SAN DIEGO
Integrated Regional
Water Management

2019 San Diego Integrated Regional Water Management Plan

Phase 1 Update of the 2013 IRWM Plan

Prepared by the Regional Water Management Group
in collaboration with the Regional Advisory Committee

The City of San Diego *County of San Diego* *San Diego County Water Authority*

Final - November 2018

Download the complete 2019 San Diego IRWM Plan - Phase 1 at : www.sdirwmp.org

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Acronyms and Abbreviations

303(d) List	List of impaired and threatened waters per Clean Water Act §303(d)
AB-32	Assembly Bill 32, the California Global Warming Solutions Act of 2006
ACS	American Community Survey
AF	Acre-feet
AFY	Acre-feet per year
ASBS	Area of Special Biological Significance
AWMP	Agricultural Water Management Plan
Basin Plan	Water Quality Control Plan for the San Diego Basin
Basin Study	San Diego Watershed Basin Study
Bay-Delta	Delta of the Sacramento and San Joaquin Rivers
BLM	United States Bureau of Land Management
BMP	Best management practice
BU	Beneficial Use
Caltrans	California Department of Transportation
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CDPH	California Department of Public Health
CEDEN	California Environmental Data Exchange Network
CEPA	Campo Environmental Protection Agency
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
CFS	Cubic feet per second
City	City of San Diego
CORDC	Coastal Observing Research and Development Center
County	County of San Diego
CPA	Community Planning Area
CSD	Community Services District
CTR	California Toxics Rule
CWP	California Water Plan
DAC	Disadvantaged community
DEH	San Diego County Department of Environmental Health
DFW	California Department of Fish and Wildlife
DMS	Data Management System
DO	Dissolved oxygen
DWR	California Department of Water Resources
EDA	Economically Distressed Area

EJ	Environmental Justice
EHC	Environmental Health Coalition
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Emergency Storage Project
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
Flood Control District	San Diego County Flood Control District
FY	Fiscal Year
GAMA	Groundwater Ambient Monitoring and Assessment
GHG	Greenhouse gas
gpcd	Gallons per capita per day
GRP	Gross Regional Product
GWMP	Groundwater Management Plan
HA	Hydrologic Area
HCP	Habitat Conservation Plan
HU	Hydrologic Unit
IBWC	International Boundary and Water Commission
IFM	Integrated Flood Management
IID	Imperial Irrigation District
IPR	Indirect potable reuse
IRWM	Integrated Regional Water Management
JEA	Jamul Environmental Agency
JPA	Joint Powers Authority
JURMP	Jurisdictional Urban Runoff Management Plan
KDLC	Kumeyaay Diegueno Land Conservancy
LID	Low impact development
LOMC	Letter of Map Change
M&I	Municipal and industrial
MBA	Methylene blue-activated substance
MCL	Maximum Contaminant Level
Metropolitan	Metropolitan Water District of Southern California
Metro System	San Diego Metropolitan Wastewater System
MGD	Million-gallons per day
mg/L	Milligrams per liter
MHI	Median Household Income
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding

MS4	Municipal Separate Storm Sewer System
MSCP	Multiple Species Conservation Program
MSHCP	Multiple Species Habitat Conservation Plan
MSL	Mean sea level
MTBE	Methyl-tertiary-butyl ether
MW	Megawatt
MWD	Municipal Water District
MWTP	Miramar Water Treatment Plant
NCCP	Natural Community Conservation Plan
NGO	Non-governmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NCWRP	North City Water Reclamation Plant
NNE	Nutrient numeric endpoint
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point source
NWIS	National Water Information System
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
O&M	Operations and maintenance
PED	Pala Environmental Department
POTW	Publicly Owned Treatment Works
PPL	Priority Project List
Pt. Loma WWTP	Point Loma Wastewater Treatment Plant
PUD	Public Utility District
QA/QC	Quality Assurance/Quality Control
QSA	Quantification Settlement Agreement
RA	Reservoir augmentation
RAC	Regional Advisory Committee
RAP	Region Acceptance Process
RCAC	Rural Community Assistance Corporation
RCWD	Rancho California Water District
Reclamation	United States Bureau of Reclamation
Region	San Diego IRWM Region
Regional Board	Regional Water Quality Control Board, San Diego Region
RFP	Request for Proposals
RMS	Resource Management Strategies
RWMG	Regional Water Management Group
RWMP	Recycled Water Master Plan

SANDAG	San Diego Association of Governments
SanGIS	San Diego Geographic Information Source
San Diego PUD	City of San Diego Public Utilities Department
SBX7-7	Senate Bill X7-7, the Water Conservation Act of 2009
SCCWRP	Southern California Coastal Water Research Project
SCCOOS	Southern California Coastal Ocean Observing System
SDSU	San Diego State University
SFHA	Special Flood Hazard Area
SIHC	Southern Indian Health Council
SIO	Scripps Institute of Oceanography
SMC	Stormwater Monitoring Coalition
SNMP	Salt and Nutrient Management Plan
SNMP Guidelines	Guidelines for Salinity/Nutrient Management Planning in the San Diego Region
SRF	State Revolving Fund
State Board	State Water Resources Control Board
SWAMP	Surface Water Ambient Monitoring Program
SWP	State Water Project
SWRP	Stormwater Resources Plan
TCR	The Climate Registry
TDS	Total dissolved solids
TMDL	Total Maximum Daily Load
Tri-County FACC	Tri-County Funding Area Coordinating Committee
UCSD	University of California, San Diego
URC	Underrepresented Community
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
UST	Underground Storage Tank
UV	Ultraviolet
UPSD	Unified Port of San Diego
UWMP	Urban Water Management Plan
VID	Vista Irrigation District
Water Authority	San Diego County Water Authority
WDL	Water Data Library
WDR	Waste Discharge Requirement

WMA	Watershed Management Area
WQIP	Water Quality Improvement Plan
WQO	Water quality objective
WURMP	Watershed Urban Runoff Management Plan
WWMP	Wastewater Master Plan

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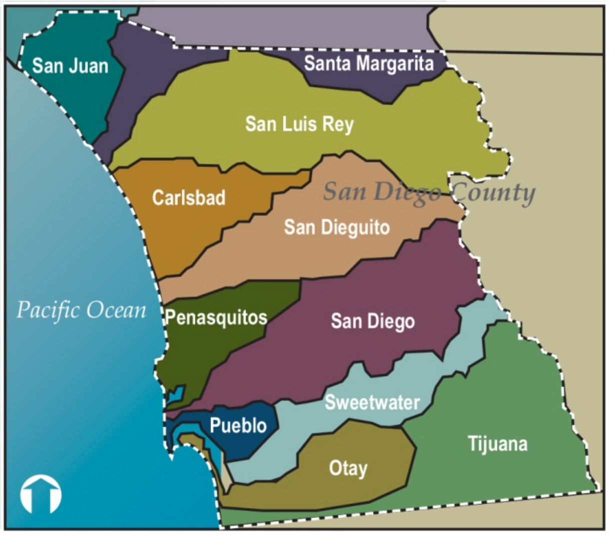
1 Introduction

The San Diego Integrated Regional Water Management (IRWM) Region extends east from the Pacific Ocean, through one of the most populous areas in the nation, to the ridgeline of a forested mountain range (ACS, 2017).

San Diego is an immensely complex border region consisting of 11 watersheds that jointly provide water sufficient to reliably meet only about 15% of the region's current water demands. The region's diverse habitats range from coastal to mountainous, and support more threatened and endangered species than any comparable land area in the nation (County of San Diego, 2009). Most of the 3.2 million people within the region inhabit the urbanized coastal areas, and the population of these areas is expected to increase by 29% percent by 2050, to over 4.0 million, according to the San Diego Association of Governments (SANDAG) forecast (SANDAG, 2013). The 2019 IRWM Plan Update presents an overarching assessment of the San Diego region's water supply, water quality and ecosystem challenges and provides recommendations for sustainable solutions.



The San Diego IRWM Region includes eleven parallel watersheds.

Seeking and implementing integrated water management solutions is not new to the San Diego region. With average precipitation levels of only 10 inches per year at the coast, collaboration has been instrumental to overcoming the challenges of water scarcity. For example, the federal government assisted local agencies with water management issues in 1908 with the formation of the Cleveland National Forest to protect source water supplies. With the formation of the San Diego County Water Authority (Water Authority) in 1944, the diverse communities of the San Diego region formally banded together to build the aqueducts needed to import freshwater supplies. Similarly, the region has worked together over the past 17 years through the Water Authority in the construction of a series of reservoirs, pipelines, treatment plants and pump stations that enable the Water Authority to deliver locally stored water to the region's residents in the event of a water supply outage. In 1998, the Metropolitan Wastewater Joint Powers Authority (Metro JPA) was formed to ensure stakeholder collaboration with regard to San Diego's ocean discharge at Point Loma. In 2000, Project Clean Water (http://www.projectcleanwater.org/) was launched to coordinate on water quality issues of regional significance, and serves as the Regional Clearinghouse for Municipal Stormwater Permit (MS4) plans, reports, data and studies.

A look into the future of integrated water management in San Diego suggests that new levels of collaboration are forthcoming. For example:

- The San Diego region is a leader in the development of potable reuse as a water supply. How will water and wastewater agencies collaborate to ensure effective partnering?
- New stormwater runoff regulations align well with water conservation best management practices (BMPs) for large landscapes. How might stormwater and water agencies work together and with regulators to efficiently partner on conservation programs?
- Stormwater is increasingly being considered as a resource. How might stormwater, water, and environmental agencies, such as the California Environmental Protection Agency and the San Diego Regional Water Quality Control Board, work together to maximize benefits of stormwater capture and use while remaining protective of human health and environmental needs?
- Many local surface waters face water quality impairment from non-point source pollution, bacteria, sediment, nutrients, salinity, metals, and toxic organic compounds. How can water agencies, stormwater agencies, land-use authorities, regulators, and others join forces to effect real local surface water quality improvements?
- The Region encompasses urban and rural disadvantaged communities (DACs) with water management issues in need of being addressed. How can DACs most effectively participate in water management projects benefitting them, and what methods can the IRWM Program use to effectively solicit feedback from and engage these communities?
- The Region includes 18 federally recognized tribes. Many people living or working on tribal lands face water management challenges. How can tribal water management issues be effectively integrated into San Diego's regional water management planning?
- The Region has improved its understanding of the impacts of climate change and is working to identify climate adaptation and mitigation strategies. How might water agencies, land use authorities, regulators, and others work together to increase climate resilience in the region?
- Water agencies have successfully partnered with one another on regional, beneficial programs, supported through IRWM and through their own initiatives. How can agencies and regulators in the region better support and encourage effective partnerships?
- The Region includes land use and water resource jurisdictions that span federal, state, and local levels. How can federal, state, and local resources be leveraged together to increase benefits to the region's water-related resources?

These are but a few of the questions that the San Diego region has begun to answer. Inherent in these opportunities are the cost drivers associated with water supply diversification, wastewater treatment, regulatory compliance, and maintenance of existing infrastructure. Integration is not an end-game, but rather an iterative, adaptive process.

Responsibilities for managing water resources span a multitude of agencies and entities. Natural water demarcations such as river systems do not correspond to political jurisdictions and each of the Region's watersheds span multiple cities and agencies. This often creates jurisdictional complexity for water management. Although water purveyors are integrated in their plans, those that are member agencies of the Water Authority are just one stakeholder group in water. IRWM offers a forum to bring together the diversity of stakeholders into a collaborative approach to water management with reduced overall costs and improved effectiveness and efficiency. The IRWM model, while still evolving, offers the San Diego Region an enhanced approach for sustainable water management.

1.1 IRWM Planning

IRWM planning evolved from a California initiative, aimed at developing long-term water supply reliability, improving water quality, and protecting natural resources. In 2002, the Integrated Regional Water Management (IRWM) Planning Act (SB 1672) was chaptered into State law, establishing the basis of California's IRWM Program. The Statewide IRWM Program is supported by Proposition 50 (2002), Proposition 84 (2006), and Proposition 1 (2014), which are providing bond funding to the California Department of Water Resources (DWR) to fund competitive grants for projects that improve water resources integration and management. The most recent of these is Proposition 1, approved in 2014, which authorized $510 million in IRWM funding that is being used to fund four grant cycles through 2020.

