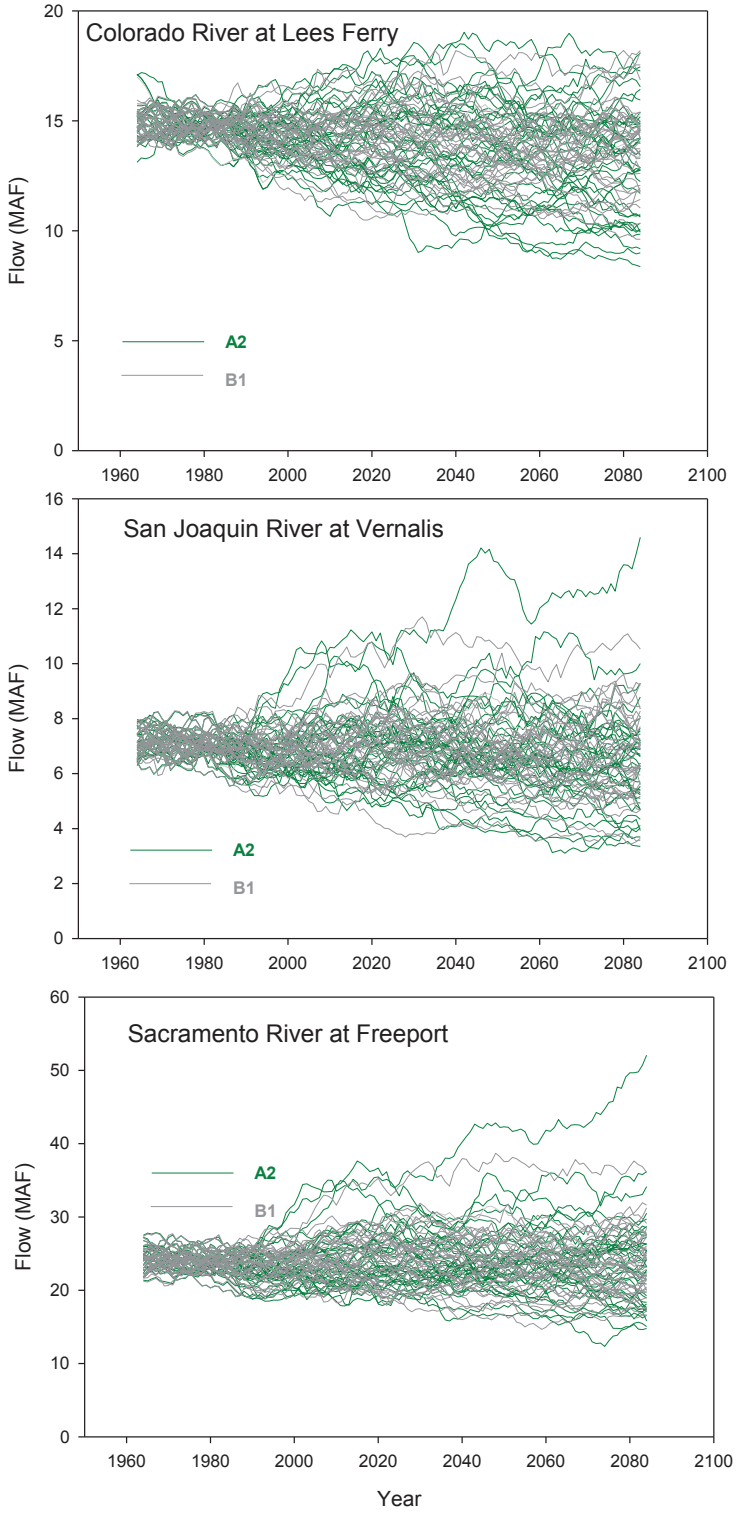

Figure 4-15. Thirty-year rolling average of 21st century streamflow in million acre feet (MAF) at Colorado River at Lees Ferry, San Joaquin River at Vernalis, and Sacramento River at Freeport, as projected from an ensemble of 16 GCMs and using two emission scenarios.

4.8 SUMMARY

Global climate projections are developed using GCMs that represent global climate processes and assumptions about future greenhouse gas emissions. GCMs are used to project future climate changes based on assumptions of different economic growth pathways and emissions of greenhouse gases, with A1b (medium), A2 (higher) and B1 (lower) being the most common scenarios used in various climate impact studies. No one model or emission pathway is the best estimate of the future, and, typically, most climate assessments utilize an ensemble of GCM results for evaluating future conditions. In this analysis, sixteen candidate climate models were selected for evaluation. The primary greenhouse gas (GHG) emission scenarios used for the climate projections are A2 and B1. Results from three 21st century periods, statistically downscaled to cells of 1/8 degree or about 12 km by 12 km, were analyzed for impacts in the early, mid, and late 21st century, defined as 2010–2039, 2040–2069, and 2070–2099 respectively. The projected data summary for the South OC IRWM planning region shows a small decrease in precipitation of slightly over by the late-21st century period: -0.37 (2010-2039), -1.06 (2040-2069), -1.54 inches/year (2070-2099) for the A2 scenario, and 0.02 (2010-2039), -0.67 (2040-2069), -0.94 inches/year (2070-2099) for the B1 scenario. This is a relatively small decrease compared to the average precipitation of approximately 13 inches per year in the region. However, the models show a consistent and substantial increase in mean annual temperature, from >2 to >5 ^{o}F over the mid- to late-21st century periods. In general, the climate models project more adverse conditions (i.e., warmer and drier) in the latter part of the 21st century.

Besides the changes in average conditions, climate change is considered likely to increase variability, with more extreme heat events, longer droughts, and more intense flooding through atmospheric rivers that transport moisture from the tropics to the Pacific coast. Although these changes are anticipated on a broad scale, they are typically not quantified at the spatial scale of the South OC planning region.

5. SUMMARY OF CLIMATE CHANGE PLANNING STUDIES IN REGIONS SUPPLYING WATER TO SOUTH ORANGE COUNTY

Key Points: *This section presents an overview of studies that pertain to water resources planning in California and the Colorado River Basin, and have considered climate change as a factor affected water supplies. Projected climate change conditions, such as the suite of models used in Chapter 4, have been used for developing plans in both regions. A key feature that stands out from the comprehensive analyses that have been performed is that both California and the Colorado Basin are severely water constrained, where it will be challenging to meet current allocations in future years. In both regions, planning model projections indicate years where deliveries will sometimes fall short of allocations, over planning horizons that range from 20 to 50 years into the future, under conditions where no changes are made to the existing operational infrastructure of the system. Because the regions jointly affected by these basins are continuing to experience relatively rapid population growth, and anticipated increased in municipal demands, over longer planning horizons water planners must address the dual challenge of reduced supplies and increased demand.*

Because a large fraction of the water supply into South OC is imported from other regions in California and Colorado, an evaluation of climate change impacts relating to water resources must consider a broader geographic region than the boundaries of the South OC IRWM planning area. This chapter presents a summary of the potential impacts across this larger area using information from prior analyses conducted in California and the Colorado Basin. Major resources for developing this summary include California's third climate assessment[2], DWR's climate change handbook for Regional Water Planning (DWR, 2011), the State Water Project Delivery Reliability Report 2009 and 2011 (DWR, 2010; DWR, 2012), MWD's Integrated Resources Plan (MWD, 2010), and the Bureau of Reclamation's Colorado River Basin Study (2012). This chapter presents the most important findings from these technical evaluations that pertain to the South OC IRWM. Specific topics addressed include water supply from California and the Colorado River basin, water quality, ecological

[2] The scientific community in California, in cooperation with resource managers, has been conducting periodic statewide studies about the potential impacts of climate change on natural and managed systems, every three years beginning in 2006. Most recently, the state's third major assessment on climate change was published in 2012. The third assessment consists of 30 peer-reviewed documents and explores local and statewide climate change vulnerabilities and opportunities for limiting impacts (on the internet at http://www.climatechange.ca.gov/adaptation/third_assessment/).

effects, and hydropower generation. Sea level rise is addressed separately as part of Chapter 6.

5.1 WATER SUPPLY FROM CALIFORNIA

Increased temperatures will result in more winter precipitation in the mountains falling as rain rather than snow as described in Chapter 3. DWR anticipates a 20 to 40 percent decrease in the state's snowpack water storage by the year 2050 (DWR 2008). This snowpack reduction impacts large water systems such as the State Water Project (SWP), the Central Valley Project (CVP), and water systems that rely on the Colorado River. It also impacts smaller watersheds relying on snowpack for water supply. Shifts in run-off timing have already been observed as discussed in Chapter 3.

Evaluation of climate change is one of the considerations for the development of the State Water Project Delivery Reliability Report (DWR 2010, 2012). The Delivery Reliability Report, or DRR, is a biannual report that describes the existing and future conditions for SWP water supply that are expected if no significant changes are made to the infrastructure to convey water past the Sacramento–San Joaquin Delta (Delta). Besides climate change the DRR projections also consider constraints imposed by federal biological opinions that seek to modify SWP (and CVP) operations to minimize impacts to certain aquatic species such as the Delta smelt. The calculations are performed for variable hydrologic conditions using an 82-year record, representing 1922-2004 conditions, and implemented through the CALSIM II model used for water planning in California. The goal of the analysis is to estimate the percentage of years where specific levels of water allocations will be met by the SWP. Water allocations are defined for each water contractor (identified in what is termed SWP Table A, DWR, 2012). The maximum water demand for all contractors is 4,133 thousand acre feet (taf). Of this delivery, the maximum allocation for MWD—the source of water for MWDOC and then to the South OC region—is 1,912 TAF. In comparison to its maximum allocation of 1,912 taf, over the past decade, MWD's water delivery from the SWP has ranged from 556 taf (2009, a dry year) to 1,720 taf (2003, an above normal year). In the most recent DRR (DWR 2012), it is estimated that existing and future water delivery 20 years into the future (i.e., 2031), will be similar. Further, the projections made in the 2009 and 2011 DRRs are similar, and suggest a 70% likelihood that a delivery target of 2,000 to 3,500 thousand acre-feet, aggregated for all contractors, will be met (Figure 5-1). There is a 17% likelihood of water delivery of 1,000–2,000 taf, a 7% likelihood of less than 1,000 taf, and a 6% likelihood of more than 3,500 taf. The variation of delivery as a function of the type of year is shown in Table 5-1, and ranges from 1,366 taf for a 6-year drought period to 443 taf for a single extreme dry year. Since MWD's allocations are 46% of the SWP Table A allocations, in dry years over the forecast period (2031), MWD's allocation could be much lower than observed in the recent past.

Although the DRR projections consider future climate change, it is important to recognize that over the 20-year planning horizon used, climate change as projected through GCMs and presented in the previous chapter, indicate relatively small changes from baseline conditions representing the second half of the 20th century.

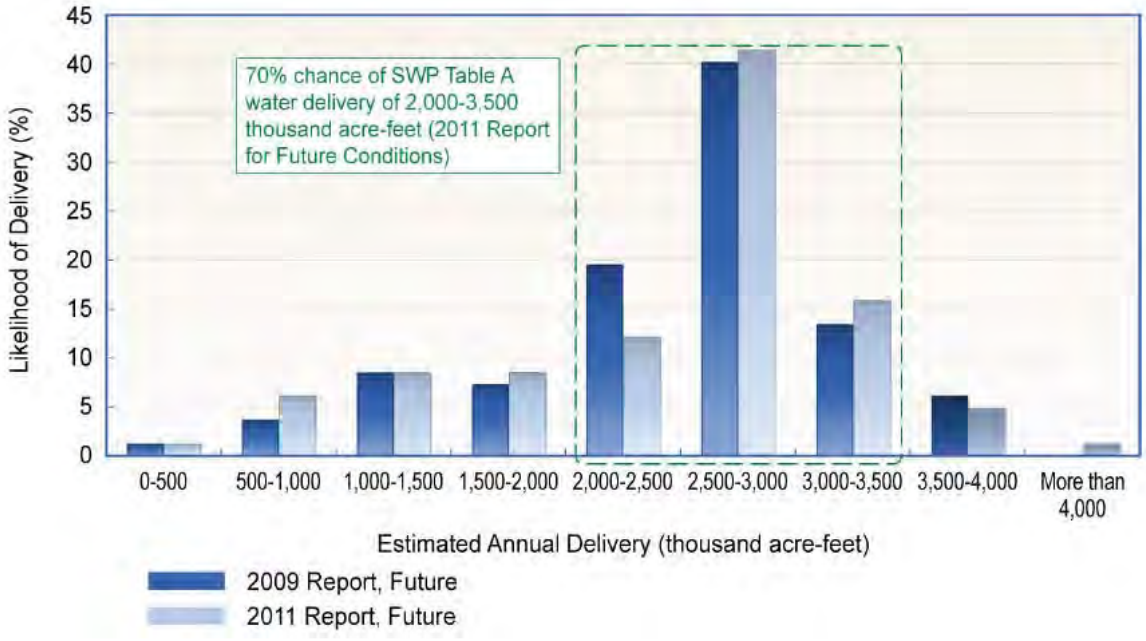

Figure 5-1 **Likelihood of specific levels of water delivery for planning conditions that represent the year 2031 by the State Water Project (Source: DWR, 2012).**

Table 5-1
Water Delieveries for Different Types of Water Years

Time Period	Long-term Average	Single Dry Year (1977)	2-Year Drought (1976–1977)	4- Year Drought (1931–1934)	6-Year Drought (1987–1992)	6-Year Drought (1929–1934)
Projected Delivery in 2011 DRR (DWR, 2012), taf	2,466	443	1,457	1,401	1,227	1,366

5.2 WATER SUPPLY FROM THE COLORADO RIVER BASIN

The Colorado River is a major source of water for MWD and its first source of water after it was established in 1928. The Colorado River Aqueduct is owned by MWD and is used to transport water from the Colorado River to Lake Mathews in Riverside County. Up to 1.25 million acre feet (maf) per year may be conveyed to MWD member agencies through the aqueduct. MWD also owns additional rights to Colorado River water, albeit at lower priority.

The Bureau of Reclamation performed the Colorado River Basin Water Supply and Demand Study (completed in December 2012), which defines current and future imbalances in water supply and demand in the Colorado River Basin and the adjacent areas of the states that receive Colorado River water for approximately the next 50 years (2010-2060), and

evaluates adaptation and mitigation strategies to resolve those imbalances.[3] The time horizon is thus longer than used for the SWP DRR reports and reflects greater change in climate over this period. The basin study also assesses the risks to resources, including water allocations and deliveries, hydroelectric power generation, recreation, ecosystems, and flood control.

Using climate scenarios derived from statistical downscaling of GCM projections, the mean natural flow at Lees Ferry on the Colorado River—the location upon which the water allocations of the river are based—is projected to decrease by approximately 9 percent, compared with a long-term historical natural flow of 16.4 maf. The range of runoffs varies amongst the individual GCM projections, with individual models projecting higher and lower flows. There is also a projected increase in both drought frequency and duration as compared to the observed historical and long-term scenarios obtained from tree-ring records. Droughts 5 years or longer are projected to occur 50 percent of the time over the next 50 years. Projected changes in climate and hydrologic processes include continued warming across the basin, a trend towards drying, increased evapotranspiration, and decreased snowpack as a higher percentage of precipitation falls as rain.

Multiple scenarios were assumed for the water demand in the basin states[4], assuming a range of population and economic growth. Based on these scenarios, the Colorado River demand for consumptive uses is projected to range between about 18.1 maf and 20.4 maf, exceeding the historical natural flows, and the reduced flows expected under climate change scenarios. The future demand as projected in the Basin Study exhibits significant growth, and may be compared with a demand of 15.3 maf over the past decade. The largest increase in demand is projected to be for municipal and industrial uses, due to population growth. Population within the areas supplied by the Colorado River are projected to grow from about 40 million in 2015 to between 49.3 million and 76.5 for different scenarios by 2060.