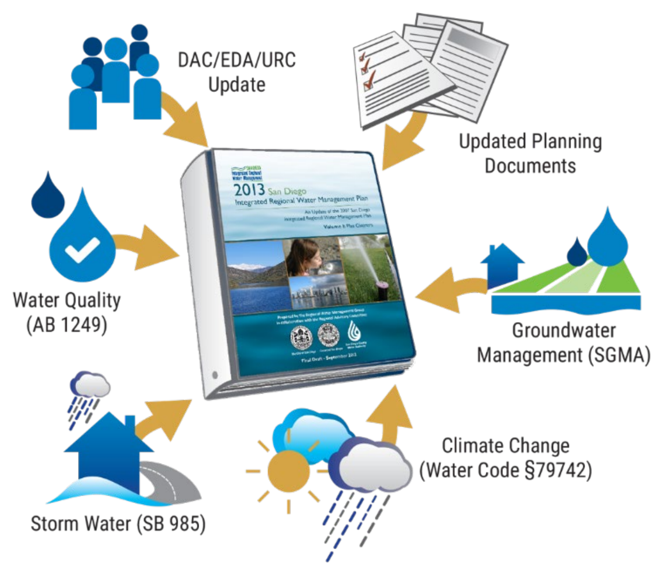
The San Diego IRWM Program was established in 2005 by the San Diego Regional Water Management Group (RWMG), which consists of the San Diego County Water Authority (Water Authority), the City of San Diego (City), and the County of San Diego (County), and since then has achieved substantial success. The San Diego RWMG published its first IRWM Plan in 2007 and has received approximately $91 million to-date through voter-approved bond funding to fund 67 priority projects, the 2013 IRWM Plan Update, and the 2019 IRWM Plan Update. As a regional plan, the San Diego IRWM Plan helps improve collaboration in water resources management across the region and attempts to address the issues and differing perspectives of all the entities involved through mutually beneficial solutions.

The 2013 IRWM Plan was a comprehensive update of the 2007 IRWM Plan. This 2019 IRWM Plan Update – Phase 1 updates the 2013 IRWM Plan for compliance with the 2016 IRWM Guidelines developed by DWR under Proposition 1 (DWR, 2016). The 2019 IRWM Plan Update – Phase 1 maintains the Region's eligibility to receive grant funds available through Proposition 1.

Unique and innovative features of the 2013 IRWM Plan Update included five planning studies developed to address identified water planning needs in the San Diego IRWM Region. The five planning studies were developed by a technical team in conjunction with IRWM stakeholders (see further detail in *Chapter 7, Regional Coordination*) and focused on:

- improving collaboration between IRWM stakeholders and the San Diego Regional Water Quality Control Board (San Diego Water Board),
- developing salinity and nutrient management guidelines and individual basin plans,
- recommending integrated flood management tools that may be utilized by water managers,
- incorporating climate change factors into IRWM planning, and
- examining how land use planning and water resources management may be better integrated.

The 2019 IRWM Plan – Phase 1 incorporates additional planning studies completed by various



This 2019 IRWM Plan Update incorporates new legislative initiatives and updated planning documents.

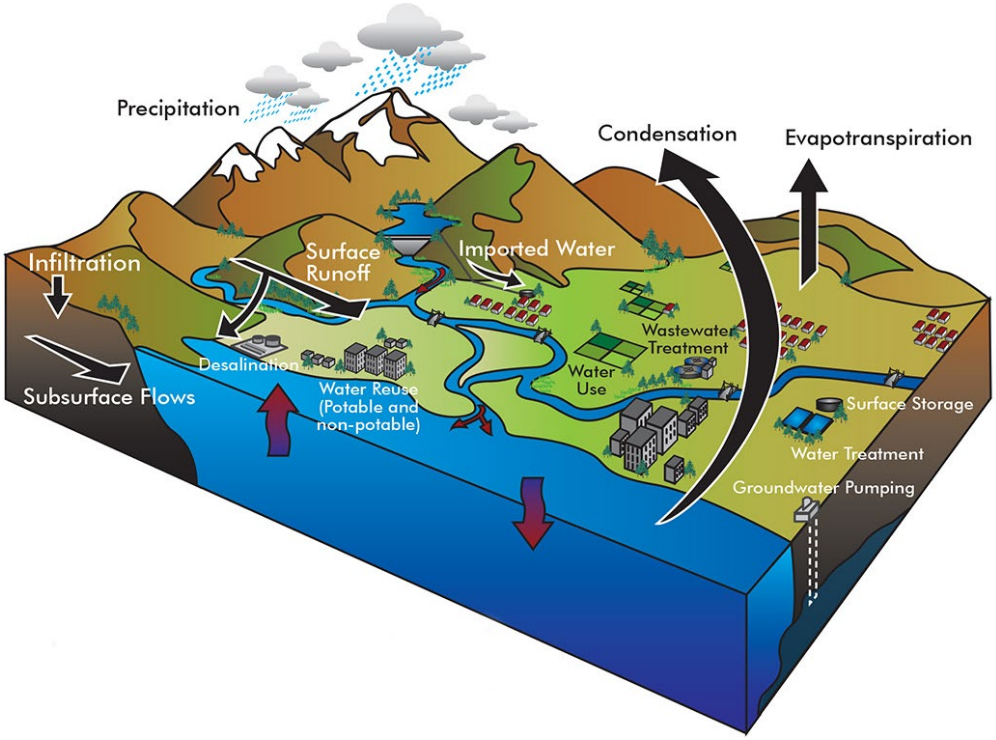
water management organizations in the Region and reflects revised statewide priorities and understanding of water resource management. It builds upon and further strengthens the 2013 IRWM Plan. Since adoption of the 2013 IRWM Plan, there have been a number of changes to water resource regulations and management priorities. The Region has identified a need to update its IRWM Plan as a result of the passage of multiple water-related pieces of legislation, an increased focus on beneficial reuse of stormwater, changes implemented as a result of the recent drought, new planning documents, new understanding of climate change and its potential impacts, and the ongoing success of the IRWM Program. The 2019 IRWM Plan – Phase 1 achieves the following:

- an update of the 2013 IRWM Plan, consistent with the Plan Standards in the Proposition 1 2016 Guidelines, including a more robust climate change adaptation strategy and incorporation of the 2017 Stormwater Resources Plan,
- a planning study in support of the IRWM Plan – the Stormwater Capture Feasibility Study (SWCFS) – that provides a comprehensive analysis and understanding of stormwater resource capture and reuse opportunities for the region, and
- updated descriptions of the conditions, needs, and engagement of disadvantaged communities (DACs), economically distressed areas (EDAs), underrepresented communities (URCs), and environmental justice (EJ) communities in water resources management within the Region.

These additions will improve the San Diego IRWM Region's planning efforts in developing water supply reliability, improving water quality, and protecting natural resources. In addition to allowing the Region to pursue future Proposition 1 funding opportunities, this update supports efforts for improved integrated water management in the Region.

1.1.1 The "I" in IRWM

The "I" in IRWM stands for integration, which is defined as combining or acting in harmony with the whole. The IRWM Program incentivizes agencies and organizations to integrate their water management activities within the "modern" hydrologic cycle – from managing different water sources to protecting water quality to restoring water-related habitat. This "modern" hydrologic cycle incorporates several human influences such as imported water, wastewater treatment and discharge, groundwater pumping, water reuse, and desalination. These human influences can change the natural flow of water within the hydrologic cycle, and where the potential for negative impacts to occur is present, must be managed to avoid negative outcomes while supporting the positive goals of water-resource projects (such as decreasing reliance on imported water, protecting water quality, etc.) . IRWM planning seeks to integrate decision-making by the different water managers so that their management activities can further work together in a mutually supportive manner.



The "modern" hydrologic cycle includes precipitation, infiltration, surface and subsurface flows, as well as water importation, treatment, storage and reuse.

1.2 Plan Overview

The 2019 IRWM Plan Update incorporates stakeholder input, updated planning documents, planning studies completed since the 2007 and 2013 IRWM Plans, and lessons learned through the IRWM Program to identify and address the water management needs of the Region. This update reflects the achievements of the IRWM Program by shifting the focus of the IRWM Plan where necessary and utilizes the increased knowledge of the Region acquired through IRWM studies, projects, and other efforts to improve water resources management. The 2019 IRWM Plan Update reflects the priorities and needs identified by stakeholders through the stakeholder involvement process, and moves the Region's water resources management planning forward to address additional concerns such as sustainable water development, valuing stormwater as a resource, investing in marginalized communities' water systems, and optimizing regional and local infrastructure. The IRWM Program in the San Diego Region is now well-established and its processes and procedures are formalized in this 2019 IRWM Plan Update to reflect the evolution of the IRWM Program. The 2019 IRWM Plan Update further strengthens the Region's commitment to comprehensive regional water resource planning.

1.2.1 Purpose of Plan

The 2019 IRWM Plan Update presents an integrated approach for addressing water management issues within the Region. Through a process that identifies and involves water management stakeholders throughout the Region, the 2019 IRWM Plan Update:

- presents the San Diego IRWM Program's vision and goals,
- establishes water management objectives and measurable targets,
- identifies water management challenges and issues,

- identifies and evaluates applicable water management strategies,
- assesses the ability of the water management strategies to meet the regional objectives,
- identifies opportunities for integrating the regional water system, starting with integration of regional water supply, water quality, and watershed management strategies,
- establishes a system for prioritizing the strategies,
- presents a plan for implementing the water management strategies, and
- identifies the framework for overall integrated regional water management planning in the Region, including future updating of water management strategies and plan priorities.

1.2.2 Plan Organization

This IRWM Plan is organized into four major sections providing in-depth background information about the San Diego region and the identified strategies for moving integrated water management forward. Figure 1-1 illustrates the 2019 IRWM Plan Update structure.

Figure 1-1: Plan Organization

1.2.3 Benefits of Regional Approach

The IRWM planning process provides a mechanism for stakeholders to work together to identify and address the challenges that potentially exist among multiple planning efforts and across diverse disciplines. The IRWM planning process also provides a means to develop and update water management objectives to address the Region's water resources management challenges, overcome potential water management constraints, and identify water management projects and programs for grant funding that help attain the Plan objectives. The 2019 IRWM Plan Update is a result of this process and reflects changes to the Region's water resources management challenges and needs, as indicated by stakeholders.

1.2.4 Existing Planning Environment

Groundwater, inland surface waters, and coastal waters within the Region support a wide variety of water supply needs, recreational uses, and important ecosystems and habitats. Like many urbanized areas in California and throughout the nation, the Region faces challenges in ensuring the long-term sustainability of its water supply, water quality, and watershed resources. A number of agencies on the local, regional and state levels are responsible for developing plans for the San Diego region to help manage water, wastewater, and stormwater resources. Some of these plans are described here.

The Water Authority and 22 of its 24 member agencies prepare *Urban Water Management Plans* (UWMPs) every five years to articulate and balance water supplies and demands throughout their respective service areas (the other two member agencies are not large enough to meet the threshold for preparing an UWMP). These UWMPs provide a summary of water use, wastewater volumes, and recycled water opportunities for each of the urban water suppliers. Water and wastewater agencies also prepare a variety of other water-related planning documents as needed to manage their assets, including reservoir management plans, groundwater management plans, wastewater master plans, and recycled water master plans.

The San Diego Water Board is responsible for regulating activities that affect the quality of the Region's groundwater and surface water resources. The San Diego Water Board adopted the current version of the *Water Quality Control Plan for the San Diego Basin* (Basin Plan) in 1994, and has amended this plan periodically, most recently in 2016. The San Diego Water Board also implements the *Water Quality Control Plan for Ocean Waters* and the *Water Quality Control Plan for Enclosed Bays and Estuaries Plan*, which establish water quality standards for marine waters and enclosed bays and estuaries, respectively (State Water Resources Control Board; 2016, 2009).

DWR is responsible for preparing multiple statewide planning documents, one of which is the *California Water Plan*, which was most recently updated in 2013. The *California Water Plan Update 2013* identifies water management challenges within the state and provides a framework for meeting the challenges. The specific Resource Management Strategies (RMS) included within the *California Water Plan Update 2013* are the basis for the RMS described in the 2019 IRWM Plan Update (refer to *Chapter 8, Resource Management Strategies*).

The State Water Resources Control Board and DWR are jointly responsible for adopting water efficiency regulations under AB 1668 and SB 606, together referred to as the Long-Term Water Conservation Regulations. As part of these regulations, the state has or will establish indoor and outdoor water budgets for different urban uses, establish reporting requirements for urban use, revise the *Agricultural Water Management Planning Act* to improve agricultural water use efficiency, identify small water suppliers and rural communities at risk for drought and water shortages, and requires the adoption of water shortage contingency plans. It also requires urban water suppliers to submit annual reports to DWR and conduct annual drought risk assessments (ACWA).

In the San Diego IRWM Region, a number of different entities are responsible for distinct areas of water management. The Region includes 21 stormwater management entities, all of which participate in the Municipal Separate Storm Sewer System (MS4) permit program to reduce and manage non-point source pollution within their respective jurisdictions. Under the MS4 permit, Water Quality Improvement Plan (WQIPs) were developed for each of the ten watershed management areas (WMAs) in the region (which include each of the eleven watersheds in the San Diego IRWM Region). The WQIPs identify priority water quality issues in each watershed management area and develop an adaptive planning and management process to respond to water quality concerns and implement solutions. The Region's flood control agencies develop flood control plans for areas of high flood risk.