A comparison of the water supply and demand projections indicates a long-term projected imbalance in future supply and demand of about 3.2 maf by 2060 (Figure 5-2).

The Colorado River Basin Study solicited input from stakeholders and the general public to identify options to resolve water supply and demand imbalances. Options were classified into four groups that focused on increased supply, reduced demand, modifying operations modifying governance and option implementation. Representative options to increase supply included desalination of water from the Pacific Ocean, water reuse, development of local supplies, and water imports from outside the basin. Options to reduce demand included greater conservation in municipal, agricultural, power generation sectors. Changed operations included consideration of reduced evaporation from reservoirs and aqueducts, and changed system operations. Potential volumes of water that could be generated or saved through each of these options were estimated. Many of these options are not feasible or reliable over the long term, or have technical and environmental challenges. Excluding less

[3] A similar basin study has been proposed for the Sacramento and San Joaquin Rivers but has not yet been performed.
[4] The basin states are Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming.

feasible options, an additional 3.7 maf per year may be produced by 2035 and 7 mafy by 2060.

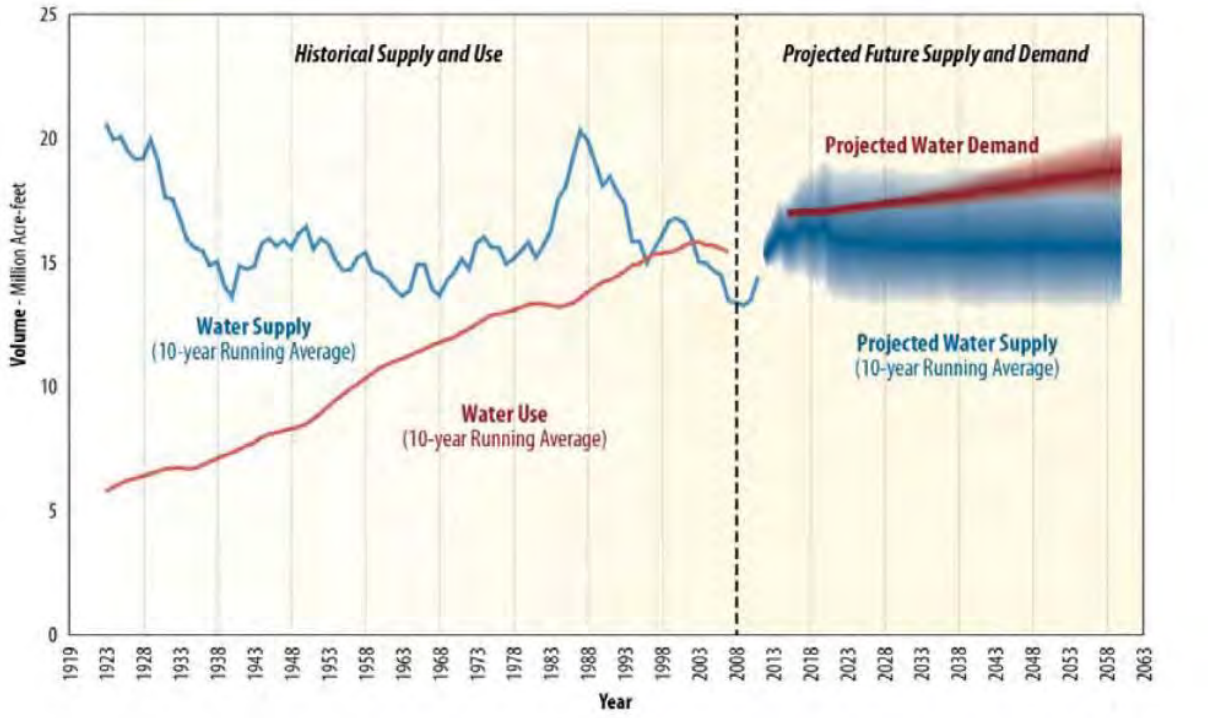

Figure 5-2 Histoical and projected water supply and demand on the Colorado River (Source: Bureau of Reclamation, 2012).

Individual options were grouped into four portfolios representing different strategies for addressing the water imbalance, focusing for example on technologies that were less energy intensive or focusing on options that were more technically feasible. These portfolios do not represent all possibilities, but provide a reasonable basis using which the future reliability of the system can be evaluated, focusing on water deliveries, but also other objectives such as those relate to ecosystem protection, flood protection, power generation, and recreation. The annual cost, in 2012 dollars, for implementing the portfolios ranges from approximately from $3.6 billion to $5.8 billion (in 2060) when considering the median of the downscaled GCM projected supply sequences. In all cases, the adaptation portfolios were shown to reduce the vulnerability of the system, i.e., the potential that one or more system goals (including water delivery) were not being met, compared to the do-nothing approach.

The basin study technical evaluation presents an approach for quantifying climate change impacts in a complex system, and for developing responses through changes in supply, demand, and operations. The analysis demonstrates that it is possible for the system to adapt to conditions as they are currently understood, albeit at significant additional investment across the basin. Conservation and desalination are an important part of all portfolios considered in the basin study, and both are being considered in the South OC planning region.

5.3 WATER DEMANDS IN THE SOUTH OC PLANNING REGION

The seasonal component of water demands (e.g., landscape irrigation and water used for cooling processes) will likely increase with climate change as droughts become more common and more severe, increasing temperatures increase evapotranspiration rates, and growing seasons become longer. Without accounting for changes in evapotranspiration rates, agricultural crop and urban outdoor demands are expected to increase in the Sacramento Valley by as much as 6% (Chung et al., 2009). However, in urban areas such as the South OC IRWM planning region, the potential increase in water demands due to climate change is severely constrained by statewide efforts—the Water Conservation Act of 2009, or SBx7-7—to enhance water conservation and reduce water consumption on a per capita basis by 20% from current levels to the year 2020 (MWDOC Urban Water Management Plan, 2011). MWDOC, in association with its member retail agencies, has created the Orange County 20x2020 Regional Alliance to meet the water use reduction targets. The future plans for compliance with the 2020 goals do not explicitly consider climate change, although the effects of climate change are likely to be relatively small over this time frame. However, over the longer term, i.e., in future decades in the 21st century, climate change will make this goal harder to achieve. From the standpoint of water availability over the long term, even with constrained per capita water use, water demands may continue to grow as population in the region grows. The population of Orange County is expected to grow by 0.66% annually over the next two to three decades (MWDOC, 2011).

5.4 WATER QUALITY

Water quality can be impacted by both extreme increases and decreases in precipitation. Increases in storm event severity may result in increased turbidity in surface water supplies (DWR, 2008). Lower summertime precipitation may also leave contaminants more concentrated in streamflows. Higher water temperatures may exacerbate water quality issues associated with dissolved oxygen levels and increased algal blooms (DWR, 2008). These changes may occur in reservoirs where water is stored in the SWP system and in the Colorado Basin, and also in the aqueducts that are used to transport water to Southern California.

Salt intrusion may also impact estuarine water supplies like the Delta (Chung et al 2009) and coastal aquifers. Water quality concerns may impact both drinking water supplies and instream flows for environmental uses. Water quality issues may also have impacts on wastewater treatment, the altered assimilative capacity of receiving waters may alter treatment standards, and collection systems may be inundated in flooding events.

5.5 ECOLOGICAL EFFECTS

Climate change is expected to have widespread effects on ecosystems and landscapes (DWR, 2011). Habitats for temperature-sensitive fish may be impacted by increased water temperatures (DWR 2008). Many commercially valuable species, such as coho salmon and steelhead trout, are at risk of extinction because they require waters below 72 ^{o}F (Moyle et al., 2012). Surface water bodies will also be more susceptible to eutrophication with increased temperatures. Invasive species may become even more challenging to manage. Climate change will stress forested areas, making them more susceptible to pests, disease, and changes in species composition. With lower rainfall, or less frequent but more intense

rainfall, wildfires incidence are areas of risk are expected to increase are likely to become more frequent and intense, potentially resulting in changes in vegetative cover (CCSP 2009, Krawchuck and Moritz, 2012). Coastal ecosystems that are sensitive to acidification and changes in salinity balances, sedimentation, and nutrient flows (such as estuaries and coastal wetlands) may be particularly vulnerable (California Natural Resources Agency, 2009).

5.6 HYDROPOWER GENERATION

Hydropower is a significant clean low-carbon electricity source in California: 21% of the state's electricity is generated from hydropower (CAT 2008). High-elevation hydropower units generate, on average, 74 percent of California's in-state hydroelectricity and are particularly vulnerable to climate change because they rely on natural snowpack reserves and snowmelt for power generation. As spring snow-melt timing shifts, power generation operations at higher elevations may have limited flexibility compared to lower elevation plants (Medellin-Azuara et al 2009; Guegan et al., 2012). Higher elevation hydropower generation units may see a decrease of as much as 20% of annual power generation (Medellin-Azuara et al., 2009). Maximum power generation capacity may not coincide with maximum energy demands in the hot summer months. Several studies have projected various levels of hydropower losses. The California Climate Action Team projected that power generation will decrease by 6% by the end of the century for the State Water Project system, and by 10% for the Central Valley system.

5.7 SUMMARY

This section presents an overview of activities that pertain to water resources planning in California and the Colorado River Basin, which indirectly affect the supply to MWD and then to South Orange County. Projected climate change conditions, such as the suite of models used in Chapter 4, has been an important part of the planning activities conducted over the past decade in both regions. Two features stand out from the comprehensive analyses that have been performed: both California and the Colorado Basin are severely water constrained, where it will be challenging to meet current allocations in future years. In both regions, planning model projections indicate years where deliveries will sometimes fall short of allocations, over planning horizons that range from 20 to 50 years into the future. For the State Water Project, the model calculations show a supply of 2,500 to 3,500 TAF over 70% of the time, with supplies well below 1,500 TAF during drought periods. Because the regions jointly affected by these basins are continuing to experience relatively rapid population growth, and anticipated increased in municipal demands, water planners must address the dual challenge of reduced supplies and increased demand.

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6. GREENHOUSE GAS EMISSIONS FOR WATER SUPPLIES

Key Points: *The General Reporting Protocol, Version 3.1, developed by the California Climate Action Registry is used to calculate indirect emissions of greenhouse gases (GHG) from electricity used for the water system in South Orange County. The water sector is the largest user of electricity in the state of California. The bulk of water for southern California specifically is transported over long distances up steep gradients and is therefore more energy expensive than local sources. Energy use for water is quantified via energy intensity, or the gross energy required for the water system to use a specific amount of water at a specific location. Under baseline conditions, the water sector in the region generates GHG emissions of over 93,000 metric tons in terms of carbon dioxide equivalents.*

6.1 GREENHOUSE GAS PROTOCOL

This study used the General Reporting Protocol (GRP), Version 3.1 developed by the California Climate Action Registry (CCAR) in 2009 to calculate greenhouse gas (GHG) emissions. The GRP was designed as a tool for businesses, government agencies, and non-profit organizations to calculate their general emissions or emissions related to a specific sector (utilities, construction, etc.). This methodology includes indirect emissions of GHG from electricity use and involves a five step process.

- Determine annual electricity use
- Select the appropriate electricity emission factors that apply to the electricity source used
- Determine total annual emissions in metric tons
- Convert non-CO_2 gases to carbon dioxide equivalent (CO_2e)
- Total the sum of all CO_2 and CO_2e gases emitted from electricity use

GHG emissions from energy related to the water supply for a region may be calculated in proportion to the volume of water obtained through its water infrastructure. The total annual water volume for a region or facility is multiplied by an electrical consumption factor, or energy intensity, from the appropriate utility to obtain the estimated annual electrical consumption per year. The energy intensity is defined as the total amount of energy in the entire system that is necessary to use a certain volume of water at a specific location (Wilkinson, 2006). Then, following the steps outlined above, the appropriate emissions factors for the greenhouse gases of interest, for instance CO_2, CH_4, and N_2O, are multiplied by the annual electrical consumption of the water volume to obtain the emission of that

individual gas. After converting into metric tons, the amount of gas is multiplied by its global warming potential (GWP) to obtain its CO_2e. The GWP defines how much a mass of non-CO_2 GHG contributes to global warming per unit time when compared with the same mass of CO_2 (EPA, 2011). The CO_2e's are then summed to obtain the total CO_2e. Table 6-1 contains GHGs and their GWPs.

Table 6-1
Table of GHGs and their GWP

Greenhouse Gas	Global Warming Potential
CO_2	1
CH_4	21
N_2O	310

6.2 ENERGY IN THE WATER SYSTEM

Nineteen percent of electricity in California is used for its water infrastructure. Thirty-three percent of non-power plant natural gas is used in the state's water systems. This energy is leveraged for groundwater extraction and pumping, conveyance of our water supply through canals and aqueducts, storage in reservoirs, treatment and distribution, wastewater treatment, recycling, and a myriad of end uses ranging from municipal to industrial to agriculture (Garrison et al, 2009, Wilkinson, 2006).

The State Water Project (SWP) is the largest user of electricity in the state of California (Cohen et al, 2004). In fact it consumes an amount equivalent to 2–3 percent of total California electricity. Much of this energy is expended pumping water over long distances of up to 400 miles. Water is pumped from essentially sea-level upwards to over 3400 feet between the Sacramento-San Joaquin Delta and the southern end of the California Aqueduct along its East Branch (DWR, 2008). The SWP obtains its electricity through a combination of purchasing and generation. It owns nine hydroelectric power plants and partially owns a coal-fired plant in Nevada, which together produce 5.9 billion kilowatt-hours of electricity per year. Four and one half billion kilowatt-hours, or approximately 76% is due to hydroelectric power.

Similarly, the Metropolitan's Colorado River Aqueduct pumps its water 242 miles from Lake Havasu, Arizona to Lake Mathews, California. The elevation gain between the two points is 1617 feet. According to Cohen et al (2004), MWD estimates that the amount of energy it takes to deliver water to its service area is roughly one-third total average household electric use there. In 2006 MWD projected its expected delivery of water would require 1,700 gigawatt-hours (GWh). This electricity comes from a combination of purchased power, and power exchanges. The primary energy sources are hydroelectric power from the Colorado River generated at the Hoover and Parker Power Plants. In the expected delivery scenario, 1,403 GWh is from the two hydroelectric power plants, and 297 GWh is from other resources including Southern California Edison and the Western Systems Power Pool.

6.3 SUMMARY OF ENERGY INTENSITIES AND EMISSIONS FACTORS

Electricity use as it applies to the water system is typically described via energy intensity. Energy intensity is defined as "the total amount of energy, calculated on a whole-system basis, required for the use of a given amount of water in a specific location (Wilkinson, 2006)." Water intensity is generally calculated in units of kWh per million gallons, and thus may be examined by water use sector, individual project, or segment of the water supply and delivery system. As described above, the water intensity figures are for the entire system, project, or sector regardless of source of electricity.

The California Energy Commission (2006) describes the water intensity of the water system in several ways. In its baseline estimates of water energy intensity (Table 6-2), it divides the parameter by location (Northern versus Southern California), indoor and outdoor uses, and segment of the water delivery system.

Table 6-2
Energy Intensity of Water (kWh/MG). Reproduced from CEC (2006)

	Indoor Uses		Outdoor Uses	
	Northern CA	Southern CA	Northern CA	Southern CA
Water Supply and Conveyance	2117	9727	2117	9727
Water Treatment	111	111	111	111
Water Distribution	1272	1272	1272	1272
Wastewater Treatment	1911	1911	0	0
Regional Total	5411	13,022	3500	11,111

The energy intensity values between Northern and Southern California vary quite significantly in the water supply and conveyance category because the bulk of water for Southern California is imported to the region through the SWP and Colorado River Aqueduct infrastructure previously described. The water supply for the northern region of the states is typically much closer to consumers, and thus much less energy intensive.

Wilkinson (2006) subdivides water intensity by specific infrastructure. For southern California, the energy intensities of water sources are shown in Table 6-3.

Table 6-3
Energy Intensity of Water, after Wilkinson (2006)

Water Source	Energy Intensity (kWh/MG)
SWP East Branch CA Aqueduct	9820
CO River Aqueduct	6140
Groundwater	2915
Recycled Water	1230

The location along the SWP East Branch where water energy intensity is calculated is the Devil Canyon Power Plant, which pumps water to the Deimer Water Treatment Plant

supplying South Orange County. In comparing the estimates of energy intensity between the two studies, the figures match well between the CEC estimate of water supply and conveyance and the Wilkinson estimate for the SWP. In fact the numbers are within 1%. The value for the Colorado River Aqueduct is only 62% of the CEC number. However, this is not unexpected as the source waters and transport systems differ.

In addition to energy intensity, several other factors are necessary to scale the GHG emissions calculated via the GRP. We obtained emissions factors for CO_2, CH_4, and N_2O from CCAR (2009) for the San Diego Gas & Electric Company which provides power to the service area (Table 6-4).

Table 6-4
Table of Emission Factors

Greenhouse Gas	lbs/MWh
CO_2	806.27
CH_4	0.0302
N_2O	0.0081

6.4 GREENHOUSE GAS EMISSIONS SUMMARY FOR SOUTH ORANGE COUNTY

This study is focused specifically on South Orange County and its GHG emissions footprint, thus the energy intensities of Wilkinson (2006) is used for the necessary calculations. The next step is to estimate the amount of water from each of the sources that South Orange County uses for its water supply. As described in Chapter 2, South Orange County obtains the bulk of its water through MWD to MWDOC. MWDOC distributes the water to its member agencies, which in turn distribute it to their respective end users. Using figures from the respective water agencies themselves (ETWD, TCWD, MNWD, LBCWD, SMWD, SCWD, San Juan Capistrano, and San Clemente), and assuming that the proportion of imported water reaching end users from the SWP and the Colorado River Aqueduct is the same as that distributed from Metropolitan (54.5% and 45.5% of imported water), we follow the GRP to calculate the GHG emissions. Table 6-5 shows the GHG emissions calculations for the baseline scenario in which the water use by the local water agencies remains the same as that outlined in the respective 2010 Urban Water Management Plans. If all of the water agencies were to reduce water use from every source by 2%, the GHG emissions would fall proportionally by 2% as shown in Table 6-6. If all water agencies were to reduce water use from every source by 5%, the GHG emissions would again fall proportionally by 5% as shown in Table 6-7.

Table 6-5
Indirect GHG emissions from Electricity Use – Baseline or Current Scenario (3, 4).

Emissions Scenario	Potable Water Estimate MG/yr	Electrical Consumption Factor kwh/MG	Annual Electrical Consumption MWh/yr	CO_2 Emission Factor (6) lbs/MWh	CH_4 Emission Factor (5) lbs/MWh	N_2O Emission Factor (5) lbs/MWh	CO_2 Emission $MTCO_2/yr$	CH_4 Emission $MTCH_4/yr$	N_2O Emission MTN_2O/yr	Annual CO_2e Emissions $MTCO_2e/yr$
SWP East Branch CA Aqueduct (1)	16,352	9820	160,580	806.27	0.0302	0.0081	58,727	2	1	58,956
CO River Aqueduct (1)	13,626	6138	83635	806.27	0.0302	0.0081	30,587	1	0	30,706
Groundwater (1)	1179	2915	3436	806.27	0.0302	0.0081	1257	0	0	1262
Recycled (1)	5399	1228	6627	806.27	0.0302	0.0081	2424	0	0	2433
Subtotal	36,555						92,994	3	1	93,357

(1): Wilkinson et al (2006)

(2): Recycled value obtained from CEC (2006) via Wilkinson et al (2004, 2006)

(3): Methodology taken from CCAR GHG Emissions Protocol 3.1 (2009)

(4): Chart layout taken from UC Davis - Appendix 3: Greenhouse Gas Calculations

(5): CH_4 and N_2O factors retrieved from CCAR (2009)

(6): CO_2 Emission Factor retrieved from CCAR Pup_Metrics_June-2009.xls

Assumptions:

Imported water proportion from CA (54.5%) & CO River (45.5%) Aqueduct the same as distribution from Metropolitan & MWDOC

Electrical consumption factor for "recycled water" is the same as for "recycled surface water"

Natural Gas is not a factor in this calculation

San Diego Gas & Electric provides all power

Table 6-6
Indirect GHG emissions from Electricity Use – 2% Decrease in Water Use Scenario (3, 4).

Emissions Scenario	Potable Water Estimate MG/yr	Electrical Consumption Factor kwh/MG	Annual Electrical Consumption MWh/yr	CO_2 Emission Factor (6) lbs/MWh	CH_4 Emission Factor (5) lbs/MWh	N_2O Emission Factor (5) lbs/MWh	CO_2 Emission $MTCO_2/yr$	CH_4 Emission $MTCH_4/yr$	N_2O Emission MTN_2O/yr	Annual CO_2e Emissions $MTCO_2e/yr$
SWP East Branch CA Aqueduct (1)	16,025	9820	157,368	806.27	0.0302	0.0081	57,553	2	1	57,777
CO River Aqueduct (1)	13,354	6138	81,963	806.27	0.0302	0.0081	29,975	1	0	30,092
Groundwater (1)	1155	2915	3367	806.27	0.0302	0.0081	1232	0	0	1236
Recycled (1)	5291	1228	6495	806.27	0.0302	0.0081	2375	0	0	2384
Subtotal	35,824						91,135	3	1	91,490

(1): Wilkinson et al (2006)

(2): Recycled value obtained from CEC (2006)

(3): Methodology taken from CCAR GHG Emissions Protocol 3.1 (2009)

(4): Chart layout taken from UC Davis - Appendix 3: Greenhouse Gas Calculations

(5): CH_4 and N_2O factors retrieved from CCAR (2009)

(6): CO_2 Emission Factor retrieved from CCAR Pup_Metrics_June-2009.xls

Assumptions:

Imported water proportion from CA (54.5%) & CO River (45.5%) Aqueduct the same as distribution from Metropolitan & MWDOC

Electrical consumption factor for "recycled water" is the same as for "recycled surface water"

Natural Gas is not a factor in this calculation

San Diego Gas & Electric provides all power

Table 6-7
Indirect GHG emissions from Electricity Use – 5% Decrease in Water Use Scenario (3, 4).

Emissions Scenario	Potable Water Estimate MG/yr	Electrical Consumption Factor kwh/MG	Annual Electrical Consumption MWh/yr	CO_2 Emission Factor (6) lbs/MWh	CH_4 Emission Factor (5) lbs/MWh	N_2O Emission Factor (5) lbs/MWh	CO_2 Emission $MTCO_2/yr$	CH_4 Emission $MTCH_4/yr$	N_2O Emission MTN_2O/yr	Annual CO_2e Emissions $MTCO_2e/yr$
SWP East Branch CA Aqueduct (1)	15,534	9820	15,2551	806.27	0.0302	0.0081	55,791	2	1	56,008
CO River Aqueduct (1)	12,945	6138	79,454	806.27	0.0302	0.0081	29,058	1	0	29,171
Groundwater (1)	1120	2915	3264	806.27	0.0302	0.0081	1194	0	0	1198
Recycled (1)	5129	1228	6296	806.27	0.0302	0.0081	2303	0	0	2311
Subtotal	34,728						88,345	3	1	88,689

(1): Wilkinson et al (2006)

(2): Recycled value obtained from CEC (2006)

(3): Methodology taken from CCAR GHG Emissions Protocol 3.1 (2009)

(4): Chart layout taken from UC Davis - Appendix 3: Greenhouse Gas Calculations

(5): CH_4 and N_2O factors retrieved from CCAR (2009)

(6): CO_2 Emission Factor retrieved from CCAR Pup_Metrics_June-2009.xls

Assumptions:

Imported water proportion from CA (54.5%) & CO River (45.5%) Aqueduct the same as distribution from Metropolitan & MWDOC

Electrical consumption factor for "recycled water" is the same as for "recycled surface water"

Natural Gas is not a factor in this calculation

San Diego Gas & Electric provides all power

6.5 SAVINGS IN GREENHOUSE GAS EMISSIONS FOR PROPOSED PROJECTS

Savings in GHG emissions may be quantified by calculating the reduction in emissions proportional to the water savings generated by a particular project, and considering the source of the water. For instance, if a project annually reduces regional imported water use by 5,000 MG, then using the electrical consumption factors and emissions factors from Table 6-5 to Table 6-7 above, the savings in GHG emissions is calculated to be approximately 2,250 $MTCO_2e$ annually. In other words, savings in water volumes translates directly to savings in GHG emissions.

Table 6-8 below provides a template for the calculation of GHG emissions savings. The potable water savings in MG/yr is mulitplied by the appropriate electrical consumption factor in kWh/MG to obtain the annual electrical consumption in MWh/yr. The CO_2 emissions are calculated by multiplying the annual electrical consumption by the CO_2 emission factor. This procedure is repeated to calculate both the CH_4 and N_2O emissions, substituting the appropriate emissions factors. The total emissions for each of the GHGs is multiplied by the appropriate GWP factor (Table 6-1), and the results summed to find the annual CO_2e emissions savings. Close attention must be paid to the units of each value. Detailed equations with conversion factors are included with Table 6-8.

The emissions methodology presented here are applied to the specific projects that have been identified as the high priority projects for this region in Chapter 8.

Table 6-8
Template for GHG Emissions Savings due to Potable Water Savings

Emissions Scenario	Potable Water Savings Estimate MG/yr	Electrical Consumption Factor kwh/MG	Annual Electrical Consumption MWh/yr	CO_2 Emission Factor (6) lbs/MWh	CH_4 Emission Factor (5) lbs/MWh	N_2O Emission Factor (5) lbs/MWh	CO_2 Emission $MTCO_2/yr$	CH_4 Emission $MTCH_4/yr$	N_2O Emission MTN_2O/yr	Annual CO_2e Emissions Savings $MTCO_2e/yr$
SWP East Branch CA Aqueduct (1)	0	9820	0	806.27	0.0302	0.0081	0	0	0	0
CO River Aqueduct (1)	0	6138	0	806.27	0.0302	0.0081	0	0	0	0
Groundwater (1)	0	2915	0	806.27	0.0302	0.0081	0	0	0	0
Recycled (1)	0	1228	0	806.27	0.0302	0.0081	0	0	0	0
Subtotal	0		0				0	0	0	0

Annual Electrical Consumption (MWh/yr) = (Potable Water Savings Estimate (MG/yr) * Electrical Consumption Factor (kWh/MG)) / 1000

CO_2 Emission ($MTCO_2/yr$) = (Annual Electrical Consumption (MWh/yr) * CO_2 Emission Factor (lbs/MWh)) / 2204.62

CH_4 Emission ($MTCH_4/yr$) = (Annual Electrical Consumption (MWh/yr) * CH_4 Emission Factor (lbs/MWh)) / 2204.62

N_2O Emission (MTN_2O/yr) = (Annual Electrical Consumption (MWh/yr) * N_2O Emission Factor (lbs/MWh)) / 2204.62

Annual CO_2e Emissions ($MTCO_2e/yr$) = CO_2 Emission ($MTCO_2/yr$) * GWP CO_2 + CH_4 Emission ($MTCH_4/yr$) * GWP CH_4 + N_2O Emission (MTN_2O/yr)* GWP N_2O

Where:

1000 is the conversion factor between kW and MW

2204.62 is the conversion factor between lbs and metric tons

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7. SEA LEVEL RISE AND ASSOCIATED IMPACTS

Key Points: *Although variable at different points along the coast due to regional factors, in general, sea levels are rising globally due climate warming including expansion of ocean water and melting of land ice. Along the Pacific Coast, the highest values of sea level rise in Southern California have been reported at Newport Beach, near the study region, where the observed increase is 2.22 mm/year. These rates are projected to accelerate over the 21st century. A recent review of different calculation approaches by the National Academy of Sciences reported that global sea level is estimated to rise 8–23 cm (3-9 inches) by 2030 relative to 2000, 18–48 cm by 2050 (7-19 inches), and 50–140 cm (20-55 inches) by 2100. This review projects that sea level in Southern California is slightly higher than the global average because of land subsidence, and will rise 4–30 cm (2-12 inches) by 2030 relative to 2000, 12–61 cm (5-24 inches) by 2050, and 42–167 cm (17-66 inches) by 2100. Maps illustrating the effects of sea level rise to 2100 and a 100-year flood were developed for the South IRWM planning region to identify areas that are vulnerable.*

7.1 SEA LEVEL RISE

Changes in sea level occur due to a complex interaction of climatic and geologic factors. The climatic factors are global, and the sea levels are rising largely because global temperatures are rising, causing ocean water to expand and land ice to melt. Besides this global trend there are also regional changes in ocean and atmospheric circulation patterns in the northern Pacific Ocean that affect sea level. The geologic factors (subsidence, rebound, and uplift) are also regional in nature, and for these reason, actual sea level rise varies by location. Across Southern California locations, the reported ranged over the 20th century is between 0.8 and 2.2 mm/year (data from the National Oceanic and Atmospheric Administration at http://tidesandcurrents.noaa.gov/sltrends). The highest values in Southern California have been reported at Newport Beach, near the study region, where data have been recorded over 1955–1993. Over this period, the recorded mean sea level increase is 2.22 mm/year, which is equivalent to a change of 0.73 feet over 100 years (Figure 7-1). A much longer-term record of sea level change in California is available at San Francisco, and shows more clearly a similar annual increase (2.0 mm/yr) over 1897-2012 (Figure 7-2). These values may be compared with a global 20th century average increase of 1.7 ± 0.5 mm per year (Intergovernmental Panel on Climate Change, 2007). Over a more recent period, 1993–2003, the global increase has been reported to be 3.1± 0.7 mm per year using satellite altimetry data (National Academy of Sciences, 2012).

The relatively slow rate of sea level rise over the 20th century is expected to increase substantially worldwide. An example of the historical and future sea level rise is shown in

Figure 7-5, which displays the rate of sea level rise based on model projections. The increase rate is closely tied to warming temperatures and increases in melting rates of ice packs.

The sea level projections in this document are based on a recent summary of research applicable to the Pacific Coast that was prepared to meet the planning needs of the region (National Academy of Sciences, 2012). Based on an assessment of calculations using multiple GCMs as well as empirical methods, global sea level is estimated to rise 8–23 cm (3-9 inches) by 2030 relative to 2000, 18–48 cm by 2050 (7-19 inches), and 50–140 cm (20-55 inches) by 2100. The global high end projections of sea level rise are nearly 5 feet over levels in 2000 (Figure 7-4). There is uncertainty among the calculation approaches, and the most recent estimates of sea level rise are considerably higher than even those published by the IPCC in 2007 (IPCC AR4, 2007).

For the U.S. Pacific Coast in particular, the rates of relative sea level rise vary among the northern and southern halves. North of Cape Mendocino, in Humboldt County (the westernmost point on the coast of California), the coast is rising about 1.5–3.0 mm per year, and south of this point, the coast is sinking at an average rate of about 1 mm per year. Relative sea level rise, therefore is higher in Southern California and in the study region, compared to the global sea level rise estimates shown in Figure 7-4. For the California coast south of Cape Mendocino, the NAS (2012) report projects that sea level will rise 4–30 cm (2-12 inches) by 2030 relative to 2000, 12–61 cm (5-24 inches) by 2050, and 42–167 cm (17-66 inches) by 2100, i.e., because of land subsidence, the rates of sea level rise are slightly higher than the global average (Figure 7-5). These values are also higher than estimated for the Pacific Coast north of Cape Mendocino.