As the San Diego region continues to reduce its reliance on imported water supplies, agencies within the region are looking to leverage stormwater as a local water supply resource. The San Diego IRWM Region recently adopted the San Diego Region Storm Water Resource Plan (SWRP). The SWRP incorporated stormwater planning information from a variety of sources across the county, and developed criteria to assist project sponsors in identifying opportunities to provide multiple benefits. All stormwater and dry weather capture projects seeking funding through Proposition 1 are required to be included in the SWRP. In addition, the 2019 IRWM Plan Update – Phase 2 (anticipated in 2019) will also incorporate the County of San Diego's Stormwater Capture Feasibility Study (SWCFS), which is under development. The SWCFS will expand and strengthen the stormwater discussion in the IRWM Plan, and will help to identify and prioritize future stormwater use alternatives to augment water supply and other beneficial uses, where feasible, in the Region.

Governmental agencies and non-governmental organizations (NGOs) within the Region also develop local watershed management plans to help conserve and protect watershed resources and habitats. Finally, some jurisdictions also participate in development of habitat protection and Multiple Species Conservation Program (MSCP) plans to ensure protection of sensitive natural resources.

Regional and national efforts are under way to assess the impacts of climate change on water supply and the different adaptation approaches. The City of San Diego Public Utilities Department is working with the U. S. Bureau of Reclamation (Reclamation) to develop the San Diego Watershed Basin Study (Basin Study). The Basin Study identifies approaches to bridge current and future water supply gaps due to climate change and projected population growth, and is designed to be used as a decision making tool in water management and climate adaptation planning. The Basin Study evaluates water supply demand under current and future climate change conditions and evaluates how different climate adaptation approaches can alleviate impacts of increasing demand and climate change. Adaptation approaches evaluated in the study include recycled water, potable reuse, conveyance improvement, enhanced conservation, as well as other adaptation concepts, for a total of 15 Adaptation Concepts evaluated overall (see call-out box on next page). In addition to evaluating water supply benefits, the study uses a tradeoff analysis to understand the costs and benefits adaptation approaches, considering objectives such as cost, watershed health, quality of life, environmental justice, and other values in the region.

Regional water resource planning should involve consideration of and input from the Region's most vulnerable populations. A regional Water Needs Assessment is under way to identify disadvantaged communities (DAC), economically distressed areas (EDA), and underrepresented communities (URC), as well as communities affected by environmental justice (EJ) issues, across the San Diego Funding Area, including the San Diego IRWM Region. The Water Needs Assessment will engage and involve DACs in defining their water management needs, identifying where these communities are located and how to identify them in the future, and determining how to increase and sustain DAC involvement in the IRWM Program over the long term. This will be incorporated into the 2019 IRWM Plan Update – Phase 2.

The 2019 IRWM Plan Update is an umbrella document that encompasses the above local plans, but addresses water management issues on a Regional level. This Plan incorporates water resources management findings and recommendations from many of the Region's major water-related planning efforts. Implementing this Plan, however, will require additional effort to address short-term priorities and to incorporate water resources management planning from all of the Region's pertinent watershed, recreation, habitat protection, flood control, land use, and conservation plans.

San Diego Basin Study Adaptation Concepts
Conveyance Improvement: Improve local and regional conveyance systems to increase supply reliability, increase operational flexibility, and reduce GHG emissions by utilizing existing conveyance facilities and natural water courses and modifying existing pump stations, pipelines, interties and bypasses.
Drought Restriction/Allocation*: Implement temporary restrictions in water use to decrease demand or shift to other supply sources during periods of drought. Restrictions or allocations may be imposed at the local, regional, or State levels, and may include restrictions or allocations by water purveyors such as MWD.
Enhanced Conservation: Implement long-term or permanent restrictions in water use to decrease demand. Restrictions or allocations may be imposed at the local, regional, or State levels, and may include restrictions or allocations by water purveyors such as MWD.
Firm Water Supply Agreements*: Provide water supply by forming agreements for firm water supply volumes to be provided from external sources, such as the Quantification Settlement Agreement.
Gray Water Use: Offset potable water usage by encouraging, supporting and/or providing incentives for gray water system installation by residential customers.
Groundwater: Provide water supply by extracting and treating and/or desalinating groundwater from local freshwater and brackish aquifers and maintain sustainable groundwater supplies through implementation of projects to recharge groundwater basins with injected or infiltrated rainfall, recycled water, imported water, or a combination thereof.
Imported Water Purchases: Provide water supply by purchasing treated or untreated water from a water wholesaler outside of the region, such as MWD.
Local Surface Water Reservoirs*: Provide water supply by capturing, storing, and treating surface water runoff in lakes or reservoirs.
Potable Reuse: Provide water supply by producing advanced treated water from wastewater for direct or indirect (e.g., reservoir or groundwater augmentation) potable use.
Recycled Water: Offset potable water use by providing non-potable recycled water use for landscape irrigation, industrial purposes or to recharge groundwater.
Seawater Desalination: Provide water supply by utilizing or expanding existing facilities or constructing new facilities to remove salts from seawater.
Stormwater BMPs: Reduce adverse water quality impacts of stormwater through implementation of stormwater Best Management Practices (BMPs). BMPs are structural, vegetative or management practices used to treat, prevent or reduce stormwater runoff and pollution.
Stormwater Capture: Provide water supply by capturing stormwater through both centralized projects and regional decentralized efforts and treating it for both potable and non-potable uses.
Urban and Agricultural Water Use Efficiency: Increase water use efficiency by encouraging long-term behavioral change and implementing water use efficiency programs (e.g., rain barrel rebates, turf replacement credits, rebates for more efficient irrigation or plumbing fixtures, graywater system rebates).
Watershed and Ecosystem Management: Promote sustainable, high quality local water supplies through practices that support healthy ecosystems and improve or restore the condition of landscapes and biological communities. Such practices may include invasive species removal, restoration of native ecosystems, land acquisition for protection or enhancement, brush/forest management for wildfire risk reduction, remediation of aquifer and reservoir water quality through engineered or biological controls, management of non-point and point source pollution, and low impact development.
**Concept only represented in the Baseline Portfolio*

1.2.5 Future of IRWM

In addition to establishing short-term priorities and facilitating the pursuit of outside funding, the 2007 IRWM Plan represented the first step in a long-term planning process. As this long-term process unfolded, stakeholder groups were expanded, governance structures refined, coordination with watershed groups enhanced, new emerging issues identified, and new priorities established. The 2013 IRWM Plan reflected these changes, refined the IRWM process, and built on the success of the original 2007 IRWM Plan. The 2019 IRWM Plan Update builds upon the progress made through the 2013 IRWM Plan Update by strengthening existing governance structures to achieve common goals.

The San Diego IRWM Plan is a living document; the 2019 Plan Update marks the third generation of IRWM planning in the Region, and the RWMG envisions that the IRWM Plan will continue to evolve in response to the changing needs of the Region. Through this stakeholder-driven, cooperative process of integrated regional water management, the San Diego Region has established itself as a leader in active water management planning.

1.2.6 Region Boundaries

Figure 1-2 (following page) presents the San Diego IRWM Region. This Region is entirely within the jurisdiction of the San Diego Water Board, and includes all portions of San Diego County that are tributary to coastal waters. The San Diego IRWM Region was approved by DWR through the 2009 Region Acceptance Process (DWR 2009).

1.3 Regional Water Management Group

The San Diego RWMG was formed in 2005 in accordance with provisions of the California Water Code (§79570 et seq.) to manage development and implementation of the IRWM Plan, and to manage the San Diego IRWM Program. The RWMG consists of:

- San Diego County Water Authority (Water Authority)
- City of San Diego (City)
- County of San Diego (County)

In accordance with terms in a Memorandum of Understanding (refer to Appendix 6-A), the three RWMG agencies are equal partners in the development of the 2019 IRWM Plan Update. The three agencies also equally share in the cost of conducting other IRWM planning activities, such as stakeholder outreach. The RWMG recognizes that cooperation with and input from stakeholders throughout the Region is critical to a successful IRWM Program. As a result, the RWMG has assumed a lead role in engaging stakeholders and soliciting stakeholder input for 2019 IRWM Plan Update development and implementation.

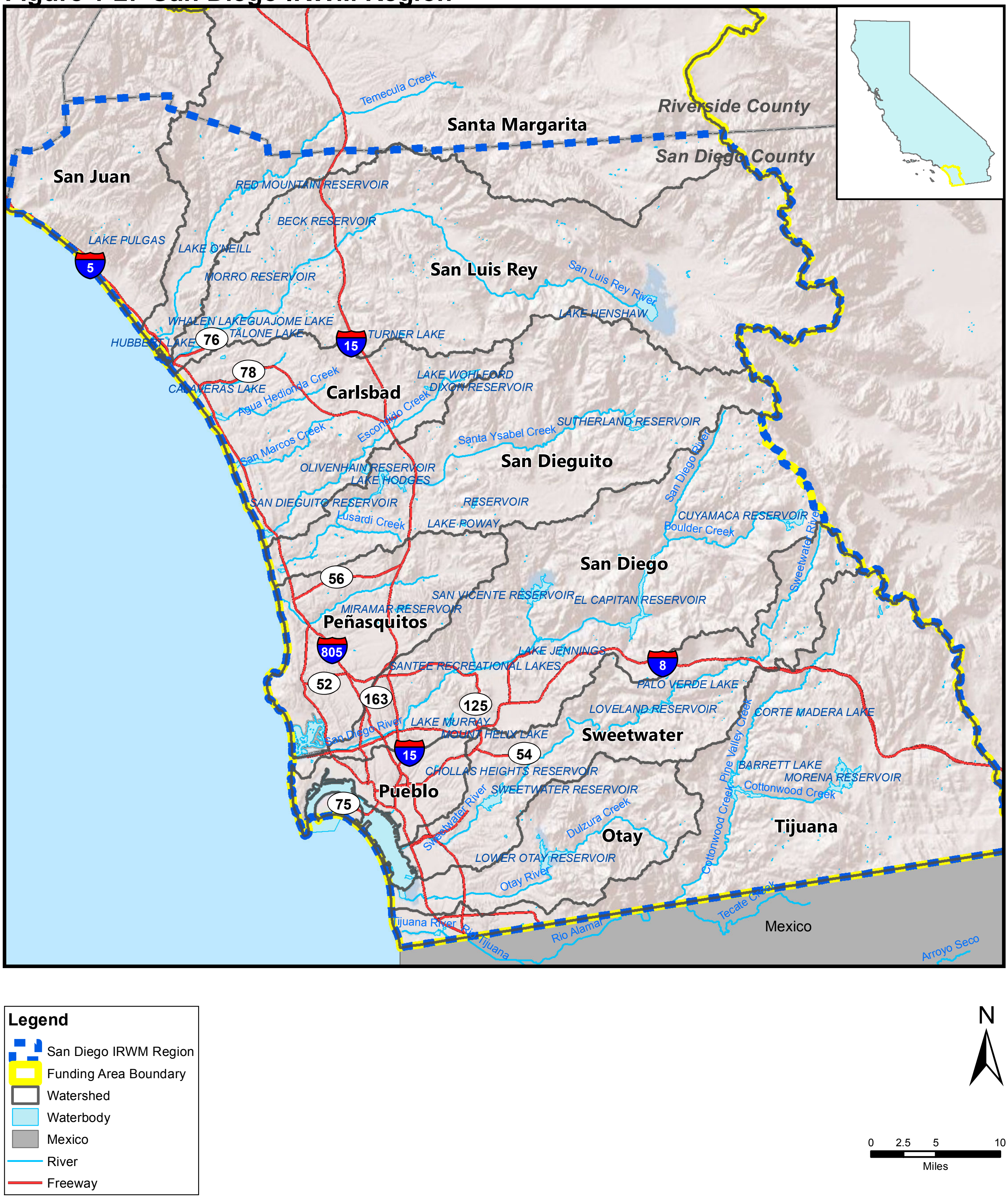
Figure 1-3 shows the jurisdictional boundaries of the three RWMG agencies. The combined jurisdiction of the three agencies encompasses the entire Region; the water supply service areas of the Water Authority and the City cover all urbanized portions of the Region. Table 1-1 summarizes water management responsibilities of the three RWMG agencies. Collectively, the three RWMG agencies have key involvement in water supply, wastewater treatment, watershed management, land use, and recreational aspects of water management within the Region.