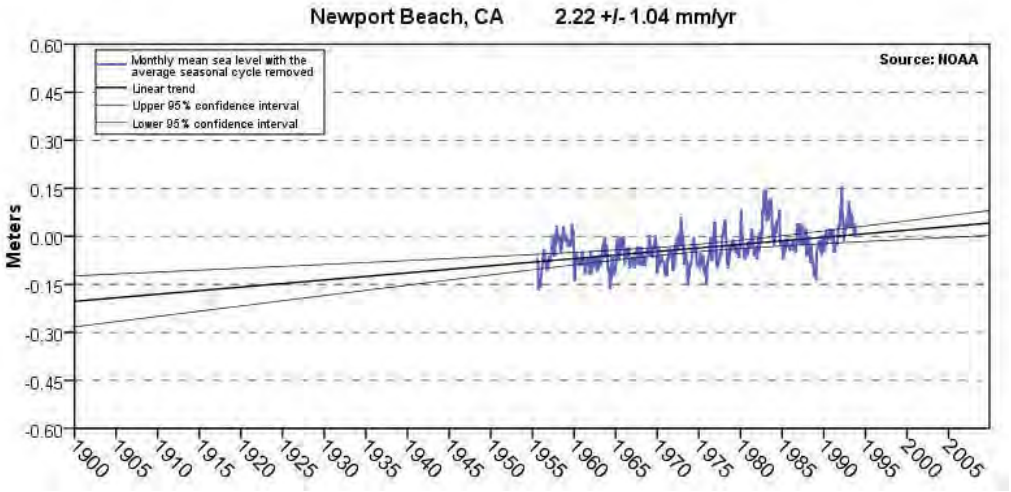

Figure 7-1 **The mean sea level trend is 2.22 millimeters/year with a 95% confidence interval of +/- 1.04 mm/yr based on monthly mean sea level data from 1955 to 1993 at Newport Beach. (Source: http://tidesandcurrents.noaa.gov/sltrends/)**

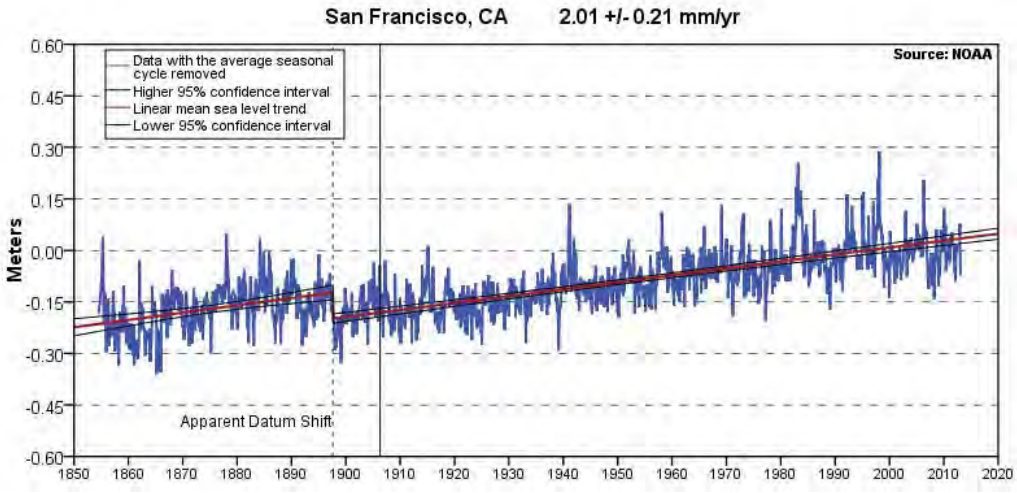

Figure 7-2 **At San Francisco, the mean sea level trend is 2.01 millimeters/year with a 95% confidence interval of +/- 0.21 mm/yr based on monthly mean sea level data from 1897 to 2006. (Source: http://tidesandcurrents.noaa.gov/sltrends/)**

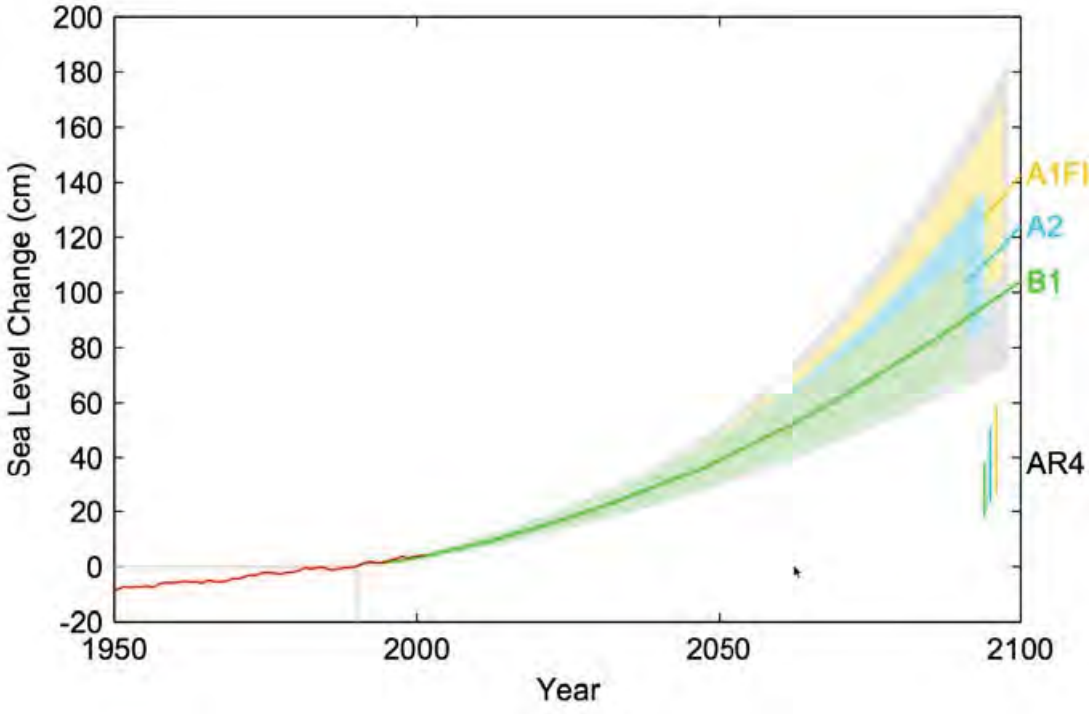

Figure 7-3 **Sea level rise from 1950 to 2100 based on a semi-empirical model (Vermeer and Rahmstorf, 2009) and three emission scenarios (A2, B1, and A1FI). The increase seen over the historical period is expected to accelerate significantly based on this model.**

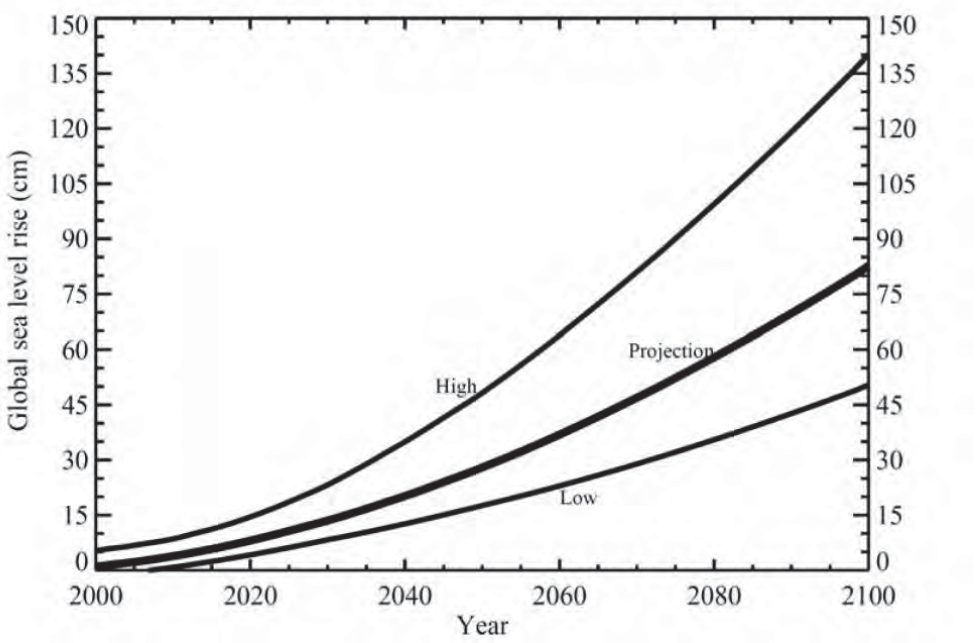

Figure 7-4 **Projection of global sea level rise from 2000 to 2100, along with upper and lower uncertainty bounds, based on an evaluation of the literature and alternative modeling methods (graphic reproduced from National Academy of Sciences, 2012). The models employed for this composite projection are in addition to the Vermeer and Rahmstorf (2009) projections shown in Figure 7-3. Note that the projection shown here are global estimate, and Southern California estimates slightly different, as discussed in the text.**

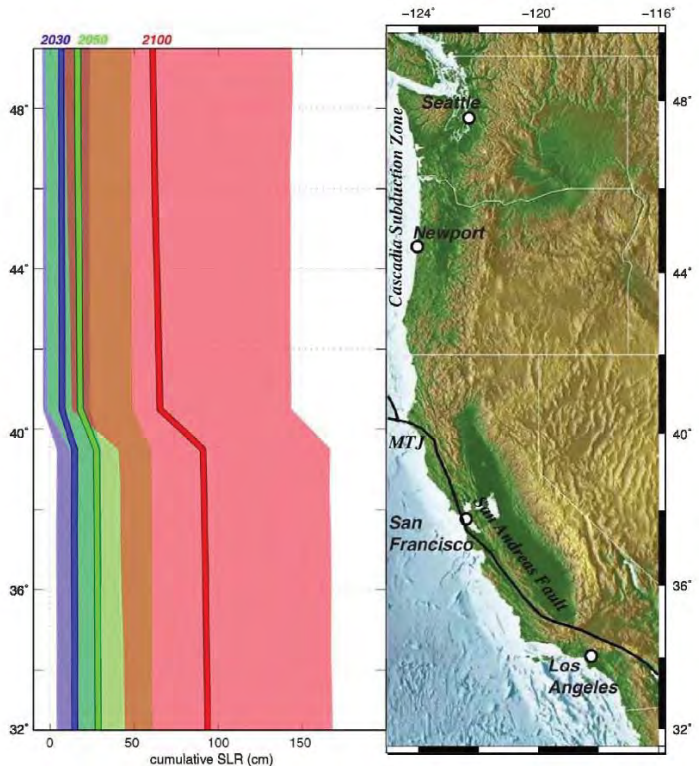

Figure 7-5 **Projected sea-level rise off California, Oregon, and Washington for 2030 (blue), 2050 (green), and 2100 (pink), relative to 2000, as a function of latitude. (Source: National Academy of Sciences, 2012). Cape Mendocino corresponds approximately to the point shown as MTJ on the map, representing the westernmost point along the coast of California, with areas south of it showing a subsidence over time, and areas north showing a rise in the land level. Thus, projected sea level rise is higher in the lower latitudes along the California coast.**

7.2 EXTREME TIDES AND STORM SURGE

One reason sea level rise is so important is that it is a permanent change, having impacts over decades to centuries. However, extreme tides and storm surges are not permanent but may be more damaging since storm surges can contribute flood water above the natural sea level. Indeed, historical events with large waves, storm surges, and high astronomical tides during a strong El Niño can exceed the levels associated with projected sea level rise in 2100 (National Academy of Sciences, 2012). If such extreme events occur simultaneously with future sea level rise, the flooding effects can be severe.

Although climate change is thought to modify storm frequency, magnitude, and direction, there is no consensus among climate model simulations about whether the number and severity of storms will change along the U.S. Pacific Coast. It is possible that storm tracks may move further northward over the 21st century, as projected by some models, but the observational support for this is limited at present. Similarly, observational studies have reported that the largest waves have been getting higher and that winds have been getting stronger in the northeastern Pacific over the past few decades, but the trends are based on limited periods of record (National Academy of Sciences, 2012).

The current state of science does not provide clear evidence of the change of storminess along the Southern California coast, although it is recognized that even with current levels of storminess, future sea-level rise will magnify the adverse impact of storm surges and high waves along the coast.

7.3 AREAS IMPACTED BY SEA LEVEL RISE

For the purpose of this analysis, we identified areas in the South OC region that are vulnerable to coastal flooding as a consequence of sea level rise to 2100 under the conditions of a 100-year flood--the flood having a one percent chance of being equaled or exceeded in any given year--termed as the base flood by the Federal Emergency Management Agency (FEMA). Although geographically focused on the study area, this approach follows the methodology presented on the State of California's decision support website, Cal-Adapt (*http://www.cal-adapt.org*), developed for estimations such as those presented in this report. The base flood is the national standard used by the National Flood Insurance Program (NFIP) and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. Base Flood Elevations (BFEs) are typically shown on Flood Insurance Rate Maps (FIRMs). The computed elevation to which floodwater is anticipated to rise during the base flood. Base Flood Elevations (BFEs) are shown on Flood Insurance Rate Maps (FIRMs) and on the flood profiles. The BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium. To compute the effect of sea level rise, we took the BFE values (in feet, NAVD88 datum) for the South OC region from FEMA and added 55 inches of sea level rise corresponding to the year 2100. The 55-inch value, representing a high estimate of sea level rise, although not the highest projection of 66 inches noted above, was used for consistency with the numbers in the Cal-Adapt website.

Maps displaying areas in the South OC planning region under threat of inundation during a 100-year flood under future conditions of sea level rise were developed. The region-wide map of inundation (Figure 7-6) shows that the areas influenced by future coastal flooding, with some exceptions, occur along a narrow strip along the coast. This is largely due to the topography along the South OC coast. To better view the areas of potential impact, a series of six maps are presented that show the affected regions from north to south (Figure 7-7 to Figure 7-12).

These maps are considered initial assessments for the purpose of the IRWM, and follow a reasonably simplified approach for large scale analysis, consistent with the methodology presented in Cal-Adapt. Importantly, this approach does not take into account protective structures such as levees and sea walls, which may reduce the extent of inundation. Although helpful as a tool to assess relative risks, these maps cannot be used to assess actual coastal hazards, insurance requirements, or property values. More detailed assessments are typically performed though Flood Insurance Studies by FEMA and presented through updated FIRMs.

Figure 7-6 **Projected inundation areas (in yellow) corresponding to a 55-inch rise in sea-level along South OC. The areas of inundation in this region occur along a narrow strip along the coastline and do not extend inland. There is a vulnerable wastewater treatment plant near Dana Point that is identified on the map.**

Figure 7-7 **Zoomed-in area of South OC coastline, zone 1, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's BFE values in feet.**

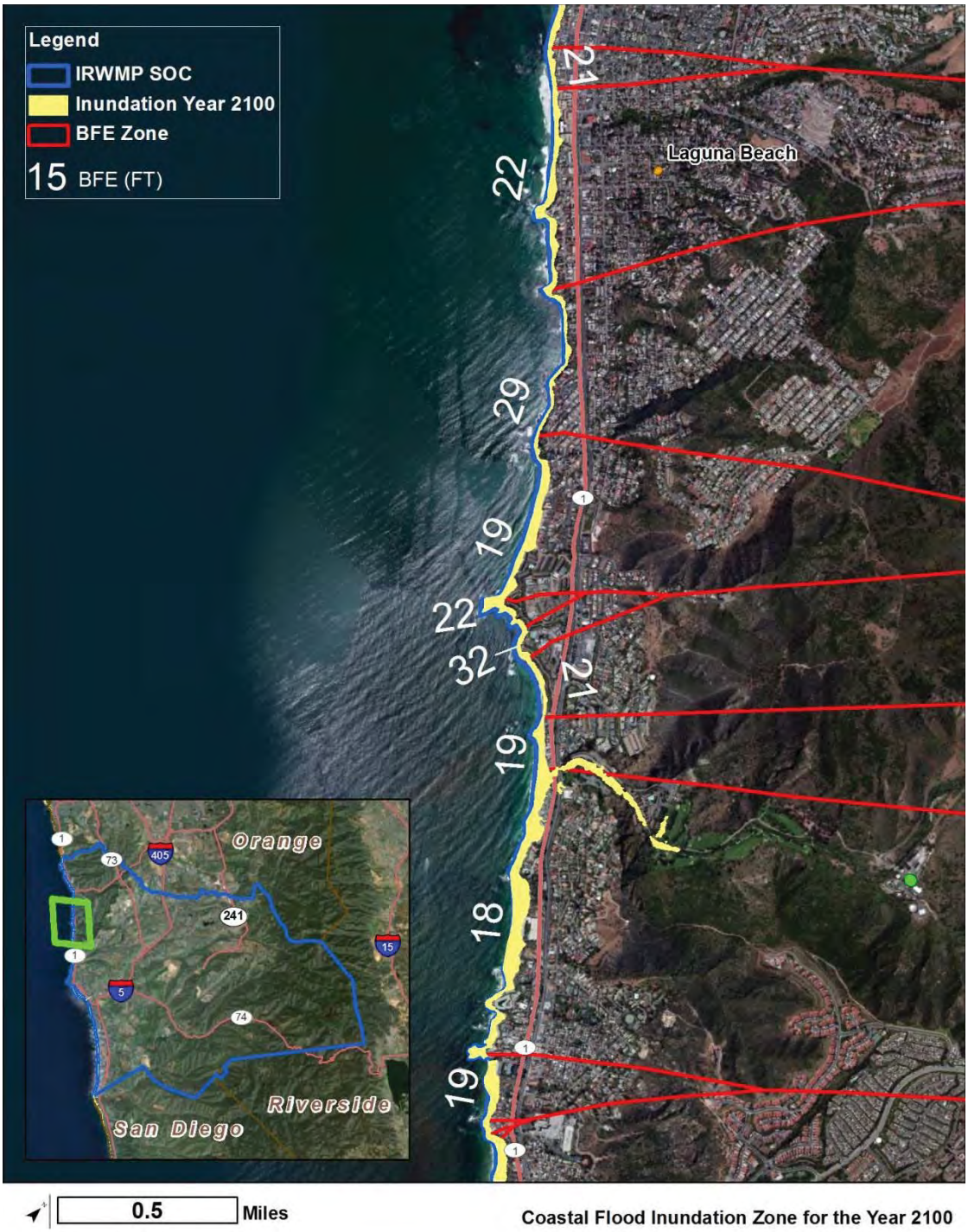

Figure 7-8 **Zoomed-in area of South OC coastline, zone 2, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's BFE values in feet.**

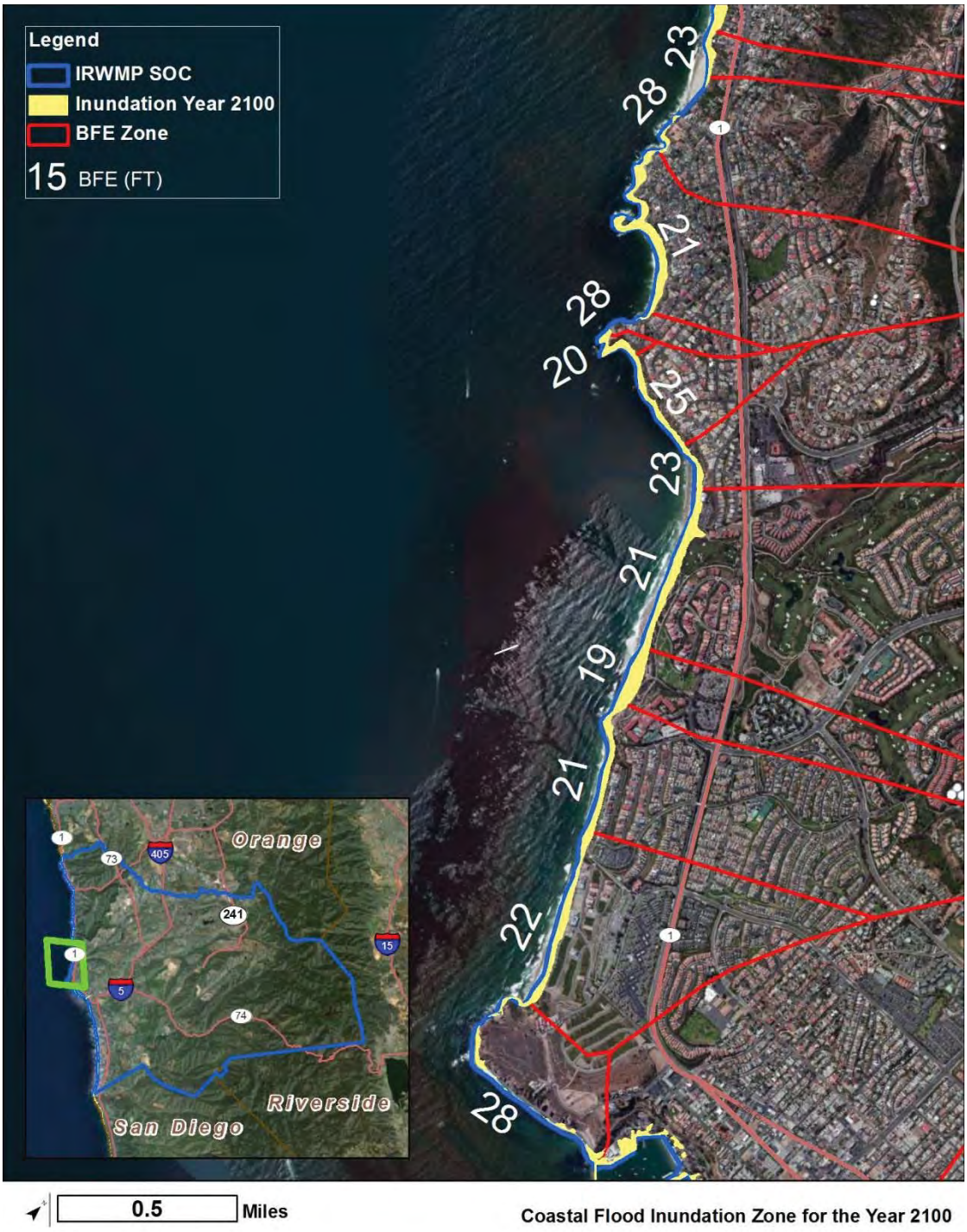

Figure 7-9 **Zoomed-in area of South OC coastline, zone 3, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's BFE values in feet.**

Figure 7-10 **Zoomed-in area of South OC coastline, zone 4, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's BFE values in feet. The red symbol denotes the Latham Wastewater Treatment Plant.**

Figure 7-11 **Zoomed-in area of South OC coastline, zone 5, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's BFE values in feet.**

Figure 7-12 **Zoomed-in area of South OC coastline, zone 6, identifying areas (in yellow) that are under flooding threat due to the combined effects of a 100-year flood and sea-level rise to 2100 (55 inches). Numbers along the coastline are FEMA's BFE values in feet.**

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8. PROPOSED IRWM PROJECTS AND RELATIONSHIP TO CLIMATE CHANGE

Key Points: *The projects identified as regional high priority projects are summarized and their relationship to climate change is impacts and greenhouse gases summarized. The high priority projects have the potential to save about 17,000 metric tons of CO_2-equivalent emissions, nearly 18% of the current total water sector emissions.*

The local response to climate change needs to be broad-based and also incremental as various engineered and natural systems respond to changes such as increased temperature, changes in precipitation and runoff, and also meet the current goals of reducing greenhouse gas emissions. Given this context, we evaluate seven projects (or groups of projects) that have been identified for funding under current IRWM funding cycle, for their relationship to climate change. The projects are briefly described and their relationship to the broader climate change assessment presented in Table 8-1. The estimated GHG emission savings that are associated with the implementation of these projects, where the water use impacts could be quantified, are presented in Table 8-2. In aggregate, the projects have the potential to save about 17,000 metric tons of CO_2-equivalent emissions, nearly 18% of the total water sector emissions today. However, much of the decrease is associated with the assumption that the Baker Water Treatment Plant will utilize up to 50% of local supplies as its feedwater. This assumption is based on information provided by the project proponent that 5,000 to 20,000 AF/yr of local water supply may be utilized out of total production of 28,345 AF/yr from the plant.

Table 8-1
Summary of projects identified for IRWM funding and relevance to climate change

Rank	Project Name	Description	Relevance to Climate Change Impacts
1	Comprehensive Landscape Water Use Efficiency Program	MWDOC proposes the implementation of a comprehensive landscape improvement program targeting residential and commercial properties throughout the plan area. The program will encourage the removal of 10.3 acres of non-functional turf replaced with California Friendly landscape; the upgrade of 1,500 antiquated irrigation timers to smart water application irrigation controllers (smart timers); and the conversion of 50,000 high-volume conventional spray irrigation heads to low-precipitation-rate irrigation equipment (rotating nozzles and drip). These improvements will result in water savings, a reduction of dry-weather runoff, pollution prevention, and reduced maintenance costs. The expected total water savings is more than 888 acre-feet per year or 8,883 acre-feet over the 10-year life of the landscape improvements.	Reduces urban water demand, and the associated energy and GHG emissions associated with imported water conveyance and treatment. Protects water quality of local groundwaters which are being developed for potable supply. Promotes applied research for technologies to reduce urban water use, with implications throughout the Western U.S.
2	Constructed wetland for improving quality of urban runoff form Dairy Fork Subwatershed	Project involves construction of a wetland to treat dry weather urban runoff prior to the confluence with Aliso Creek.	Dampens peak flows and downstream flooding; can store a volume of 72,000 cubic feet of stormwater. Reduces the need for downstream water treatment at the reclamation SOCWA Reclamation Plant. Decreases energy use and GHG emissions.

Table 8-1 (continued)
Summary of projects identified for IRWM funding and relevance to climate change

Rank	Project Name	Description	Relevance to Climate Change Impacts
3	Audubon Starr Ranch Sanctuary	Project includes two years of non-chemical invasive control, restoration, and vegetation and wildlife monitoring within the 4.7 mile section (125 acres) of Bell Creek protected within Starr Ranch borders.	Improve flood protection by enhancing native vegetation growth in riparian zone. Improve riparian habitat; provide baseline monitoring data for flora and fauna in Bell Creek, and help long-term management of ecological resources in the region and detect climate change impacts. Enhance groundwater recharge, and resilience of local water supply, by removing non-native vegetation. Demonstrate application of non-chemical methods for invasive species control, which use less energy and have lower associated GHG emissions. This project can serve as a test bed for wider application of non-chemical methods in the region.
4	San Juan Creek Watershed Diversion	Construction of a major storm drain dry weather flow diversion and trash removal unit in the San Juan Creek watershed (358 acres), directly discharging to San Juan Creek and the Pacific Ocean at Doheny State Beach. Includes removal of up to 2 acres of invasive Arundo in Dana Point or the upper watershed.	Protects coastal water quality by separating and managing dry weather flows.

Table 8-1 (continued)
Summary of projects identified for IRWM funding and relevance to climate change

Rank	Project Name	Description	Relevance to Climate Change Impacts
5	Irvine Ranch Water District, Baker Treatment Plant	The Project includes design and construction of a new 28 million gallons per day (mgd) membrane surface water treatment plant that will increase water supply reliability for nearly one million people that reside in the South Orange County communities	Allows use of local runoff and groundwater for potable supply, minimizing the energy costs of imported water from MWD. Local supplies are less vulnerable to statewide impacts such as drought and loss of snowpack. This project frees up MWD system capacity for use by other agencies and may also provide operational flexibility, particularly during peak demand and/or drought periods.
6	Oso Creek Multi-Use Trails Project	Demonstration project for green infrastructure, replacing roadway pavement along Oso Creek with permeable bikeway and walking surfaces and native landscaping areas, and providing stormwater hydromodification facilities and groundwater recharge, for new creekside trailways	Improved groundwater recharge for enhancing local water supply. Stormwater capture will minimize peak flows. Improves non-vehicular mobility, thus decreasing GHG emissions from automobiles.
7	Water Conservation Programs in South Coast Water District	The proposed projects will lead to reductions in water demand through targeted education, analysis of existing water/recycled water demands, rebate programs for landscaping and plumbing fixture replacements, and increased leak detection activities. Proposed increases in staff have been allocated to analyze, plan, implement and measure the results of these activities. The goal is to reduce water demand by 5,600 acre-feet over the life of the program, assumed to be an 8 year period from 2013-2020.	Reduces urban water demand, and the associated energy and GHG emissions associated with imported water conveyance and treatment. Reduces the need for imported water from MWD sources that are vulnerable to climate change (sources in the Sierra Nevada and the Rocky Mountains). Protects water quality of local groundwaters which are being developed for potable supply.

Table 8-2
GHG emissions estimated for IRWM projects using the methodology presented in Chapter 6

Number	Project Name	Water Savings Per Year (million gallons) (1 AF = 326,000 gallons)	Assumptions	Annual GHG Emissions Reduced (MTCO2e/yr)
1	Comprehensive Landscape Water Use Efficiency Program	289	Water saved is imported in the ratio 45% from Colorado River Aqueduct and 55% from the State Water Project	866
2	Constructed wetland for improving quality of urban runoff form Dairy Fork Subwatershed	Not quantified		
3	Audubon Starr Ranch Sanctuary	Not quantified		
4	San Juan Creek Watershed Diversion	Not quantified		
5	Irvine Ranch Water District, Baker Treatment Plant	5,110	50% of the water is assumed to be local supply, 50% imported. Water savings are associated with substitution of imported water supply with local supplies.	15,315
6	Oso Creek Multi-Use Trails Project	Not quantified		
7	Water Conservation Programs in South Coast Water District	228	Water saved is imported in the ratio 55 from Colorado River Aqueduct and 45% from the State Water Project	683

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9. CLIMATE CHANGE VULNERABILITY ASSESSMENT

Key Points: *This section presents an overall assessment of vulnerability to climate change for South OC. The assessment follows a checklist presented in the Climate Change Handbook for Regional Water Planning, developed by DWR. As noted throughout this document, the major water supply system vulnerabilities in this region are not unique, but are tied to the water supply system in California and the Colorado River Basin that are being evaluated through statewide or regional efforts. Besides water supply, other areas of potential concern for this planning region are coastal flooding due to sea level rise, increase in fire risk, and impacts to ecosystems.*

A local vulnerability assessment, applicable to resources in South OC, was performed using a checklist presented in the Climate Change Handbook for Regional Water Planning (DWR and EPA, 2011, presented as Box 4-1 in the source document). This checklist is meant to identify potential vulnerabilities to water supply, water quality, flooding, ecosystems and habitats, and hydropower. This is a broad list and the goal is to identify vulnerabilities at a high level and provide a summary of the most important climate-related risks for the region.

9.1 WATER DEMAND

1. *Are there any major industries that require cooling/process water in your planning region?*

   There are no major cooling water/process water using industries in the South OC region, according to the Urban Water Management Plans for MWDOC and its member agencies that were reviewed for the development of this report. The major demand for water in the region is for municipal use.

2. *Does water use vary by more than 50% seasonally in parts of your region?*

   Monthly or seasonal water use data are not provided in any of the Urban Water Management Plans for the region. Because the water use is largely municipal, with a small component for landscape irrigation, it is expected that the seasonal variation will not exceed 50%.

3. *Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?*

   Agricultural water use is a very small component of the water use in the region, and is zero for 6 of 8 water agencies and less than 2% for the other two agencies (San Juan Capistrano and Trabuco Canyon Water District). Because this is such a small component

of water use in the region, climate impacts are not expected to have a large overall effect of water demand.