Table 1-1: Summary of Water Management Responsibilities for Regional Water Management Group

Water Management Category	San Diego County Water Authority	City of San Diego	County of San Diego
Imported Water Delivery	●		
Water Supply Infrastructure	●	●	●
Water Supply Planning	●	●	○
Storing Raw Imported Water	●	●	
Capturing and Storing Local Runoff	○	●	●
Groundwater Supply	○[1]	●	●
Wastewater Treatment		●	●
Recycled Water Supply	○[1]	●	
Water and Recycled Water Regulation	○	○	●
Public Health Regulation			●
Municipal Stormwater NPDES Management		●	●
Flood Management and Control		●	●
Watershed Protection	○	●	●
Land Use Control and Management		●	●
Natural Community Conservation Planning	●	●	●
Parks and Recreation		●	●

● Direct water management involvement
○ Provides planning support
1 The Water Authority supports these efforts by its member agencies but does not directly produce recycled water or groundwater for sale to its member agencies.

Figure 1-2: San Diego IRWM Region



Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig1-2_IRWM Region 060713.mxd

Figure 1-3: RWMG Agencies

Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse, Esri, USGS, NOAA
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig1-3_RWMG Boundaries_060713.mxd

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The RWMG is leading the development of the 2019 IRWM Plan Update by providing staffing and consultant services towards the effort. Each of the RWMG agencies serves multiple water management roles within the Region and is involved in a number of region-wide water management coordination efforts. As documented in Chapter 3*, Region Description*, depending on regional hydrologic conditions, approximately 80% of the Region's water supply is provided through the Water Authority. In times of drought, this amount increases, as in 2015, when the Water Authority supplied nearly 90% of water in the Region (Water Authority, 2016). The City of San Diego, the Region's largest retail water agency, is involved in water management within six of the Region's eleven watersheds. The County is involved in watershed planning efforts in all but one of the Region's watersheds (San Juan). The City and County together provide wastewater service to a sizable portion of population within the Region. Additionally, the City and County are the largest Copermittees under the Region MS4 permit. The City and County are also responsible for land use planning and regulation within the majority of the Region.

1.3.1 San Diego County Water Authority

The Water Authority is the regional water wholesale agency in San Diego County. The Water Authority's mission is to provide a safe and reliable supply of water to its 24 member agencies, which serve a combined population of approximately 3.2 million (97% of the County's population) and support an annual regional economy of more than $215 billion.

The Water Authority's boundaries comprise the western one-third of San Diego County with a total area of 1,468 square miles. The urbanized parts of the Region are entirely within the Water Authority's service area. Water Authority member agencies include six cities, five water districts, eight municipal water districts, three irrigation districts, a public utility district, and the U.S. Marine Corps Base Camp Pendleton.

San Diego County Water Authority

The Water Authority is a member agency of the Metropolitan Water District of Southern California (Metropolitan) and is the largest Metropolitan customer in terms of water purchases. The Water Authority also purchases conserved agricultural supplies through a water transfer agreement with the Imperial Irrigation District, and has been assigned rights to water saved by lining the All-American Canal and Coachella Canal in Imperial County. In addition, the Water Authority purchases desalinated seawater from the Claude "Bud" Lewis Carlsbad Desalination Plant. The Water Authority conveys water supplies to its member agencies via five parallel pipelines that run north-south from the Riverside County line in two rights of way called the First Aqueduct and Second Aqueduct. The Water Authority delivers both treated and untreated supplies to its member agencies through 88 service connections.

In coordination with its member agencies, the Water Authority has implemented an Emergency Storage Program that enhances the Region's reservoir capacity and improves conveyance facilities. While the Emergency Storage Program is designed to make the regional water supply more reliable during an emergency that disrupts normal imported water deliveries, the new facilities will improve the Region's water system flexibility and reliability at all times.

As part of water supply diversity plans set forth in the Water Authority's *2015 Urban Water Management Plan*, the Water Authority is active in coordinating with its 24 member agencies to plan and pursue water conservation, recycled water use, development of local groundwater supplies, surface water storage and supplies, water transfers, seawater and groundwater desalination, and water quality protection projects.

1.3.2 City of San Diego

The City of San Diego exercises a range of water supply, wastewater, recycled water, stormwater, recreation, and watershed management responsibilities, and administers a number of programs that provide opportunities for the City and its partners to pursue integrated approaches with other agencies and jurisdictions.

The City of San Diego Public Utilities Department operates an extensive water system that currently provides drinking water to 1.33 million customers located within the cities of San Diego, Del Mar, Coronado, and portions of National City, Chula Vista, and Imperial Beach. In addition to providing drinking water to approximately half of the population of San Diego County, the City of San Diego Public Utilities Department also delivers untreated water to three adjacent agencies. On an annual basis, the City treats and delivers approximately 200,000 acre-feet of water to residential, commercial, industrial, and agricultural customers within a 340-square-mile service area. The City's water system includes nine water storage reservoirs, three water treatment facilities, 32 treated water storage facilities, and 3,293 miles of transmission and distribution pipelines (City of San Diego, 2016). The City of San Diego is the Water Authority's largest member agency in terms of land area, population, and water purchases. It is also the largest member agency in terms of representation, with 10 members on the 35-member Water Authority Board of Directors.

The City of San Diego Public Utilities Department also operates an extensive wastewater collection and treatment system that includes approximately 2,900 miles of sewer line servicing a 330-square mile area. The City Public Utilities Department is the operating agency for the San Diego Metropolitan Wastewater System (Metro System). The Metro System provides wastewater services to 2.2 million residents of the City of San Diego and 15 other cities and districts (called Participating Agencies) within a 450-square mile service area, and treats approximately 160 million-gallons per day of wastewater (City of San Diego, 2016). Approximately three-quarters of the County's population discharge their wastewater to the Metro System.

The City has been a pioneer in the field of water recycling. Two reclamation facilities with a combined treatment capacity of 45 million gallons per day of non-potable recycled water are in operation. Additionally, the City is actively pursuing potable reuse as an alternative water supply. The Pure Water San Diego program, which is the City's phased, multi-year program, will provide one-third of San Diego's water supply locally by 2035. A one million gallon per day water purification demonstration project has been in operation since the summer of 2011. Tests for 342 constituents and parameters over a one-year period showed the purified water met all regulatory limits and had concentrations similar to distilled water. For more information about Pure Water San Diego, see www.purewatersd.org.

The City of San Diego maintains storm drain structures, pipelines, and channels within the City. The City is one of the 21 Copermittees in San Diego County regulated by San Diego Water Board under the 2013 Municipal Separate Storm Sewer System (MS4) Permit (Order No. R9-2013-0001 [NPDES No. CAS0109266]), as amended. There are also 12 Copermittees in Orange County and 6 Copermittees in Riverside County regulated under the same regional MS4 permit. The Storm Water Division in the Transportation & Storm Water Department leads the City's efforts to protect and improve the water quality of rivers, creeks, bays and estuaries, and the ocean within its jurisdiction. The Division's efforts are conducted to ensure compliance with the MS4 Permit and other surface water quality regulations issued by the State of California. The Division's priorities are to identify sources of pollution and abate them through the implementation of innovative and efficient public education, watershed management, stormwater development regulations, enforcement, and citywide training programs, and to provide the most efficient storm drain system operation and maintenance services to San Diego's residents. This includes the popular "Think Blue" (www.sandiego.gov/thinkblue) educational program implemented in coordination with other organizations.

The City of San Diego Planning Department regulates land use and flood control within the metropolitan boundaries and is responsible for coordinating with other regional agencies in implementing the MSCP Plan.

1.3.3 County of San Diego

The County maintains a number of water and watershed-related program responsibilities within unincorporated portions of the Region. These responsibilities include: water supply (outside Water Authority service area), wastewater treatment, land use and planning, public health, parks and recreation, flood management and control, stormwater and water quality management, ecosystem and habitat protection, and watershed planning. The County appoints a non-voting representative to the Water Authority Board.

The County's Department of Planning and Development Services is responsible for developing the County's General Plan. The Department of Planning and Development Services also manages the MSCP South County Subarea Plan, the North County MSCP Plan, and the East County MSCP Plan. Additionally, the department manages the County's Agricultural Conservation Easement Program, maintains the groundwater and landscape ordinances, and manages environmental mitigation banks.

The County's Department of Public Works provides limited wastewater and drinking water services to unincorporated communities outside the imported water distribution service area. The Department of Public Works also provides the following services for the unincorporated portion of the County:

- stormwater conveyance service and maintenance
- residential recycling and composting programs
- erosion control and flood management services
- stormwater and watershed planning and protection programs and services

The County's Department of Environmental Health has regulatory authority for the beach recreational water use, site assessment and mitigation, on-site wastewater (septic) systems, recycled water use, small water systems and monitoring wells. The County's Department of Planning and Development Services has discretionary project approval authorities.

The County uses an inter-departmental approach for addressing county-wide issues such as habitat protection, watershed protection, and water quality improvement. The County implements its own stormwater program in unincorporated areas providing public education, employee training, water quality monitoring, source identification, code enforcement, watershed management, Total Maximum Daily Load (TMDL) implementation and the development and implementation of BMPs. Historically the County has acted as Principal Permittee for the MS4 Permit that regulates MS4 discharges from the County of San Diego and 20 other Copermittees, which includes the 18 municipalities of the County, the San Diego Unified Port District, and the San Diego County Regional Airport Authority. The County continued in this role during the two-year transition period under the 2013, as revised in 2014 and 2015 MS4 Permit. Following this transition period, the MS4 permit moved to a distributive watershed model in which the County is the lead permittee for the San Luis Rey and San Diego River Watersheds and a participant in the other watersheds.

Starting in 2000, the County developed and supported Project Clean Water, a broad-based forum for developing stakeholder-driven solutions to pressing water quality problems throughout the Region. Through Project Clean Water's website (www.projectcleanwater.org) and stakeholder groups, the County assumed the primary responsibility for coordinating stakeholder input into the development of the 2007 IRWM Plan and the associated list of regional implementation projects. The Project Clean Water stakeholder process continues today in the form of the IRWM Program while the website continues as the permit-required Regional Clearinghouse that contains plans, reports, water-quality related data and studies conducted in the region, including the SWCFS. As such, Project Clean Water is a water quality resource for the Region.

1.4 IRWM Program History and Accomplishments

The San Diego IRWM Program was initiated in 2005, and since then has achieved multiple successes. The Program continues to evolve with respect to increasing stakeholder diversity and input, changing conditions, and adapting to meet regional needs. The following is a brief timeline and outline of major accomplishments that the Program has achieved during its 12-year tenure.

> *"San Diego has been fortunate to have the IRWM program which has incorporated and welcomed so many different groups, such as NGO's, Tribal bands, farm associations, water agencies, local government and the public. It has leveraged diverse fields of knowledge from all of these groups to forge a living document to develop new water supplies, improve water quality and use throughout the region to benefit people, wildlife and habitats"*
>
> *-Robyn Badger, RAC member representing Zoological Society of San Diego and Other Caucus (2013-2020)*

- **2005:** The City of San Diego, County of San Diego, and San Diego County Water Authority, who collectively comprise the RWMG, completed a **Memorandum of Understanding (MOU)** that formalized their commitment to fund, guide, and manage development and implementation of the IRWM Program.
- **2006:** Establishment of the **Regional Advisory Committee** (RAC), a collection of professionals who represent diverse groups and points of view with a stake in water management in the region. The RAC has met regularly since its inception and is responsible for providing input and feedback to the RWMG with regards to regional planning and funding activities. Details on the RAC, its composition and role, are provided in Chapter 6 *Governance and Stakeholder Involvement*.
- **2007:** Wrote the **2007 San Diego IRWM Plan**. The 2007 IRWM Plan laid the groundwork for enhanced collaborative, multi-benefit water resource projects by facilitating cooperation between public agencies and non-profit organizations. The Plan was adopted by the Water Authority Board of Directors, County Board of Supervisors and San Diego City Council.

- **2008:** DWR awarded the San Diego IRWM Region **$25 million** to support 19 high-priority local projects under Proposition 50.
- **2009:** The Region completed DWR's **Region Acceptance Process** and received formal approval of the Region's boundaries and composition.
- **2009:** The San Diego RWMG and management groups from the neighboring IRWM Regions (Upper Santa Margarita and South Orange County) formed the Tri-County Funding Area Coordinating Committee (FACC) as a collaborative inter-regional body. The San Diego Funding Area was the **first** funding area in the State to formalize grant funding agreements to allocate IRWM funding (Proposition 84 funding) and promote inter-jurisdictional planning between IRWM regions.
- **2010:** DWR awarded the San Diego IRWM Region a **$1 million grant award** for planning activities associated with conducting stakeholder outreach, completing planning studies, and preparing the 2013 IRWM Plan.
- **2011:** DWR awarded the San Diego IRWM Region **$8 million** to implement 11 high-priority local projects under Proposition 84-Round 1.
- **2012:** Kicked off planning efforts to update the 2007 IRWM Plan. Initial outreach efforts included an **IRWM Summit** to raise awareness among the public and stakeholders about development of the 2013 IRWM Plan.
- **2013:** DWR awarded the San Diego IRWM Region a **$10.3 million** implementation grant to implement 7 high-priority local projects with potential grant funding support from Proposition 84-Round 2.
- **2013:** Completed and adopted the **2013 IRWM Plan, which subsequently was accepted by DWR as being consistent with the IRWM Planning Act**.
- **2014:** DWR awarded the San Diego IRWM Region **$15 million** in grant funding to implement 7 high-priority drought relief projects under Proposition 84-Round 3.
- **2015:** DWR awarded the San Diego IRWM Region **$31 million** to implement 13 high-priority projects under the final round of Proposition 84 funding.
- **2016:** DWR awarded the San Diego IRWM Region **$250,000** in Proposition 1 planning funds to update the 2013 IRWM Plan.
- **2016:** The San Diego IRWM Program celebrated its 10th anniversary by holding its second **IRWM Summit** to assess the Region's progress and to refine its goals.
- **2017:** DWR awarded the San Diego IRWM Region **$5.6 million** in grant funding for DAC planning projects, including the Water Needs Assessment under the Proposition 1 DAC Involvement grant program.,

1.5 Addressing the Region's Water Management Challenges

Numerous water management plans have been developed by individual or multiple agencies or groups within the Region to address water supply, water quality, stormwater and flood, ecosystem and habitat protection and enhancement, watershed protection, conservation, recreation, climate change, and land use controls (see *Chapter 7, Regional Coordination* for a description of these plans). Each local plan addresses portions of the Region, but many of the plans overlap in geography, scope, or agency jurisdiction, which can contribute to regional water management conflicts and challenges.

Rural Community Assistance Corporation (RCAC) is addressing water quality concerns in the Tijuana River Valley (including trash, shown here) through a project funded through Proposition 84

Photo Credit: Jennifer Hazard, RCAC

Table 1-2 summarizes several key challenges or constraints that the Region faces in addressing water management issues. Table 1-2 also identifies how the IRWM Plan can assist in solving those challenges. The list of key challenges or constraints was developed by the RWMG and affirmed by the RAC and stakeholders at a public workshop held on June 5, 2013 and revisited by the RWMG in 2018. Given the importance of the challenges presented in Table 1-2, the Region will strive to implement projects to address these issues. Information about the Region's project prioritization and selection process is in *Chapter 9, Project Evaluation and Prioritization.*

As shown in Table 1-2, the IRWM Plan provides a process to address and resolve conflicts through a collaborative regional effort. Additionally, the IRWM Plan may prove useful in identifying, coordinating, and addressing environmental and regulatory issues on a regional basis.

In addition to resolving existing water management conflicts and prioritizing and focusing regional water management efforts, the IRWM Plan may help make water management projects and programs in the Region eligible for future state and federal funding. An approved IRWM Plan is necessary to apply for State Proposition 1 IRWM funding, which is administered by DWR. Further, it is possible that other forms of future state and federal funding will be tied into the IRWM Plan process.

Table 1-2: Current Challenges to Water Management within the Region and How the IRWM Plan Can Help Resolve the Challenges

Challenges and Conflicts in Water Management	How the IRWM Program Can Address Challenges
1. Regulatory Process/Administration: Regulatory constraints or disconnects – namely as they relate to the administration of regulations – can cause water management conflicts. This is particularly true for implementation of unfunded mandates, instances where there are conflicting priorities between entities, permitting or implementation of new/cutting-edge technology, and inconsistent regulatory requirements. Specifically, current regulations may be infeasible to implement from a cost and technology perspective, and implementation requirements may not yield desired benefits, or may create unintended consequences.	The IRWM Program provides a unified regional approach for identifying and assessing regulatory compliance issues. Implementation of the recommended action items were first steps in improving coordination between regulators and water managers. Because IRWM funding can be leveraged to increase scientific knowledge and fill data gaps, the Program can potentially provide the data and information necessary to address regulatory compliance issues.
2. Water Quality Objectives and Beneficial Uses: There is widespread concern that beneficial uses and water quality objectives that support the beneficial uses are not properly defined. This may result in unnecessarily strict or unrepresentative water quality standards for surface waters. Such restrictions impact the Region's ability to effectively and affordably manage water, including imported and reuse supplies. There is concern that because beneficial uses are not prioritized, management is not realistic as every use is considered equally.	The IRWM Program provides a forum for collaboration between water managers, the regulatory agencies which establish water quality standards, and other stakeholders, including potentially redefining beneficial uses. The IRWM Program provides a forum through which regulated entities, non-governmental organizations, and others can collaborate on potential win-win solutions to current issues associated with water quality objectives and beneficial uses.

Challenges and Conflicts in Water Management	How the IRWM Program Can Address Challenges
3. Integrated Planning: There are numerous entities involved in water management in the Region, including water agencies, non-governmental organizations, and other entities. Due to the number of entities in the Region, there are also conflicts with beneficial uses as different entities may not agree on which beneficial uses are most important from a water management point of view. Conflicts between jurisdictional and interested parties as well as beneficial uses are unavoidable, and demonstrate a need to integrate planning efforts in order to increase the ability to move forward in addressing water management issues. Although communication between water managers and land use jurisdictions has improved, ongoing disconnects may result in water quality, flooding, natural resources, and other water-related issues.	The IRWM Program provides a forum to bring different entities together to potentially resolve or avoid conflicts resulting from overlapping jurisdiction. It is also possible that the IRWM Program can help eliminate duplicative efforts by increasing cross-pollination of water management efforts in the Region. The IRWM Program can also bring together water managers from different disciplines, and therefore can help resolve management disputes regarding various beneficial uses. One example of this is how the IRWM Program helps to bring together water managers from different water sectors such as water supply and wastewater managers for efforts associated with potable reuse. In addition, the IRWM Program provides a regional forum for water managers to engage the land use community. Implementation of the recommended action items were the first steps in improving coordination between land use planners and water managers.
4. Stakeholder Involvement: Stakeholder involvement in the IRWM Program is a concern, particularly given the complex nature of the program and the number of entities involved. There is particular concern that due to the number of entities, all entities may not be involved in a meaningful way. There have been identified barriers for participation of various entities, particularly those that may not participate due to funding or regulatory restrictions (e.g. non-governmental organizations, tribal entities, and DACs).	The IRWM Program's outreach efforts have attempted to resolve participation barriers to the maximum extent feasible. Specific efforts have been made to create solutions that will resolve participation barriers, such as partnering non-governmental organizations with tribal governments and DACs for grant-funded projects to resolve grant contracting and implementation issues. In addition, the IRWM Program has commented to DWR on behalf of stakeholders in an attempt to resolve regulatory and programmatic complexities that may bar or discourage certain entities from participating in the Program. The Regional Water Needs Assessment has identified critical needs in marginalized communities so that the San Diego IRWM Program can better address and invest in these issues. Additional targeted outreach was conducted for the Water Needs Assessment to help identify DACs, EDAs, URCs, and EJs that have not been involved in IRWM and to consider ways to encourage sustained engagement with DACs, EDAs, URCs, and EJs.
5. Public Awareness and Education: Regional awareness of water management issues is a concern, particularly given that the public and elected officials may be less inclined to support water management financing (e.g., bond or fee programs) if they are unaware of the need for these efforts. Public awareness and expectations of the IRWM Program need to be managed, especially as the State faces uncertainties regarding future water bond funding.	The IRWM Program allows for greater public understanding and acceptance of water management issues and the potential solutions (projects) to address those issues through extensive outreach and education efforts. The San Diego IRWM Program requires projects funded through an IRWM grant include an outreach and education component. The IRWM Program conducts outreach in an attempt to educate the public on the potential future of the program.
6. Funding: Given the limited amount of funding available through DWR's IRWM Grant Program and the increasing amount of resource limitations for public agencies, there is a need for affordable solutions to manage water and address water-related issues. In addition, limited funding makes prioritization of water management needs imperative. Given the uncertainty of DWR's future IRWM Grant Program, which is based on voter-approved water bonds, there is a need to determine how the Region will augment future IRWM planning efforts.	The IRWM Program brings entities together to prioritize projects for IRWM Program funding. The Region's project prioritization process specifically takes long-term, triple bottom line cost-effectiveness into consideration when evaluating projects and the online project database that has been developed for the IRWM Program can also increase cost-effectiveness by allowing stakeholders to learn about similar projects, and potentially collaborate or coordinate efforts with other entities to reduce duplicative or redundant projects. The Regional Water Quality Control Board has also experienced interest in working with the San Diego IRWM Program and potentially using the online project database to prioritize supplemental environmental projects (SEPs). In addition, the IRWM Program keeps track of other (non-IRWM) grant opportunities that are available, and announces those opportunities to stakeholders during regular meetings and email announcements.

Challenges and Conflicts in Water Management	How the IRWM Program Can Address Challenges
7. IRWM Grant Administration: To-date there have been substantial concerns with IRWM grant funding delays by the State, as these delays affect the ability for the Region's local project sponsors to effectively implement projects and programs to manage water resources. Given the uncertainty of the IRWM Program's future, it is uncertain at this time if the Program will continue on its current path – that focuses on grant funding efforts – or become a larger, regional planning effort.	The IRWM Program is continuing to attempt to resolve grant funding issues through communications with DWR, meeting in Sacramento to discuss Region's needs, participation in DWR forums and workshops, and providing feedback to DWR. The IRWM Program has not created a long-term plan for governance or a programmatic structure in the absence of a MOU between the RWMG agencies or State grant funding.
8. Affordability: The Region is pressed to find solutions that meet regulatory, outreach, IRWM Program, and other needs, while maintaining affordability for the Region's residents. Affordability is an issue that is considered to span across all other issues listed in this table as it pertains to all aspects of the IRWM Program and of regional water management.	IRWM grant funding can be used to offset project-related costs in the Region. In addition, because the IRWM project prioritization process encourages projects with multiple benefits, the IRWM Program aims to fund projects that represent up-front investments with holistic solutions that can prevent negative impacts (and associated costs) from occurring. There are still additional costs incurred due to program administration and other components, which are not reimbursed by grant funding. As affordability is a regional issue, it cannot be wholly resolved by the IRWM Program.
9. Political Coordination: Regulatory, awareness, conflicts, and other items listed above present challenges to the Region's water managers with respect to political coordination. Specifically, issues that arise may present difficulties associated with project approvals that are necessary for the Region's water managers to move forward with water management efforts.	To-date the IRWM Program has not focused on political coordination, but rather has focused on public and stakeholder outreach efforts. Additional outreach and coordination efforts with other regulatory agencies and political bodies may be possible through the IRWM Program. Also, effective public outreach may impact political decision-making.
10. Managing Water Rights and Compliance: There is a need to reconcile water rights and water quality management for a variety of beneficial uses. Specifically, addressing water quality compliance concerns can result in reduced water recharge/discharge, which can potentially impact downstream or adjacent uses that may have an existing "right" to water sources.	The IRWM Program provides a mechanism to bring different entities together to potentially resolve or avoid water rights conflicts, including the potential for funding for water supply and water quality projects.
11. Sustainability of Water Resources: There is a need to manage water sustainably throughout the Region, meaning that solutions to water-related issues and conflicts, including climate change impacts, are economically and environmentally preferable, and also provide equitable resource protection for the entire Region. Sustainably managing the Region's water resources will help to ensure the long-term availability of water supplies for multiple beneficial uses.	The IRWM Program has adopted the concept of sustainability, and incorporated this concept throughout the IRWM Vision, Mission, Goals and Objectives (refer to *Chapter 2, Vision and Objectives).* The project prioritization process also encompasses the idea of sustainability by prioritizing projects that provide multiple benefits (to the environment and to people) and are also cost-effective. IRWM grant-funded projects throughout the Region have helped to reduce reliance on imported water, improve sustainability of local resources, and increase the region's resilience to climate change.

1.6 IRWM Plan Development

To facilitate plan review, the 2019 IRWM Plan Update is organized in accordance with DWR's IRWM Plan Standards established by the 2016 IRWM Program Guidelines (DWR, 2016). Table 1-3 summarizes how the 2019 IRWM Plan Update chapters correspond with required elements of the IRWM Program Guidelines. Figure 1-1 (page 1-2) presents a schematic depicting how the chapters of these 2019 IRWM Plan Update are organized to establish Plan goals and objectives, select water management strategies, establish regional priorities, and identify how the Plan is to be implemented. Remaining chapters of the 2019 Plan Update address conformance with state-mandated planning elements as set forth in the IRWM Program Guidelines.