4. *Do groundwater supplies in your region lack resiliency after drought events?*

   Drought effects on groundwater may be relevant for the San Juan Basin within the South Orange County Planning region.,

5. *Are water use curtailment measures effective in your region?*

   Yes, all water agencies in the South OC region have adopted Water Shortage Contingency Plans adopted within their respective Urban Water Management Plans. These plans are updated at least every five years and have been effective in responding to both drought and other water emergencies such as pipeline breaks and treatment plant shutdowns. Other measures, such as assigned weekly outdoor watering days have been effective as well.

6. *Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?*

   Historically most streams in the region were intermittent. Where streams receive urban runoff flows or groundwater is supplemented by landscape irrigation, streams have become perennial. No in-stream flow requirements have been established in the South OC region due primarily to its arid hydrology.

9.2 WATER SUPPLY

1. *Does a portion of the water supply in your region come from snowmelt?*

   Roughly 90% of the water supply in the region originates from sources external to South OC. The imported water is supplied by MWD and originates as snowmelt in the Sierra Nevada and Rocky Mountains.

2. *Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?*

   A majority of the water supply in the region (nearly 90%) originates from the Delta and from the Colorado River.

3. *Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?*

   Groundwater is a small, but important component of the water supply in the South OC region. The San Juan Basin in South OC, a source of groundwater supply, may have a problem with seawater intrusion, which is a concern because the City of San Juan Capistrano is very invested and is taking a large part of its regular potable water supply from the basin.

4. *Would your region have difficulty in storing carryover supply surpluses from year to year?*

   South OC relies on Metropolitan's extensive water storage capabilities. At present, Metropolitan has approximately 2.65 million acre feet in storage for future use. This storage is outside the planning region.

5. *Has your region faced a drought in the past during which it failed to meet local water demands?*

   There is no record of local water needs not being met in the recent past. Looking forward, regional planning done by MWD indicated that it will be able to meet full service demands from 2015 to 2035 for various types of water years including years that consider an extremely dry year such as 1977, and a multiple dry year condition (1990, 1991, and 1992) (MWDOC, 2012). Longer term planning, beyond a 20-year time frame, is not typically performed by these agencies.

6. *Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?*

   Some habitat areas along stream courses have become infested with Arundo and other exotic species. Aliso Creek Watershed and the San Juan Capistrano watershed have invasive species that reduce water flows in those creeks, in the case of Aliso Creek that limits the water available to the Aliso Creek Runoff Recovery facility that SCWD is now constructing. The presence and spawning of quagga mussels in the lower Colorado River from Lake Mead through Lake Havasu also poses a threat to Metropolitan and other Colorado River water users. Although the introduction of this species into drinking water supplies does not typically result in violation of drinking water standards, invasive mussel infestations can adversely impact aquatic environments. In 2007, Metropolitan developed a quagga mussel control plan (QMCP) incorporating enhanced detection, surveillance, and mitigation strategies.

9.3 WATER QUALITY

1. *Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?*

   Increased wildfire risk as a result of urban growth and climate change is a risk in the South OC planning area. More broadly, many of the reservoirs that are part of California's water supply system that manage water flows into the Delta are surrounded by lands that are susceptible to fire. Thus, there is a potential for indirect impacts to water quality. Fire risk maps for the planning region have recently been completed and available at: www.fire.ca.gov/fire_prevention/fire_prevention_wildland_zones_maps.php. Several cities in the planning region have Very High Fire Hazard Severity zones within their boundaries.

2. *Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?*

   The South OC region does not rely on local surface water sources with eutrophication related concerns, because most of the local sources are in the form of groundwater or recycled water. However, potential eutrophication is a concern in the external supplies especially along the California aqueduct where there is potential for algal growth and creation of organic carbon that can serve as a precursor for disinfection byproduct (DBP)

formation during drinking water treatment. DBPs are carcinogens and elevated levels of organic carbon in source waters are a concern.

3. *Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?*

   Seasonal low flows have been observed to decrease as water district conservation measures have reduced urban runoff discharge into streams. Concentrations of certain constituents naturally occurring in local groundwaters have been observed to increase in surface streams due to lessening of dilution by low flow urban runoff.

4. *Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?*

   Several water bodies in the planning region are listed on the San Diego Regional Water Board list on impaired waters (the 303(d) list), implying that one or more beneficial uses are not being met. The listings include nutrients (nitrogen and phosphorus), total dissolved solids, diazinon, toxicity, enterococcus and coliform bacteria, and turbidity. Total maximum daily load (TMDL) assessments for different water bodies are planned over the next decade.

5. *Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?*

   Storm flows that find their way into sanitary sewer systems can impact treatment times and resultant quality of recycled water supply and water supplies from Aliso Creek being proposed for use in the Aliso Creek Runoff Recovery Facility.

9.4 SEA LEVEL RISE

1. *Has coastal erosion already been observed in your region?*

   Coastal erosion has been observed in the region, both over the long and short term (Hapke et al., 2009).

2. *Are there coastal structures, such as levees or breakwaters, in your region?*

   The Dana Point Harbor is a coastal structure that may be affected by sea level rise.

3. *Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?*

   Areas that are within the inundation zone are described in Chapter 7 of this assessment. There is private and public infrastructure, including a wastewater treatment plant (South Orange County Wastewater Authority JB Latham Plant) that may be considered vulnerable to sea level rise.

4. *Are there climate-sensitive low-lying coastal habitats in your region?*

   There are some low-lying coastal habitats in the South OC region, but because of the regional topography, their areal extent along the coastline is small.

5. *Are there areas in your region that currently flood during extreme high tides or storm surges?*

There are areas in the South OC region that are currently under risk of coastal flooding as determined by FEMA.

6. *Is there land subsidence in the coastal areas of your region?*

   Based on statewide data, the South OC region, and Southern California in general, is subsiding at the rate of 1 mm/yr (NAS, 2012).

7. *Do tidal gauges along the coastal parts of your region show an increase over the past several decades?*

   Tide gauges at a nearby location operated by the National Oceanic and Atmospheric Administration (Newport Beach), with data from 1955–1993, show an increase in mean sea level of 2.22 mm/yr. This corresponds to a sea level increase of 0.73 feet over the past century. These data are shown in Chapter 7 of this assessment.

9.5 FLOODING

1. *Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/.*

   The 200-year floodplains have not been developed for Orange County, following the above link and maps at http://gis.bam.water.ca.gov/bam/. Based on other information, the South Coast Water District groundwater recovery facility and the JB Latham Wastewater Treatment Plants are within areas that would be substantially negatively impacted by a 200-year flood event.

2. *Does part of your region lie within the Sacramento-San Joaquin Drainage District?*

   No, the region falls outside the Sacramento-San Joaquin Drainage District.

3. *Does aging critical flood protection infrastructure exist in your region?*

   Yes. Also, see response to the following question.

4. *Have flood control facilities (such as impoundment structures) been insufficient in the past?*

   In the 1960's residential homes were being developed over agricultural land and the channel infrastructure was constructed to convey the 25-year storm event. With the inception of the National Flood Insurance Program in 1978, the design criteria "100-year storm event" for channel infrastructure was introduced. The Orange County Flood Control District has been and continues to improve its flood control infrastructure and uphold this threshold. To date only 50% been constructed to adequately convey the 100-year storm flow and approximately $2.5 billion dollars today is estimated to construct the remaining (Countywide).

   Although the overall condition has slightly improved over recent years, it remains a daunting task faced by the state and local jurisdictions to continuously upgrade, repair, and maintain the systems which provide public safety. The local levees and flood control systems are aging and in some areas do not meet the current standards. These deficient and marginally adequate facilities are increasingly impacting the abilities of jurisdictions to keep pace with maintenance efforts. The problem is further compounded by the

increasingly more stringent environmental regulations including additional mitigation for ongoing maintenance of flood control facilities, which are driving the costs up and forcing jurisdictions to limit the extent of systems that can be annually maintained.

FEMA is remapping coastal zones on the Flood Insurance Rate Map (FIRM) to depict the climate change in regards to sea level rise. Coastal cities must be prepared to regulate any impacts the FIRM may have in their jurisdiction.

5. *Are wildfires a concern in parts of your region?*

   Wildfire is a major concern in the parts of the South OC region, with a large fraction of the region being defined to be in the very high risk zone by CalFire (*http://www.fire.ca.gov/fire_prevention/fhsz_maps_orange.php*). In the future, wildfire risk is expected to increase as a consequence of changed precipitation and urban growth.

9.6 ECOSYSTEMS AND HABITAT VULNERABILITY

1. *Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?*

   The region contains coastal habitats that are vulnerable to sedimentation issues. The San Juan Creek Estuary is highly impacted by excess sediment which adversely affects it habitat suitability for fish species.

2. *Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?*

   There are estuaries in the region that rely on freshwater patterns and tidal flushing (Aliso and San Juan Creek Estuary).

3. *Do climate-sensitive fauna or flora populations live in your region?*

   Temperature sensitive fish species, such as steelhead in Trabuco and San Juan Creek exist in the region.

4. *Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?*

   The U.S. Fish and Wildlife Service notes the *possible* presence of 33 endangered and threatened species of birds, fish, crustaceans, amphibians, flowering plants, and insects in the region. More broadly, the protection of endangered aquatic species in the Delta and Central Valley (Delta smelt, Chinook salmon, and Central Valley steelhead) affects the operation of the State Water Project, and the delivery of water to MWD.

5. *Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?*

   Water dependent recreation along the Pacific Ocean is an important part of the economy of the South OC region.

6. *Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?*

Some creeks in the region have been identified to have stressors to aquatic life, including water quality, barriers, and temperature. While the San Juan Creek watershed has no major dams, there are a number of smaller diversions and other impediments to fish passage. Water management and land use practices have altered natural sediment and hydrologic processes in the region.

7. *Do estuaries, coastal dunes, wetlands, marches, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?*

   Estuaries, coastal dunes and beaches exist in the region. Coastal storms leading to erosion are possible in the region.

8. *Does your region include one or more of the habitats described in the Endangered Species Coalitions' Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?*

   The Endangered Species Coalition's report identifies the Bay-Delta which is an area that is indirectly linked to the water supply for South OC via the California aqueduct.

9. *Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?*

   The South OC region is densely urbanized with a large fraction of developed land. Over the 20th century there has been a loss of estuarine habitat in the broader region. While there has been widespread habitat degradation to the coastal and middle mainstems in these watersheds, native non-anadromous steelhead populations do inhabit the relatively high-quality habitat that remains in the upper portions of the watersheds. No specific future projects are known that might impede species movement, although a Steelhead Recovery Watershed Management Plan proposes a variety of future steps to improve populations.

9.7 HYDROPOWER

1. *Is hydropower a source of electricity in your region?*

   The hydropower plants in the region in the region are small (<10 MW capacity), but hydropower is a part of the energy portfolio for some of the major utilities supplying power to the region (San Diego Gas and Electric and Southern California Edison). More importantly hydropower is a major source of electricity for the State Water Project that is used to transport water from Northern to Southern California

2. *Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in you region?*

   Electricity needs are expected to increase according to forecasts made by the major utilities: San Diego Gas and Electric (1.95% per year growth in consumption) and Southern California Edison (1.1% per year) (data from California Energy Commission (2012). There are no known plans for hydropower generation in the region.

9.8 CONCLUSIONS FROM VULNERABILITY ASSESSMENT

The vulnerability assessment above is a summary of major climate change related sensitivities to the human and natural systems in the planning region. Given the characteristics of the region and its largely imported water supply, not all of the impacts are likely to be as important. Based on the discussion and information presented above, following concerns are of particular importance for each of the topic areas:

Water demand: There little quantitative evaluation of the impacts of climate change on water demands in the South OC planning region. Given increased temperatures and evapotranspiration, it is expected that landscape irrigation use may tend to increase. However, this is countered by the statewide mandate to reduce per capita use by 20%, and it is likely that this mandate will override any climate-related changes. In addition, significant investments in the development of recycled water continue to be made by water agencies throughout the South OC region. These recycled water supplies are used primarily for irrigation of urban landscape further offsetting potential increased irrigation needs associated with climate change.

Water supply: Climate change has the potential to impact water supplies because of the dependence on snowmelt. However, the South OC planning region is part of a much larger network of supply, storage, and delivery infrastructure that spans the Southwestern U.S., and climate change planning for water supplies is being done at this larger regional scale. Over the near to medium term (20 years), water supplies are constrained, but various management options undertaken by MWD and MWDOC, including storage, banking, and water use efficiency, indicate that water supply reliability levels will be met.

Water quality: The water quality effects of climate change in the study region have not been quantified, although it is possible that larger precipitation events or longer dry periods both adversely affect stream water quality. Warmer temperatures in summer have the potential to increase wildfire risk in the region, a substantial portion of which is already considered to be at high risk.

Sea level rise: Sea level rise is a potential concern in the region, but the topography of the South OC region indicates that the areas affected by coastal flooding may be limited to a narrow strip along the coastline, without extensive flooding inland. There is a wastewater treatment plant in the region that is considered vulnerable to sea level rise (Latham Wastewater Treatment Plant). The analysis presented here is based on a preliminary assessment of coastal flooding in the context of sea level rise, although specific urban areas may need to do more detailed characterization and dynamic modeling to fully assess impacts The potential for enhanced erosion along beaches and bluffs is also a concern.

Flooding: Areas of the South OC region, particularly along the canyons are liable to flooding (http://ocflood.com). There is aging flood protection infrastructure or infrastructure that needs to be upgraded to meet current flood protection levels. The region in general may be adversely impacted by a very large flood, such as that caused by large atmospheric river events.

Ecosystems and habitat vulnerability: Changes in stream temperatures have the potential to adversely impact endangered fish species that occur in the creeks and estuaries of the South OC planning region.

Hydropower: The dependence of the region on hydropower is indirect, largely through the its use for the transport of State Water Project water to Southern California. Impacts on hydropower production will be felt regionally, and not only to the planning region.

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10. SUMMARY AND NEXT STEPS

This document presented an assessment of the potential impacts of climate change on the water resources of South Orange County (South OC) that addresses IRWM plan standards developed by DWR. The intent of the Climate Change Standard is to ensure that IRWM Plans, describe, consider, and address the effects of climate change on their regions, and similarly, and disclose, consider, and when possible, reduce when GHG emissions.

As a first step, this assessment reviewed the water supply sources summarized in the Urban Water Management Plans of the wholesale suppliers and retail agencies in the South OC region. MWD provides Orange County with the bulk of its water. According to its 2010 Urban Water Management Plan, approximately 55% of the water provided to the county is from the State Water Project (SWP), and 45% of the water is from the Colorado River Aqueduct. The Municipal Water District of Orange County (MWDOC) is the entity interfacing with local water agencies in the South Orange County region. It distributes water to the local water agencies including El Toro Water District (ETWD), Trabuco Canyon Water District (TCWD), Moulton Niguel Water District (MNWD), Laguna Beach County Water District (LBCWD), Santa Margarita Water District (SMWD), South Coast Water District (SCWD), San Juan Capistrano, and San Clemente. The total water demand for all 8 districts is 36.5 million gallons per day, and 90% of it is imported obtained from the Sacramento-San Joaquin and Colorado River basins.

Because of the importance of imported water supply to South Orange County, potential impacts of climate change to water resources must be examined over a region broader than the IRWM planning area. Changes in observed climatic variables in this larger region representing the Western U.S. have been examined through data collected in the 20th century. Over this period, particularly in winter and spring, temperatures have risen across western North America. In the second half of the 20th century, the warming in the mountainous western North America has led to a higher rain-to-snow ratio, lower snow water content (one exception is the high Southern Sierra Nevada Mountains where April 1 snow water equivalent has been increasing at the high elevation stations), decline in March snow cover, a shift toward earlier annual snowmelt timing by 5 to 30 days, and changes in the timing of biological events, such as flower blooming. These changes illustrate the effects of climate change on the hydrology of California's mountains, and indicate the need to predict future 21st century changes in order that appropriate adaptation strategies to protect South OC's water-supply sources can be developed.