Table 1-3: Organization of the 2013 IRWM Plan

IRWM Program Guidelines Requirement[1]	2019 IRWM Plan Update Chapter that Addresses the Requirement
1. Governance	6. Governance and Stakeholder Involvement
2. Region Description	3. Region Description
3. Objectives	2. Vision and Objectives
4. Resource Management Strategies (RMS)	8. Resource Management Strategies
5. Integration	9. Project Evaluation and Prioritization
6. Project Review Process	9. Project Evaluation and Prioritization
7. Impacts and Benefits	11. Implementation
8. Plan Performance and Monitoring	11. Implementation
9. Data Management	10. Data and Technical Analysis
10. Finance	11. Implementation
11. Technical Analysis	10. Data and Technical Analysis
12. Relation to Local Water Planning	7. Regional Coordination
13. Relation to Local Land Use Planning	7. Regional Coordination
14. Stakeholder Involvement	6. Governance and Stakeholder Involvement
15. Coordination	7. Regional Coordination
16. Climate Change	* Incorporated throughout Plan – see Chapters 2, 3, 5, and 6

[1]From Table 1 – IRWM Plan Standards in the 2016 IRWM Program Guidelines (Volume 2).

1.6.1 Plan Preparation Team

The RWMG provided overall direction in the development and preparation of the 2019 IRWM Plan Update. The RWMG was assisted in preparing both the 2013 and 2019 Plan documents by a team of consultants that included:

- Woodard & Curran (formerly RMC Water and Environment)
- Katz and Associates
- Michael R. Welch, Ph.D., P.E., Consulting Engineer
- CityPlace Planning
- PACE
- AECOM

1.6.2 Plan Development Process and Stakeholder Input

Development of the IRWM Plans involves a significant public input process (see *Chapter 6, Governance and Stakeholder Involvement*) that endeavored to secure participation from as many stakeholders as possible in the IRWM process. In past planning efforts, the RWMG and consultants coordinated with the following regional groups in organizing the stakeholder input process as well as organizing, preparing, and reviewing the IRWM Plan:

San Diego Regional Advisory Committee during a 2019 IRWM Plan Update Workshop, 2018

Photo Credit: Jen Sajor, Woodard & Curran

- *Regional Advisory Committee.* Policy-level input to the IRWM Plans was provided by the Regional Advisory Committee (RAC), which included subject matter experts representing environmental groups, academic entities, local business, agricultural groups, water suppliers, wastewater agencies, water quality interests, and regulatory agencies. The RAC includes representatives of both public agencies, non-profit organizations, DAC representatives and tribes. The RAC served as the primary organization that provided input to the RWMG for plan preparation.
- *Workgroups.* Technical input was provided by various workgroups that participated in planning studies. The workgroups comprised representatives from the RAC and other stakeholders and interested parties.

Additional technical and stakeholder input was achieved through an outreach effort to planning groups, environmental organizations, watershed groups, municipalities, water and wastewater agencies, transportation agencies, flood control agencies, regulatory agencies, business groups, community groups including DACs, environmental justice organizations, local Tribal Nations, and general members of the public. The outreach effort included workshops and workgroups conducted throughout both Plan updates to discuss Region-specific issues, priorities, and needs (see *Chapter 6, Governance and Stakeholder Involvement* for a detailed description of the IRWM Plan outreach effort).

1.6.3 California Environmental Quality Act (CEQA) Exemption

This 2019 IRWM Plan Update consists of a data collection effort and planning study that will not result in the disturbance of environmental resources. Approval or adoption of this Plan does not entail any direct commitment of resources by the RWMG or any other agency. Preparation and adoption of this Plan are thus exempt from the California Environmental Quality Act (CEQA) pursuant to Sections 15262 and 15306 of the CEQA Guidelines, and programmatic analysis under CEQA is not required.

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2 Vision and Objectives

This chapter addresses requirements set forth in the Objectives Standard included in the 2016 IRWM Program Guidelines (DWR, 2016). Consistent with DWR's 2016 Guidelines, the objectives presented in this chapter were developed to manage or eliminate the challenges faced by the Region as described in detail in *Chapter 3, Region Description.*

2.1 Overview

The intent of this chapter is to document various aspects of the planning hierarchy established for the 2013 and 2019 San Diego IRWM Plans. Specifically, this chapter includes information regarding:

- the process used to develop the IRWM objectives,
- how the objectives address major water-related issues and conflicts of the Region,
- how the objectives will be measured so that achievement of objectives can be monitored,
- an explanation of why the objectives were not prioritized, and
- an explanation of the overall planning hierarchy (vision, mission, goals, and objectives) included in the 2013 and 2019 IRWM Plans.

2.2 Describing the Process

The IRWM planning components (vision, mission, goals, and objectives) were revised for the 2013 IRWM Plan through a collaborative process that involved members of the public, stakeholders, workgroup members, the Regional Advisory Committee (RAC), and the Regional Water Management Group (RWMG). During development of the 2019 San Diego IRWM Plan – Phase 1, these components were revisited by the RWMG and the RAC, who recommended modifications that reflected the Region's current priorities and those of DWR's 2016 Guidelines.

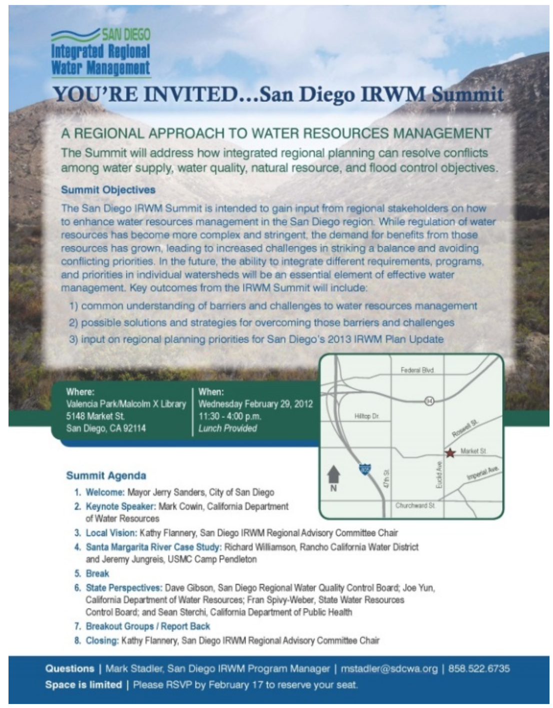
As described in detail in Chapter 6, *Governance and Stakeholder Involvement,* the 2013 IRWM Plan involved a number of workgroups consisting of representatives from the RAC and interested stakeholders, which were convened to provide input on specific components of the Plan. One workgroup, the Priorities and Metrics Workgroup, was convened to complete the following tasks:

- Refine IRWM vision, mission, goals, and objectives
- Review information received during the IRWM Summit (described in detail below) and use that information to refine the vision, mission, goals, and objectives
- Develop a recommended list of targets and metrics that can be used to measure achievement of the IRWM objectives
- Discuss pros and cons of prioritization and potentially prioritize the IRWM objectives

The Priorities and Metrics Workgroup met a total of five times from February to December 2012 and provided substantial input on the development of the IRWM vision, mission, goals, and objectives.

The workgroup used information received at a public IRWM Summit to refine those planning components. Further information regarding the Priorities and Metrics Workgroup, including complete meeting agendas and notes are available online at the following web address: http://sdirwmp.org/2013-irwm-plan-update-workgroups.

The 2007 IRWM Plan vision, mission, goals, and objectives were used as a starting point for the Priorities and Metrics, as these existing IRWM Plan components were previously determined by the Region's stakeholders. Further, the Priorities and Metrics Workgroup considered existing water management plans such as the Region's 2010 Urban Water Management Plans, the San Diego County General Plan Update, and requirements and considerations established by the California Department of Water Resources (DWR) in the 2012 IRWM Guidelines (DWR, 2012).



The IRWM Summit, held in February 2012, provided a venue to receive public input on key aspects of the 2013 IRWM Plan, including the IRWM Objectives.

The first IRWM Summit, held on February 29, 2012, was open to members of the public and had two purposes: 1) to increase awareness of the IRWM Program and 2013 IRWM Plan as part of the Region's public outreach and involvement process, and 2) to solicit stakeholder input on the existing IRWM objectives, and any additional objectives that may be suitable to include in the 2013 IRWM Plan. IRWM Summit attendees considered a wide array of information to make recommendations regarding the IRWM objectives. IRWM Summit attendees provided input via open discussions, and largely relied upon personal knowledge and experience as the basis for their input.

Determining the IRWM objectives was considerably more challenging than determining the IRWM vision, mission, or goals and included many revisions and substantial input from all stakeholders. Further, due to the planning hierarchy of the vision, mission, goals, and objectives; the goals were reviewed and revised as applicable when revising the objectives to ensure that the information and priorities included in the goals were reflected in the objectives, and vice versa. The Region's understanding of climate change and how it plays a role in most aspects of water resource management is reflected in the shift of climate change from an objective in the 2013 IRWM Plan Update to a goal in the 2019 IRWM Plan Update.

The Priorities and Metrics Workgroup, in coordination with the RWMG, was responsible for compiling a draft version of the vision, mission, goals, and objectives for further vetting through the RAC and members of the public. On December 5, 2012, a joint Public Workshop/RAC meeting was held, which focused on receiving input on the revised IRWM vision, mission, goals, and objectives before they were incorporated into the 2013 IRWM Plan.

The second IRWM Summit, held on February 29, 2016, was open to members of the public and had two purposes: 1) celebrate the successes of the San Diego IRWM Program and reminisce about the

Program's first 10 years, and 2) identify pressing regional issues and innovative solutions to address those issues, and brainstorm priorities for Proposition 1 IRWM funding. One of the IRWM Summit panels focused on key topics the IRWM Program should address in its next Plan update. Those suggestions were used as a starting point for refinement of this chapter in the 2019 IRWM Plan Update effort.

During the 2019 IRWM Plan Update, the RWMG and RAC revisited the vision, mission, goals, and objectives. At a RAC meeting held February 7, 2018, consideration was given to the process undergone during development of the IRWM Plan Objectives, changes to water resources context and management strategies, updated planning documents, stakeholder feedback on IRWM priorities (from the 2016 IRWM Summit and prior RAC meetings), and continued evolution of the San Diego IRWM Program. The RAC recommended keeping the vision and mission the same as the 2013 IRWM Plan, and converting the climate change objective to a goal to recognize is broad scope and priority in the region. Minor modifications were made to the remaining ten objectives.

The information included in the following sections regarding the IRWM vision, mission, goals, and objectives represents a synthesis of the input received through the aforementioned processes and stakeholder groups. Together, these processes were highly collaborative, involving as many IRWM stakeholders and interested parties as possible. All input received on the IRWM vision, mission, goals, and objectives was compiled into the Public Draft version of the 2019 San Diego IRWM Plan Update – Phase 1 which was further reviewed and commented upon by IRWM stakeholders, ensuring that the IRWM vision, mission, goals, and objectives were established and reaffirmed through a collaborative stakeholder process.

2.3 Sustainability of Water Resources

The IRWM Program supports the concept of sustainability, which is integrated in the IRWM vision, mission, goals, and objectives. Sustainability, broadly stated, calls for meeting the needs of the present without compromising the ability of future generations to meet their own needs. The San Diego IRWM Program advocates for sustainable water resources planning and has adopted a triple-bottom line definition to foster comprehensive results. The San Diego IRWM Program's definition of sustainability is shown below.

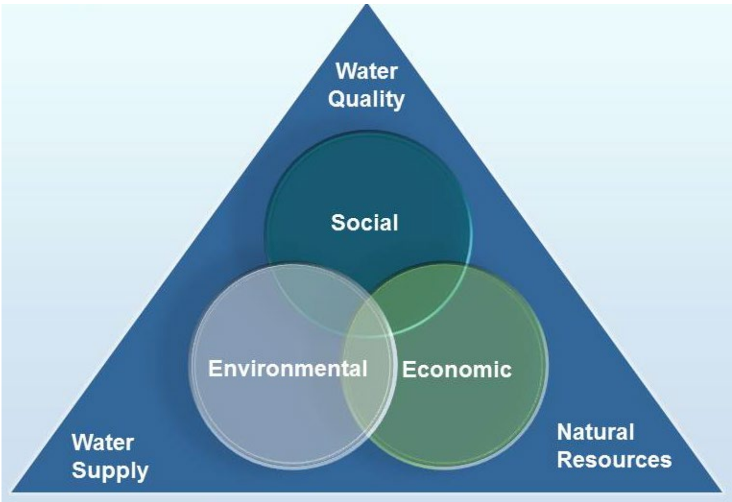
Definition of Sustainability for the 2019 IRWM Plan

Sustainable water resources management involves:

- ***Social***: Fostering public health and safety and maintaining a community's quality of life through provision of safe, reliable, affordable water supplies and recreational waters.
- ***Environmental***: Providing effective stewardship of water-based natural resources, including protection of water quality, habitat, water supply, and minimizing climate change impacts.
- ***Economic***: Providing and protecting reliable, sustainable water resources that supports the regional economy.

Ensuring long term sustainability requires effective leadership and commitment that encourages collaboration, improved integration of infrastructure and natural systems, and addresses conflicting regulations and policies. Sustainability is also furthered by the approach that is taken to assess and manage water resource projects. Considerations in assuring sustainable water management may include: water quality, habitat, floodplain functions, biodiversity, wetland and surface water functions, greenhouse gas emissions, resiliency, and life cycle costing that broadly considers all costs associated with materials, construction, operations maintenance, and decommissioning. No-regret climate change strategies (discussed in *Section 7.9.1* and the *Climate Change Study* in Appendix 7-D), which are defined as those strategies that would take place in the Region even in the absence of climate change, will also be considered for purposes of assessing sustainability.

As discussed in *Chapter 1, Introduction*, securing reliable sources of funding for these costs, particularly for operation and maintenance costs, is considered a potential implementation barrier as funding for these items is not readily available. For more information on implementation issues and challenges to sustainability, refer to *Chapter 11, Framework for Implementation.*



Principles of Sustainability for the 2019 IRWM Plan

2.4 IRWM Vision

The San Diego IRWM vision is to achieve:

> ***An integrated, balanced, and consensus-based approach to ensuring the long-term sustainability of the Region's water supply, water quality, and natural resources.***

2.5 IRWM Mission

The mission of the San Diego IRWM Program is:

> ***To develop and implement an integrated strategy to guide the Region toward protecting, managing, and developing reliable and sustainable water resources. Through a stakeholder-driven and adaptive process, the Region can develop solutions to water-related issues and conflicts that are economically and environmentally preferable, and that provide equitable resource protection for the entire Region.***

2.6 IRWM Goals

The San Diego IRWM goals are as follows, and apply to existing and future conditions, including climate change:

1. ***Improve the reliability and sustainability of regional water supplies.***
2. ***Protect and enhance water quality.***
3. ***Protect and enhance our watersheds and natural resources.***
4. ***Enhance resiliency to climate change for local water resources.***
5. ***Promote and support sustainable integrated water resource management.***

How the IRWM Plan Goals Address Issues and Needs in the Region

1. **Improve the reliability and sustainability of regional water supplies.** Expanding local water supply, supporting water supply reliability and security, reducing reliance on the Delta, and generally supporting improved water management help to sustain communities, economies, and the environment.
2. **Protect and enhance water quality.** Maintaining healthy and safe water resources is critical to the Region's public and environmental health, supports compliance with regulatory requirements, and reduces risk in the Region.
3. **Protect and enhance our watersheds and natural resources.** Protecting and enhancing our watersheds and natural resources help to promote public and environmental health, improve quality of life, support community engagement, protect threatened and endangered species, and provide opportunities for enriching experiences.
4. **Enhance resiliency to climate change for local water resources.** Effective water resources management helps to mitigate risks associated with supply reliability, sea level rise, flooding, wildfire, drought, and other extreme weather events. Responding to climate change impacts may include implementing "climate-proof" water management projects or incorporating greenhouse gas emissions reduction into project implementation. Increasing resiliency to climate change supports the four other goals of the IRWM Plan.
5. **Promote and support sustainable integrated water resource management.** Engaging stakeholders in water resource management is critical for achieving buy-in on integrated solutions, which can help resolve potential management challenges, promote efficiency and efficacy in management practices and projects, and achieve sustainable solutions.

2.7 IRWM Objectives

The ten IRWM objectives described below were developed and refined to meet the IRWM goals included in the 2013 and 2019 IRWM Plans. Objective K (addressing climate change) from the 2013 IRWM Plan has been converted into a goal in the 2019 IRWM Plan to better reflect the way climate change affects multiple aspects of water management and the Region's commitment to climate change resiliency. Table 2-1 provides a "crosswalk" of the Plan objectives and goals. As shown in the table, each of the goals is addressed by multiple objectives. Each objective has a number of targets and associated metrics designed to evaluate how well each objective is being met by the Region's water management activities. These targets, along with their metrics, are presented in Table 2-3 (page 2-21). The IRWM objectives and targets were developed considering the State's planning guidance in CWC §10540(c) and DWR's Proposition 1 Program Success Matrix (2017), and encompass water supply reliability, water quality, groundwater overdraft, environmental stewardship, and water-related needs of economically disadvantaged communities (DACs). These objectives reflect the San Diego Region's efforts towards obtaining the State's goal for water and the environment.

Table 2-1: Crosswalk of San Diego IRWM Plan Goals and Objectives

San Diego IRWM Objectives	San Diego IRWM Plan Goals					
	Reliability and Sustainability of Water Supplies	Protect and Enhance Water Quality	Protect and Enhance Watersheds and Natural Resources	Promote and Support Sustainable Integrated Water Resources Management	Enhance Resiliency to Climate Change for Water Resources	
					Adaptation	Climate Mitigation
Objective A: Encourage the development of integrated solutions to address water management issues and conflicts.	○	○	○	●	○	○
Objective B: Maximize stakeholder/community involvement and stewardship of water resources, emphasizing education and outreach.	○	○	○	●	●	○
Objective C: Effectively obtain, manage, and assess water resource data and information.	○	○	○	○	○	○
Objective D: Further scientific and technical foundation of water management.	○	○	○	○	○	○
Objective E: Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies.	●	○	●	●	●	●
Objective F: Construct, operate, and maintain a reliable and resilient infrastructure system.	●	●	○	○	●	●
Objective G: Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management.	○	●	●	●	●	●
Objective H: Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment.	●	●	●	○	○	○
Objective I: Protect, restore, and maintain habitat and open space.	○	○	●	○	○	●
Objective J: Advance water-based enriching experiences.		○	○	○	○	○

● IRWM Plan objective directly supports the listed IRWM Plan Goal
○ IRWM Plan objective indirectly supports the listed IRWM Plan Goal

To be included in the IRWM Plan, projects need to meet one of the ten IRWM objectives (refer to *Chapter 9, Project Evaluation and Prioritization*). However, to be considered for IRWM funding, projects must meet Objective A, Objective B, and at least one other objective. Each of the ten IRWM objectives, as well as information regarding how each objective addresses relevant water management issues, is provided below.

IRWM Funding Requirement – Objective A, Objective B, and One Other

To be included in the IRWM Plan, projects must contribute to at least one IRWM objective. To be **eligible for IRWM funding**, projects must meet Objective A, Objective B, and at least one additional IRWM objective.

Objective A: Encourage the development of integrated solutions to address water management issues and conflicts.

Detailed Description of Objective A

Implement projects and programs that effectively address local water management issues and conflicts through the following types of integration:

1. *Partnerships*: Establishing partnerships between different organizations to increase cost-effectiveness through sharing of data, resources, and infrastructure.
2. *Resource Management*: Employing multiple resource management strategies within a single project to effectively address a variety of issues.
3. *Beneficial Uses*: Developing solutions that address multiple beneficial uses to expand benefits.
4. *Geography*: Implementing watershed- or regional-scale projects to benefit more of people and potentially save costs through economies of scale.
5. *Hydrology*: Addressing multiple watershed functions within the hydrologic cycle to holistically address issues and resolve conflicts.
6. *Sustainability:* Implement projects that meet the needs of the present without compromising the ability of future generations to meet their own needs and broadly support social, environmental, and economic benefits.

The focus of this objective is to meet the requirements of Goal 5/Integration, which focuses on integration of water resources management. Both the vision and mission emphasize an integrated approach to water management, which is also a Statewide Priority (refer to Section 2.9). Goal 4/Climate Resiliency is also addressed by Objective A, because the impacts of climate change cross jurisdictional boundaries and require integrated and multidisciplinary approaches to water management in order to effectively mitigate climate and implement adaptation strategies.

Table 1-2, which can be found in *Chapter 1*, *Introduction,* includes an overview of identified water management challenges and conflicts relevant to the Region. In addition to the integration definitions described above, attainment of this objective will be evaluated based upon the ability to address relevant issues listed in Table 1-2.

Determination and Rationale for Objective A: The Region is a large and diverse area, falling under the jurisdiction of multiple water management agencies and organizations. By creating an objective that specifically focuses on integrated approaches to water resources and their management, the 2019 IRWM Plan emphasizes the importance of addressing issues across the Region regardless of jurisdictional and other boundaries that are not necessarily conducive to effective water management. Integration is the "I" in IRWM planning, which encourages planning and understanding of the inter-relationships across a variety of resource areas rather than traditional water planning efforts through which different resource areas (water supply, water quality, natural resources, flood management, etc.) are not necessarily coordinated. For example, water reuse efforts in the Region integrate both wastewater management and water supply development, and represent an integrated approach to managing water resources within the Region.

Incorporating cost-effective approaches to water management is essential for sustainable water management. Integration should also focus on the region's ability to accomplish more with less. The IRWM mission seeks solutions to water-management issues that are economically preferable on a long-term basis. The following text box, developed by the Priorities and Metrics Workgroup, acknowledges some of the disincentives and benefits of integration.

Potential Barriers or Disincentives to Integration	***Potential Benefits or Incentives to Integration***
• Takes a lot of time and energy to coordinate with other partners. • Integration may mean reducing the amount of grant funding that each organization receives. • Administrative costs associated with combining projects and completing grant administrative for multiple entities. • Integrating with other partners could mean losing some control over a project. • Integration makes projects more complex. • May have to give up some benefits or features of the original project concept to integrate with another project concept.	• Integration makes projects more competitive to receive grant funding, although integration in early or pre-design produces more win-win opportunities. • May be more cost-effective – partners such as NGOs can provide services at a lower cost and are adept at grant writing and grant administration. • May be more cost effective due to cost sharing with other agencies. • Integration reduces conflicts, which may result in streamlining for project approvals. • Integration may add additional expertise to a project. • Integration may allow for additional climate adaptation or mitigation strategies.

Objective B: Maximize stakeholder/community involvement and stewardship of water resources, emphasizing education and outreach.

Detailed Description of Objective B

Implement efforts to engage and educate the public on the IRWM Program and the interconnectedness of water supply, water quality, and natural resources. Build stewardship throughout the Region by providing opportunities to participate in water management and promote individual and community ownership of water resource problems and solutions. Increase public knowledge and understanding of the importance of water resource management, including stormwater as a resource, watershed and water quality protection, and supply diversification.

The focus of this objective is to incorporate stakeholder and community involvement and engagement into realization of each IRWM goal. The IRWM vision emphasizes the need for a consensus-based approach in water resources management within the Region, and the mission emphasizes the need for a stakeholder-driven process. Maximizing stakeholder and community involvement and stewardship has been a critical focus of the IRWM Program, and is a component of every aspect of the IRWM planning hierarchy. Due to the importance of stakeholder involvement to the San Diego IRWM Region, stakeholders determined that to be eligible for IRWM grant funding, a project must meet Objective A, Objective B, and at least one additional objective. Refer to *Chapter 9, Project Evaluation and Prioritization* for more information.

Determination and Rationale for Objective B: Stakeholder involvement is a vital part of the IRWM Program, and is necessary to identify and address public interests and perceptions, address stakeholder questions and issues upfront, ensure that the 2019 IRWM Plan and projects are consistent with public interests, provide for public ownership and support of IRWM activities, and bring diverse viewpoints to improve the next iteration of the IRWM Plan. Stakeholder involvement is also essential for building the capacity of small water systems, especially those in DACs, EDAs, URCs, and EJs where system administrators and operators may not be trained professionals.

Stakeholder involvement may assist in identifying areas where increased public education and outreach is required and help focus on the public's key water management issues and potential solutions. Increasing public knowledge and understanding of the importance of water resource management, as well as finding ways to listen to the community and solicit input on finding solutions to common challenges, is essential for garnering public support for IRWM projects, including stormwater as a resource, watershed and water quality protection, and water supply diversification. It also helps to build knowledge and capacity to increase awareness of the anticipated impacts of climate change and promote projects and activities that support climate adaptation or mitigation strategies. Public education and outreach at community events, workshops, and school-based educational programs are required to promote the identification and understanding of the Region's resources. Hands-on and volunteer participation of the public encourages community ownership of water resource problems and solutions. Stakeholder input is also an essential element in identifying and resolving potential water management conflicts within the Region, and has been a fundamental component of the 2007, 2013, and 2019 San Diego IRWM Plans.

Objective C: Effectively obtain, manage, and assess water resource data and information.

Detailed Description of Objective C

Increase and expand sharing, integration, and comprehensive analysis of water resource and water quality data to provide a basis for improved and adaptive water resources management.