In California mean annual temperature increases of 0.6 °C, and winter and spring increases of 1.5 °C and 1 °C, have been documented, respectively, and these trends are very unlikely to be solely due to natural variability. The late-spring and early-summer runoff fraction runoff of eight major rivers in the western Sierra Nevada in California have been decreasing since the mid-20th century. There is evidence of trends in climatic and hydrologic variables in western mountain environments in the second half of the 20th century – including

temperature, precipitation, rain-to-snow ratio, snow water content, and snowmelt timing. It has been concluded that many of the changes already observed, are, to a high degree of confidence, attributable to climate change that has already occurred over the latter part of the 20th century.

For estimating future climate conditions, global climate processes are represented using atmosphere-ocean general circulation models (AOGCMs or GCMs, also known as "global climate models"). Several published GCMs, developed by research groups worldwide, are in common use. GCMs are used to project future climate changes based on assumptions of different economic growth pathways and emissions of greenhouse gases, with A1b (medium), A2 (higher) and B1 (lower) being the most common named scenarios used in various climate impact studies. No one model or emission pathway is the best estimate of the future, and, typically, most climate assessments utilize an ensemble of GCM results for evaluating future conditions. In this review, sixteen candidate climate models were selected for evaluation. The primary greenhouse gas (GHG) emission scenarios used are A2 and B1, and bracket a range of conditions. GCM outputs are presented in spatially more detailed form through downscaling, with statistical downscaling being the most commonly used approach. Statistical downscaling is based on the development of relationships between local-scale observations and large scale GCM projections, which are then used to estimate spatially resolved future climate projections. Results from three 21st century periods, statistically downscaled to cells of 1/8 degree or about 12 km by 12 km, were analyzed for impacts in the early, mid, and late 21st century, defined as 2010–2039, 2040–2069, and 2070–2099 respectively. The projected data summary for the South OC IRWM planning region show a small decrease in precipitation of slightly over an inch per year by mid- to late-21st century periods. They also show an increase in temperature from >2 to >5 ^{o}F over the same periods. In general, climate models project more adverse conditions (i.e., warmer and drier) in the latter part of the 21st century compared to conditions observed in the second half of the 20th century.

Several major planning studies have been performed in South OC water supply regions that consider the impacts of climate change. Projected climate change conditions, typically obtained from statistical downscaling of an ensemble of models, have been used for developing plants in in both regions. A key feature that stands out from the comprehensive analyses that have been performed is that both California and the Colorado Basin are severely water constrained, where it will be challenging to meet current allocations in future years. In both regions, planning model projections indicate years where deliveries will sometimes fall short of allocations, over planning horizons that range from 20 to 50 years into the future, under conditions where no changes are made to the existing operational infrastructure of the system. Because the regions jointly affected by these basins are continuing to experience relatively rapid population growth, and anticipated increased in municipal demands, water planners must address the dual challenge of reduced supplies and increased demand.

Although variable at different points along the coast due to regional factors, in general, sea levels are rising globally due climate warming including expansion of ocean water and melting of land ice. Along the Pacific Coast, the highest values of sea level rise in Southern California have been reported at Newport Beach, near the study region, where the observed

increase is 2.22 mm/year. These rates are projected to accelerate over the 21st century. A recent review of different calculation approaches by the National Academy of Sciences reported that global sea level is estimated to rise 8–23 cm (3-9 inches) by 2030 relative to 2000, 18–48 cm by 2050 (7-19 inches), and 50–140 cm (20-55 inches) by 2100. This review projects that sea level in Southern California is slightly higher than the global average because of land subsidence, and will rise 4–30 cm (2-12 inches) by 2030 relative to 2000, 12–61 cm (5-24 inches) by 2050, and 42–167 cm (17-66 inches) by 2100. Maps illustrating the effects of sea level rise to 2100 and a 100-year flood were developed for the South IRWM planning region to identify areas that are vulnerable.

Greenhouse gas emissions associated with the water sector were estimated for the South OC planning region. The General Reporting Protocol, Version 3.1, developed by the California Climate Action Registry is used to calculate indirect emissions of greenhouse gases (GHG) from electricity used for the water system in south Orange County. The water sector is the largest user of electricity in the state of California. The bulk of water for southern California specifically is transported over long distances up steep gradients and is therefore more energy expensive than local sources. Energy use for water is quantified via energy intensity, or the gross energy required for the water system to use a specific amount of water at a specific location. Under baseline conditions, the water sector in the region generates GHG emissions of over 93,000 metric tons in terms of carbon dioxide equivalent. Seven projects identified for the current round of IRWM funding were evaluated for their relationship to climate change and greenhouse gas emissions. The projects identified for funding have the potential to save about 17,000 metric tons of CO_2-equivalent emissions annually, nearly 18% of the current total water sector emissions.

An overall assessment of vulnerability to climate change for South OC following a checklist presented in the Climate Change Handbook for Regional Water Planning, and specifically recommended for IRWM climate change planning. As noted above, the major water supply system vulnerabilities in this region are not unique, but are tied to the water supply system in California and the Colorado River Basin that are being evaluated through statewide or regional efforts. Besides water supply, other areas of potential concern for this planning region are coastal flooding due to sea level rise, increase in fire risk, and impacts to ecosystems.

Taken together, the information presented in this report shows that climate change assessment is an integral part of the water resources related planning in the South OC region, as well as the larger region, spanning the Southwestern U.S., that supplies its water. The best current understanding of climate change has been incorporated in the assessment of impacts, especially those relating to water supply and sea level rise.

10.1 FUTURE WORK

Looking forward, it is expected that climate change planning in support of the IRWM will be updated as better information on climate projections, including extreme events, become available, and impacts to other sectors, such as water quality and habitats will be similarly evaluated. Examples of possible future work are described below.

Given the coastal location of the South OC IRWM planning region, more detailed analysis of the effects of sea level rise in specific areas along the coastline are required. These analyses need to consider the dynamics of storm surges, and the existing protective infrastructure that exists. To support understanding of sea level rise impacts, there should be continued data collection on the wave climate (height, period, direction) in the region. From the standpoint of water supply and water quality, the impact of sea level rise on the Latham Wastewater Treatment Plant needs to be considered.

Climate change, on larger geographic scales, is expected to increase the intensity of precipitation events through the occurrence of atmospheric rivers along the Pacific coast, with the possibility of increased riverine flooding. However, there is limited quantitative information at the spatial scale of a county that can be used to assess the degree to which flooding extents may change. Further developments in climate modeling as well as local data can provide more insight into changes that are occurring. The county may also interface with other research groups in the region that are evaluating the effects of large floods across California (such as the ARkStorm, for Atmospheric River 1000 Storm, project being performed by the US Geological Survey, http://urbanearth.gps.caltech.edu/winter-storm-2). These scenario runs show planners the extent of damage that may occur across the state, including in Orange County. This planning exercise informs local-level agencies to address the effects of major storm event, in a manner similar to that used for exercises related to earthquake preparedness in California.

Climate projections are subject to updates as models are updated and different scenarios are run. The climate projections presented here are based on the IPCC fourth assessment (IPCC AR4, 2007), but a new set of projections are expected in 2013/2014 (the fifth assessment), and may provide more current information for planners. Similarly, there is an ongoing effort to develop detailed dynamically downscaled climate projections for North America (North American Regional Climate Change Assessment Program or NARCCAP, http://www.narccap.ucar.edu/), that may provide a more spatially and temporally detailed information on future climate in the South OC planning region.

The current water supply planning efforts in California are mostly focused over a 20-year planning horizon. Most climate models do not project major changes in climate over this time frame. Additional, longer-term planning studies, perhaps extending 50-75 years into the future may provide greater insight for planners in support of long-term infrastructure sustainability assessment and for investments with a lifetime greater than 20 years.

The creeks and estuaries of the South OC region are home to several native fish species that are the focus of ongoing recovery efforts that may be affected adversely by climate change. A plan for continued monitoring of stream flows, water quality and temperature across the South OC region is recommended for understanding and managing these species impacts. To further support the ecosystem functions of the planning region, watershed modeling to quantify future impacts is also recommended.

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APPENDIX K

Round 3 Goals & Objectives

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TETRA TECH

MEMORANDUM

TO:	Marilyn Thoms, Watershed Program
FROM:	Patti Sexton, P.E; Tetra Tech
JOB TITLE:	SOCWMA IRWMP
SUBJECT:	Round 3 Goals – Improvements to Quantifying Goals
DATE:	September 25, 2013

Based on the experience rating projects for Round 2 IRMWP Implementation Grants and to prepare for Round 3, focus groups were established to refine the goals, objectives, and strategies. One purpose of the update is to better reflect what was intended with each of the goals by updating the objectives and strategies. The second purpose is to improve the ability to quantify project impacts and measure the progress within each goal.

Updated goals, objectives and strategies will be finalized by each of the focus groups by March, 2014 and will be presented to the Management Committee for their acceptance. Final review will be undertaken after Round 3 guidelines have been released and will be incorporated into the IRWM Plan prior to the next adoption.

Below is the status of each of the focus groups and a summary of the progress. The attachment to this memorandum provides the spreadsheet for each goal that reflects the updated goal statement, objectives, and strategies.

The Water Supply Focus Group

The Water Supply Focus Group was led by Bob Hill (ETWD) and met on June 11, 2013. Attendees to the initial meeting included Bob Hill (ETWD), Mark Tettemer (IRWD), Hector Ruiz (TCWD), Dave Rebensdorf (City of San Clemente), Richard Gardener (NGO), Betty Burnett (SCWD), Marilyn Thoms (County), and Patti Sexton (Tetra Tech).

The goal for the Water Supply Goal was stated as "Protect Existing Water Supply, Increase Water Supply by 22,000 acf/y and Improve Reliability to achieve 60 days off MET by 2020. The goal was established based on the increased demand projected in the South Orange County Water Reliability Study (MWDOC 2013 Table 4). The following table identifies the objectives that were defined:

Table 1. Water Supply Objectives

WS1 - Improve/Increase groundwater supplies in SOCWMA
WS2 - Improve/Increase efficient use of recycled water from municipal wastewater sources
WS3 - Increase capture and utilization of urban runoff for irrigation purposes
WS4 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020
WS5 - Improve Water Supply and System Reliability
WS-6 - Research, Evaluation, Planning, and Education

The attachment to this memorandum includes the worksheet that lists the Water Supply Goal and the objectives. Potential strategies to meet the objective are provided.

Objectives WS1 – WS5 focus on constructible projects. The score for each objective is based on the quantity of acre-feet per year (afy) produced or protected by the project being scored. A single project could meet multiple objectives and would therefore be scored under multiple objectives. Scores received under multiple objectives are added together to determine the score for that specific goal. The score for the goal can be thought of as a measurement of how well the project does in meeting the goal – which is to protect existing water supply and increase water supply by 22,000 afy.

The score received under each objective is modified based on other considerations (or factors). For water supply projects the critical factors are being developed by the group but will likely include the cost per acre-foot. Cost per acre-foot accounts for the cost to develop or protect the water and the life span of the project.

Objective WS6 is a planning objective and is discussed following the discussion of each specific goal.

The Water Use Efficiency Focus Group

The Water Use Efficiency Focus Group was led by Joe Berg (MWDOC) and met on June 13, 2013. Attendees to the initial meeting included Tracy Ingebrigsten (Laguna Beach), Kelly Winsor (MNWD), Devin Slaven (City of Lake Forest), Marilyn Thoms (County), and Patti Sexton (Tetra Tech). Roger Butow (Clean Water Now) was not in attendance but was part of the email coordination.

The overall goal for Water Use Efficiency Goal was defined to be "Promote Water Use Efficiency to Achieve 1,730 acre-feet/year Demand Reduction by 2020". The goal was established based on the South Orange County portion of the countywide water use efficiency established in the Orange County Water Use Efficiency Master Plan (2013). This number is based on the goals of the programs that have been adopted as part of that Master Plan. The total countywide goal was reduced based on the proportion of features (landscaped area, commercial facilities, etc.) in South Orange County. SOCWMA accounts for 1,730 acre-feet/year of the total savings projected for 2020. The following objectives to meet this goal were identified:

Table 2. Water Use Efficiency Objectives

WC1 - Reduce consumption from outdoor residential, commerical, industrial, and institutional landscapes
WC2 - Reduce consumption through enhanced water utility operations
WC3 - Reduce consumption from indoor residential, commercial, industrial, and institutional uses
WC4 - Research, Evaluation, Planning & Education

The attachment to this memorandum includes the worksheet that lists the Water Use Efficiency Goal and the objectives. Potential strategies to meet the objective are provided.

Objectives WC1 – WC3 focus on constructible projects. The score for each objective is based on the quantity of acre-feet per year (afy) produced or protected by the project being scored. A single project could meet multiple objectives and would therefore be scored under multiple objectives. Scores received under multiple objectives are added together to determine the score for that specific goal. The score for the goal can be thought of as a measurement of how well the project does in meeting the goal – which is to achieve 1,730 acre-feet/year of demand reduction.

The score received under each objective is modified based on other considerations (or factors). For water use efficiency projects the critical factors are being developed by the group but will likely include the cost per acre-foot. Cost per acre-foot accounts for the cost to develop or protect the water and the life span of the project.

Objective WC4 is a planning objective and is discussed following the discussion of each specific goal.

The Flood Focus Group

The Flood Focus Group was led by Ziad Mazboudi (San Juan Capistrano) and met on July 31, 2013. Attendees to the initial meeting included Penny Lew (OCFCD), Mike Granda (OCFCD), Mehdi Sobhani (OCFCD), Brian Peck (SOCWA), Brad Fowler (Dana Point), Marilyn Thoms (County), and Patti Sexton (Tetra Tech). George Sutherland (Trouts Unlimited) was not in attendance but was part of the email coordination.

The overall goal for Flood Goal was defined to be "Reduce Flood Risk to Life and Property over the 82,000 developed acres within the SOCWMA by 2020". The goal was established based on the total developed acres that are within the SOCWMA. The following objectives to meet this goal were identified:

Table 3. Flood Management Objectives

FM1: Improve conveyance and/or reliability of channelized flood control systems and related facilities
FM2: Remove properties from the 100-year floodplain
FM3: Reduce scour and erosion to river, stream, and channel banks
FM4: Improve sub-regional facilities and local storm drain systems where historical flooding exists where the regional system has the capacity to accept the additional flows
FM5: Preserve or return floodplains as open space
FM6: Planning, studies, research to acquire Best Data

The attachment to this memorandum includes the worksheet that lists the Flood Goal and the objectives. Potential strategies to meet the objectives are provided.

Objectives FM1 – FM5 focus on constructible projects. The score for each objective is based on the quantity of acres over which the flood risk is reduced by the project being scored. A single project could meet multiple objectives and would therefore be scored under multiple objectives. Scores received under multiple objectives are added together to determine the score for that specific goal. The score for the goal can be thought of as a measurement of how well the project does in meeting the goal – which is to reduced flood risk over the 82,000 developed acres within the SOCWMA.

Additional factors to consider in the scoring for the flood goal are under discussion.

Objective FM6 is a planning objective and is discussed following the discussion of each specific goal.

The Natural Resources Group

The Natural Resources Focus Group was led by Nancy Palmer (Laguna Niguel) and met on August 13, 2013. Attendees to the initial meeting included Sandy Desimone (Audobon-Starr Ranch), Pete Desimone (Audobon-Starr Ranch), Celia Kutcher (Native Plant Society), Brittany Struck (NOAA), Joey Soto (Soto Resources), Marilyn Thoms (County), and Patti Sexton (Tetra Tech).

The overall goal for Natural Resources Goal was defined to be "Conserve and Benefit X Acres of Natural Resources and Ecosystem by 2020". The quantity associated with this goal is under discussion. The following objectives to meet this goal were identified:

Table 4. Natural Resources Objectives

NR1 - Benefit aquatic and riparian ecosystems
NR2 - Benefit terrestrial resources
NR3 - Benefit air, climate, an energy resources
NR4 - Research, evaluation, monitoring, planning, and education

The attachment to this memorandum includes the worksheet that lists the Natural Resource Goal and the objectives. Potential strategies to meet the objectives are provided.

Objectives NR1 – NR3 focus on constructible projects. The score for each objective is based on the quantity of acres of natural resources and ecosystems that are benefitted by the project being scored. A single project could meet multiple objectives and would therefore be scored under multiple objectives. Scores received under multiple objectives are added together to determine the score for that specific goal. The score for the goal can be thought of as a measurement of how well the project does in meeting the goal.

Additional factors to consider in the scoring for the natural resources goal is under discussion.

Objective NR-4 is a planning objective and is discussed following the discussion of each specific goal.

The Water Quality Group

The Water Quality Focus Group was led by Brad Fowler (Dana Point) and met on August 28, 2013. Attendees to the initial meeting included Nancy Palmer (Laguna Niguel), Mike Beanan (South Laguna Civic Association), Penny Elia (Sierra Club), Lisa Zawaski (Dana Point), Marilyn Thoms (County), and Patti Sexton (Tetra Tech).

The overall goal for the Water Quality Goal was defined to be "Improve Water Quality over the 82,000 developed acres and throughout the SOCWMA by 2020". The following objectives to meet this goal were identified:

Table 5. Water Quality Objectives

WQ1: Control anthropogenic pollutants over the developed area (82,000 acres) of the SOCWMA
WQ2: Control anthropogenic dry weather flows from the developed area (82,000 acres) within the SOCWMA
WQ3: Control wet weather flows to meet NPDES MS4 permit criteria from 82,000 acres within the SOCWMA
WQ4: Improve water quality regulatory framework and/or awareness and/or knowledge of water quality issues within the SOCWMA area (168,000 acres)

The attachment to this memorandum includes the worksheet that lists the Water Quality Goal and the objectives. Potential strategies to meet the objectives are provided.

Objectives WQ1 – WQ3 focus on constructible projects. The score for each objective is based on the quantity of acres of natural resources and ecosystems that are benefitted by the project being scored. A single project could meet multiple objectives and would therefore be scored under multiple objectives. Scores received under multiple objectives are added together to determine the score for that specific goal. The score for the goal can be thought of as a measurement of how well the project does in meeting the goal.

Additional factors to consider in the scoring of the project for the natural resources goal are under discussion. Factors discussed include the impacted area, efficiency, and the life span.

Objective WQ-4 is a planning objective and is discussed following the discussion of each specific goal.

Planning Objectives

The last objective in each goal is related to planning and research rather than project implementation. This objective is scored differently and is based on the following line of thinking:

- A project that makes significant strides in the planning or research is scored as X-X. The scoring would need to consider how well the project addresses the strategy and how much the goal is addressed.
- A project that makes moderate strides in the planning or research for protecting or increasing water supply is scored as Y-Y. The scoring would need to consider how well the project addresses the strategy and how much the goal is addressed.
- A project that makes minor strides in the planning or research protecting or increasing water supply is scored as Z-Z. The scoring would need to consider how well the project addresses the strategy and how much the goal is addressed.

It should be understood that this objective is very qualitative in nature. It is anticipated that scoring initially provided in this area by a project proponent will need to be evaluated against other projects submitted that scored in this objective. This evaluation will be focused on ensuring an appropriate score in this objective relative to other projects. As the evaluation process matures, this objective may be further refined to provide more detailed scoring guidance.

Strategies

It is important to note that additional strategies could be developed for a project that meets the specified objective and can be incorporated in the "Other" strategy listed under each Objective. The intent of the strategies is to help clarify what was envisioned by the Focus Group in development of the objective but it is NOT intended to limit the way in which the objectives can be met

MEMORANDUM

ATTACHMENT

GOAL SHEETS INCLUDING GOAL, OBJECTIVES, STRATEGIES

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Reduce Flood Risk to Life and Property over the 82,000 developed acres within the SOCWMA by 2020
FM1: Improve conveyance and/or reliability of channelized flood control systems and related facilities
#1: Construct Channel improvement projects to convey the 100-year storm event
#2: Remove invasive vegetation to convey the 100-year storm event
#3: OTHER
FM2: Remove properties from the 100-year floodplain
#1: Construct Channel improvement projects to contain the 100-year storm event within the channel
#2: Plan Local watershed improvements (e.g. raising land above flood elevation, removing structures in floodplain)
#3: Perform more detailed studies that support objective
#4: OTHER
FM3: Reduce scour and erosion to river, stream, and channel banks
#1: Incorporate hydromodification retrofits to existing development
#2: Incorporate grade control structures or other improvements to reduce or eliminate scour and erosion to Channel
#3: OTHER
FM4: . Improve sub-regional facilities and local storm drain systems where historical flooding exists where the regional system has the capacity to accept the additional flows
#1: Plan and construct Infrastructure improvements
#2: OTHER
FM5: Preserve or return floodplains as open space
#1: Purchase land and dedicate as open space
#2: Work with Planning departments to encourage open space from developers and other entities
#3: OTHER
FM6: Planning, studies, research to acquire Best Data
#1: Update FEMA floodplain studies
#2: Improve OC Flood Deficiency Studies
#3: Obtain LiDAR within SOCWMA
#4: Obtain new or updated discharges
#5: OTHER

Protect Natural Resources		
NR-1 - Benefit aquatic and riparian ecosystems		
#1-Manage developed areas to minimize impacts on downstream aquatic ecosystems		
#2-Eliminate anthropogenic impacts to marine ASBS's		
#3-Construct artificial wetlands where feasible and appropriate to buffer the impacts of development on natural aquatic ecosystems		
#4- Retrofit stormflow attenuation processes, devices and/or permeable surfacing into developments to restore natural hydrologic patterns (i.e. natural flow regimes)		
#5-Improve water quality of runoff from developed areas		
#6-Eradicate non-native, harmful invasive plant and animal species		
#7: Re-establish native communities along stream courses		
#8: Provide opportunities for controlled recreational access and enjoyment of aquatic and terrestrial ecosystem areas to minimize the environmental impacts of uncontrolled use		
#9: Stabilize streams and urban-impacted channels utilizing bioengineering techniques		
#10: Restore currently restricted floodplains to their natural/original condition, including the natural/original extent of inundated riparian vegetation during higher flows (i.e., storm events)		
#11: Removal of water diversions from steelhead-bearing creeks that preclude natural stream flow regimes to recover and maintain suitable living space for endangered steelhead		
#12: Incorporate “climate smart” conservation principles in restoration projects: add species to plant palettes that would do favorably under projected climate extremes.		
#13: Incorporate climate smart conservation principles: adopt strategies that are robust in an uncertain future (e.g. sea level rise, extended drought).		
#14: Incorporate climate smart conservation principles: safeguard people and wildlife from projected climate extremes		
#15: OTHER		
NR-2 - Benefit terrestrial resources		
#1: Manage developed areas to minimize impacts on downstream terrestrial ecosystems		
#2: Eradicate non-native, harmful invasive plant and animal species		
#3: Provide opportunities for controlled recreational access and enjoyment of aquatic and terrestrial ecosystem areas to minimize the environmental impacts of uncontrolled use		
#4: Reduce soild waste generation		
#5: Manage vegetation to balance fire-safety needs with restoration and enhancement of native habitat		
#6: Incorporate “climate smart” conservation principles in restoration: add species to plant palettes that would do favorably under projected climate extremes.		
#7: Incorporate climate smart conservation principles: adopt strategies that are robust in an uncertain future (e.g. sea level rise, extended drought).		
#8: Incorporate climate smart conservation principles: safeguard people and wildlife from projected climate extremes.		
#6: OTHER		
NR-3 - Benefit air, climate, an energy resources		
#1: Promote recovery and recycling of solid waste materials collected from streets or surface drainage		
#2: Reduce carbon footprint		
#3: Reduce soild waste generation		
#4: OTHER		
NR-4 - Research, evaluation, monitoring, planning, and education		
#1: Promote scientific research, technology development and investigative studies		
#2: Initiate a climate-focused study to monitor and track water temperature in steelhead-bearing streams within the county of Orange		
#3: OTHER		

IMPROVE WATER QUALITY over the 82,000 developed acres and throughout the SOCWMA by 2020
WQ1: Control anthropogenic pollutants over the developed area (82,000 acres) of the SOCWMA
#1: Implement pollution prevention measures, including non-structural BMPs, not including educational activities
#2: Implement structural controls
#3: Implement LID strategies targeting anthroprogenic pollutants
#4: Retrofit soil erosion and sedimentation controls (includes hydromodification)
#5: Improve or protect the quality of water that may reach a water supply source
#6: Improve or protect the quality of recycled water
#7: Implement measures to reduce health risk/rate of illness in recreational waters, where risk has been identified
#8: OTHER
WQ2: Control anthropogenic dry weather flows from the developed area (82,000 acres) within the SOCWMA
#1: Implement dry weather flow prevention measures, including non-structural BMPs (i.e. onsite / source controls)
#2: Implement dry weather flow volume reduction measures (e.g. diversions)
#3: OTHER
WQ3: Control wet weather flows to meet NPDES MS4 permit criteria from 82,000 acres within the SOCWMA
#1: Implement storm water prevention measures, including non-structural BMPs (i.e. onsite / source controls)
#2: Implement storm water structural controls
#3: Implement hydromodification management measures
#4: OTHER
WQ4: Improve water quality regulatory framework and/or awareness and/or knowledge of water quality issues within the SOCWMA area (168,000 acres)
#1: Conduct studies, planning, research, evaluations, or monitoring projects
#2: Pursue site specific objectives (SSOs), Use Attainability Analysis (UAA), Qualitative Microbial Risk Assessment (QMRAs), development of subcategories of Beneficial Use Designations, etc.
#3: Implement programs to comply with TMDLs
#4: Develop and/or implement programs to educate and/or increase awareness and knowledge
#5: OTHER

Protect Existing 108,000 acf/y Water Supply, Increase Water Supply by 22,000 acf/y and Improve Reliability to achieve 60 days off MET by 2020	Score	Value	Units
WS1 - Improve/Increase groundwater supplies in SOCWMA			
#1: Increase use of groundwater for potable supply by 2015			Acre-Feet
#2: Protect aquifers from saltwater intrusion and contamination from natural or man-made sources			Acre-Feet Protected
#3: Eliminate negative impacts to groundwater resources from non-native plants (Arundo)			Acre-Feet Protected
#4: Identify and cap abandoned wells where groundwater supply is susceptible to contamination			Acre-Feet Protected
WS2 - Improve/Increase efficient use of recycled water from municipal wastewater sources			
#1: Increase recycled water production and distribution capacity			Acre-Feet
#2: Support improvements in the quality of recycled water and development of Salinity Management Plans			Acre-Feet Improved
WS3 - Increase capture and utilization of urban runoff for irrigation purposes			
#1: Increase direct non-potable reuse of urban runoff			Acre-Feet Captured
#2: Incorporate supply improvement aspects where feasible in storm/runoff/natural watercourse management projects			Acre-Feet Captured
WS4 - Produce 15 MGD of ocean water desalination as a new drought proof supply by 2020			
#1: Produce Doheny Desalination water			Acre-Feet
#2: Produce Huntington Beach Desalination water			Acre-Feet
WS5 - Improve Water Supply and System Reliability			
#1: Improve system reliability through various methods by 2020			YES/NO
#2: Improve supply reliability through various methods by 2030			YES/NO
WS-6 - Research, Evaluation, Planning, and Education		0.00	
#1: Examine pursuit of feasibility studies, state and federal funding and institutional arrangements to develop Ocean Desalination facilities (Doheny, Huntington Beach and Camp Pendleton)			
#2: Participate in Met Integrated Resources Planning and on-going evaluation /quantification of import supply and delivery vulnerability			YES/NO
#3: Support San Juan Basin Authority's (SJBA) groundwater and ocean desalination optimization program			YES/NO
#4: Evaluate/Investigate opportunities for import water, urban runoff and recycled water groundwater recharge that maximizes local basin storage/annual yield and enhances efficiency of basin management			YES/NO
#5: Evaluate opportunities to integrate Cadiz and Strand Ranch water transfers into the Orange County System on a permanent and/or emergency basis			YES/NO
#6: Evaluate opportunities to develop regional recycled water seasonal storage and interagency connections to economically maximize the production/delivery of recycled water across individual agency service area boundaries			YES/NO
#7: Seek technical and funding assistance to support and encourage voluntary and/or mandated on-site customer recycled water conversions			YES/NO
#8: Advocate for local and regional (MWDOC/Met) support for participant supply and system reliability projects that translate into overall improved South Orange County reliability			YES/NO
#9: Support local and regional collaboration to advance the value of water message and the economic benefits associated with dependable water supplies			YES/NO
#10: Explore the feasibility of developing institutional and financial arrangements that could be regionally employed when sharing water resources during an emergency			YES/NO
#11: Investigate options for regional standards and promote use of rain water capture systems			Acre-Feet
#12: Develop a methodology to measure and quantify system/supply reliability improvements and support improvements that increase the ability of individual agencies to increase days off the import system			Acre-Feet

Promote Water Use Efficiency to Achieve 1,730 af/y Demand Reduction by 2020 [1]				
WUE Expansion Program Project Example	**PROJECT SCORE:**	**0**		
		Life Span (years)	Quantity	Units
WC1 - Reduce consumption from outdoor residential, commerical, industrial, and institutional landscapes	0			
#1: Promote use/retrofitting of irrigation system distribution uniformity improvements				Acre-Feet Conserved
#2: Promote the use/retrofitting of low-volume irrigation technologies in urban landscapes				Acre-Feet Conserved
#3: Promote use of native and non-native California Friendly plants in urban landscapes				Acres-Feet irrigation Conserved
#4: Promote the replacement of non-functional turf grass with California Friendly plantings				Acre-Feet Conserved
#5: Promote the use/retrofitting of smart timers in urban landscapes				Acre-Feet Conserved
#6: Other				Acre-Feet Conserved
WC2 - Reduce consumption through enhanced water utility operations				
#1: Implement Distribution System Audit, Leak Detection and Repair programs following AWWA Standards				Acre-Feet Conserved
Implement efficiency based rate structures				Acre-Feet Conserved
#3: Install Smart water metering infrastructure				Acre-Feet Conserved
#4: Implement meter repair and replacement programs following AWWA Standards				Acre-Feet Conserved
#5: Other				Acre-Feet Conserved
WC3 Reduce consumption from indoor residential, commercial, industrial, and institutional uses				
#1: Provide technical assistance and financial incentives to single- and multi-family residential consumers				Acre-Feet Conserved
#2: Promote use/retrofitting of water efficient plumbing fixtures in businesses and institutions				Acre-Feet Conserved
#3: Provide technical assistance and financial incentives for water efficiency to industrial manufacturers				Acre-Feet Conserved
#4: Promote use/retrofitting of water efficient plumbing fixtures in single- and multi-family homes				Acre-Feet Conserved
#5: Other				Acre-Feet Conserved
WC4 - Research, Evaluation, Planning & Education	0			
#1: Update water waste prevention regulations every 5 years				High / Med / Low
#2: Promote leak detection and repair				High / Med / Low
#3: Implement school education and public information programs to consumers				High / Med / Low
#4: Promote use of alternative landscape designs, including Low Impact Development, that maximize stormwater capture				High / Med / Low
#5: Provide technical assistance to single- and multi-family residential consumers				High / Med / Low
#6: Provide landscape water efficiency education to landscape owners and managers				High / Med / Low
#7: Update Orange County's Water Use Efficeincy Master Plan every 5 years				High / Med / Low
#8: Other: research into efficiency factors of the technoology				High / Med / Low

(1) The water use efficiency goal of 1,730 acre feet per year represents South Orange County's share of the water savings goal contained in Orange County's Water Use Efficiency Master Plan.

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