Attainment of each IRWM goal can be enhanced through data and information sharing. Through this objective, the RWMG and RAC recognize that obtaining and evaluating water quality, water supply, environmental, and recreational data is essential to the successful development and implementation of regional water management actions and programs. Data collection and analysis is required to identify trends, document water quality improvements or impairments, assess the effectiveness of water resource management programs, measure impacts from climate change at the regional level, evaluate the effectiveness of climate mitigation and adaptation strategies, and provide direction for future program planning and management strategies.

Determination and Rationale for Objective C: Organizations and individuals that collect data within the Region have historically worked separately, and have not compiled information into a central repository where data can be evaluated, formulated, compared, and shared with interested stakeholders. The IRWM Program has undertaken actions to address this issue and hosts an upgraded online project database that will help to address this need. Refer to *Chapter 10*, *Data and Technical Analysis* for more information about the online project database (http://irwm.rmcwater.com/sd/login.php) and the WaterGIS page (http://sdirwmp.org/watergis).

Despite the IRWM Program's efforts towards implementing a Region-wide DMS, there are still challenges associated with data and data management that are the impetus for Objective C. Challenges associated with trying to collect regional data from multiple jurisdictions and organizations include: (1) differences and sometimes incompatibilities in electronic formats, (2) the lack of a centralized system or location for maintaining hard copy data such as reports or maps, (3) proprietary data use concerns, (4) inconsistent data protocols that make data comparison difficult and time-consuming, and (5) the cost of maintaining an ongoing regional data management system. IRWM Program participants are encouraged to continue submitting data to existing databases, despite known challenges, because data sharing and integration will support better water resources management.

The RWMG and RAC recognize that the IRWM Program offers a potential opportunity for regional entities to coordinate the collection, storage, analysis, and distribution of water quality, water supply, and natural resources data to overcome the challenges stated above. Beyond the regional DMS, other potential data-related opportunities for managers and stakeholders may include:

- making it possible to identify and update water supply, water quality, and other related data that will assist with water management issues
- providing data collection and storage in compatible electronic formats so that it is easily accessible to water managers and regional stakeholders
- analyzing collected data from areas within the Region that will assist in supporting water management actions/decisions
- assessing integration efforts between managers and stakeholders to provide water quality, water supply, and natural resources data in a beneficial manner to all parties involved
- developing a method to implement adequate quality controls for data collection, record keeping and analysis for the Region
- soliciting public/stakeholder involvement on data management and distribution
- identifying gaps in existing data or research needs to improve water resource management

Objective D: Further the scientific and technical foundation of water management.

Detailed Description of Objective D

Promote actions, programs, and projects that increase scientific knowledge and understanding of water management issues and support sustainable science-based regulations and requirements. Coordinate with regulatory agencies to assess and resolve ambiguous or conflicting regulatory standards or requirements.

Attainment of each IRWM goal can also be enhanced through increasing the scientific and technical foundation of water management. Objective D recognizes that additional scientific information and technical understanding is required to effectively implement many water management strategies, as well as improve regulations pertaining to water management.

Determination and Rationale for Objective D: Water management actions for the Region must comply with existing water quality, public health, flood control, environmental, and other laws and regulations. While water management actions must be addressed within the framework of existing regulations, additional technical and peer-reviewed scientific understanding is required to adjust regulations and the way in which regulations are implemented to ensure that such regulations are realistic, cost-effective, and being implemented in a meaningful way.

By addressing scientific and technical issues through regional coordination efforts, implementing agencies may recognize benefits of cost sharing, economies of scale and scope, and the increased potential for outside funding through collaborative approaches. Additionally, increased technical and scientific understanding allows for more consistent and expedient implementation of programs and activities. Sharing technical data, approaches, and results is essential for expanding the knowledge base of water resource managers within the Region, particularly related to new and emerging technologies such as advanced water treatment or the effectiveness of climate change adaptation strategies. Engaging with the scientific community may advance management-relevant research and partnerships.

Increased scientific data and technical comprehension may allow for the development of regionally-feasible or watershed-based compliance alternatives that may not have been feasible from site-specific or project-specific standpoints. Better scientific understanding will result in more effective use of technology and other natural approaches that will encourage the implementation of the most cost-effective solutions and improved water quality on a long-term basis. The IRWM Plan process may also allow regional agencies to coordinate with regulators to identify areas where modification of regulations or regulatory procedures may be appropriate for maximizing beneficial use and protecting the Region's water resources.

Objective E: Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies.

Detailed Description of Objective E

Continue to develop diverse water resources to meet local supply and conservation goals, reduce dependence on imported water supplies, and increase water supply availability and reliability. A diverse mix of water resources includes imported water, water transfers, recycled water, water conservation, desalination (brackish groundwater or seawater), local surface water, stormwater capture and use, potable reuse, and groundwater. Promote ethic of "conserve, reuse, and recycle".

The focus of this objective is to meet the requirements of Goal 1/Water Supply. The Region's population of approximately three million and the Region's economy are both dependent upon a reliable, cost-effective, and diverse water supply. Securing a variety of water supply sources will help the Region ensure that even in drought or emergency conditions, reliable water supply can be made available now and in the future. Ensuring that water supplies are available to meet future demands is essential given that the Region's population is projected to increase by approximately one third by 2030. This objective addresses the variety of water supply sources – both imported and local – that are necessary to sustain the Region's water demands. This also helps address Goal 4/Climate Resiliency by increasing the Region's resiliency to changes in supply availability that may be related to climate change (e.g., more frequent drought, sea level rise, etc.).

El Capitan Reservoir has a storage capacity of 112,800 acre-feet and holds both surface runoff and imported water.

Photo credit: Jeff Pasek, City of San Diego

Determination and Rationale for Objective E: As documented within the *California Water Plan Update 2013* (DWR, 2013), water allocation, environmental, and hydrologic constraints present significant challenges to the sustainability of State Water Project and Colorado River supplies (imported water supplies), particularly during long-term droughts. Additionally, reliance on imported water supplies renders the Region potentially vulnerable to short-term reliability issues that may occur in the event of a catastrophic emergency such as an earthquake that cuts off imported water supplies for up to six months.

Despite historic reliance on imported water supplies, the Region has made substantial progress in diversifying its water supply portfolio, a trend which will continue to occur in the future. Objective E aims to support the Region's water supply diversification efforts as well as the Region's water conservation efforts, which will both help to increase water supply reliability and reduce demands on imported water supplies. Projects that address Objective E include, but are not limited to, those that increase availability and reliability of local water supply, conservation and water use efficiency, water reuse and recycling, brackish groundwater desalination, and potable reuse. Regional water managers anticipate significant increases in potable reuse over the next few decades as water treatment technologies and regulations are established and more widely accepted.

Objective F: Construct, operate, and maintain a reliable and resilient water management infrastructure system.

Detailed Description of Objective F

Construct, operate, and maintain water conveyance, treatment, storage, and distribution facilities that comprise a reliable water infrastructure system consistent with the future planned mix of water resources. Provide flexibility in system operations, including utilization of natural systems for stormwater management. Improve asset management to allow use of existing infrastructure to meet water management needs and reduce the need for future projects. Address potential hazards to infrastructure from sea level rise and flooding.

The focus of this objective is to provide reliable infrastructure to meet Goals 1/Water Supply, 2/Water Quality, and 3/Natural Resources. Objective F also addresses Goal 4/Climate Resiliency, by providing reliable infrastructure that adapts to the potential impacts of climate change (e.g., design to withstand sea level rise and/or accommodate increased flows during extreme weather events). The Region's residents and economy are both dependent upon a reliable infrastructure to deliver water to residents, businesses, industries, parks, and agricultural lands. The Region's existing water supply infrastructure is described in *Chapter 3, Region Description*, and is a complex system of aqueducts, reservoirs, treatment plants, water pipelines, pump stations, and other appurtenances. Further, this objective addresses water infrastructure required for the disposal and reuse of wastewater, stormwater management, flood control, water quality-related concerns, and natural resources protection and enhancement.

Determination and Rationale for Objective F: Improvements to existing water supply infrastructure are required to ensure facilities are in place to produce, deliver, store, and treat supplies to reliably meet existing and future demands throughout the Region. Capital improvements will focus on increasing water supply flexibility, storage, supply diversity, safety and reliability. Asset management should allow for flexible use (or reoperation) of existing infrastructure to meet current or future water management needs, such as combined water storage, water quality improvement, and flood control benefits of local reservoirs, green infrastructure, or low impact development (LID). Training for DAC, EDA, URC, and EJ managers may help to ensure that technical, managerial, and financial capacity is adequately developed to manage existing infrastructure.

This objective also addresses requisite improvements to other types of water infrastructure that are required to meet other objectives included in this IRWM Plan. Other types of infrastructure are related: wastewater, flood control, and stormwater infrastructure should be designed in a manner to address, improve, and maintain water quality, and protect and enhance natural resources and watersheds.

Objective G: Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management.

Detailed Description of Objective G

Restore and enhance natural hydrologic processes, and promote best management practices that reduce negative effects on receiving systems such as natural stream systems, groundwater systems, local water supply reservoirs, and lagoons, bays, and the ocean. Reduce runoff from impervious surfaces, erosion, sedimentation, and flooding. Use integrated flood management to holistically address flood issues, sea level rise, water quality, natural resources, and other water management concerns. Maximize environmental, habitat, and water quality benefits of stormwater projects. Prioritize green infrastructure where feasible.

The focus of this objective is to help achieve Goals 2/Water Quality and 3/Natural Resources, while also addressing Goal 4/Climate Resiliency. Sediment pollution, erosion, and other development-related water quality and hydromodification issues have impacted the Region's water resources, and may affect the Region's ability to respond to climate change by limiting or constraining water management options. This objective is intended to encourage restoration and floodplain management activities that help to address these historical issues, and includes activities that utilize natural infrastructure and mimic natural infrastructure functions.

Determination and Rationale for Objective G: Sedimentation, erosion, and hydromodification present significant water management challenges within many of the Region's watersheds. Development practices may decrease normal, distributed, at-source infiltration and therefore increase the volume and duration of stormwater runoff due to the increased amount of impermeable surfaces, such as paved areas and roofs. These development practices impact natural conveyance systems, such as creeks, streams and rivers due to increases of water loads from storm drain and other discharge points not originally part of the natural drainage system. Additionally, runoff picks up contaminants from roads and other impermeable surfaces before entering receiving waters. Future development in the Region will also contribute to these impacts.

One way to address community flood damage is through integrated flood management solutions.

Photo credit: Bruce Phillips, PACE

Pollution loads due to runoff will reflect the change in residential, commercial, industrial, construction, and agricultural activities (land use changes). These land use changes can result in physical changes (hydromodification) to the Region's waterways. Stormwater management with a focus on habitat protection can maximize the beneficial services that natural systems provide in terms of water attenuation, contaminant removal, and overall water quality improvement. Addressing these problems will require regional cooperation in identifying and implementing cost-effective strategies. By identifying and addressing areas that are already, or likely to be, affected by hydromodification, stakeholders and mangers can prevent or decrease its impacts, mitigate its negative effects, and address economic impacts that future development may have on the current infrastructure.

Further, integrated flood management, which is a Statewide Priority, is also included within this objective. Integrated flood management involves developing solutions for effectively managing flood risks through a watershed approach that allows for development of holistic strategies that can also address beneficial uses and watershed functions. Potential climate change impacts, such as highly variable precipitation patterns (including extreme/extended drought punctuated by extreme precipitation events) and sea level rise, have high potential to result in flooding throughout the region, which can indirectly reduce water quality. Management of natural waterways and habitat areas to decrease vulnerability to these impacts can help to protect the region in the future.

Objective H: Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment.

Detailed Description of Objective H

Reduce pollutants and environmental stressors to protect and improve water quality through the application of point and non-point source controls, stormwater best management practices, management measures such as land use planning and conservation, and reservoir management. Reduce pollutant loads to protect the health and safety of humans and the environment and improve asset management to protect and enhance water quality.

The focus of this objective is to help achieve Goals 2/Water Quality and 3/Natural Resources, and to address Goal 4/Climate Resiliency through mitigation of some of the consequences of climate change. Existing regulatory programs control pollutants through a broad array of point source and non-point source programs. These programs are directed towards achieving compliance by mandating pollutant source controls and industry-standard best management practices. This objective is intended to encourage restoration, source control, and treatment activities that help to address water quality issues.

Determination and Rationale for Objective H: Approximately 60 inland surface waters (rivers or streams) and 13 reservoirs are listed on the Federal Clean Water Act 303(d) list of impaired water bodies as not attaining applicable water quality standards. Region-wide constituents of concern include bacteria, sediment, nutrients, and total dissolved solids (TDS). Toxic inorganic and toxic organic constituents are additional pollutants of concern in many of the Region's urbanized watersheds. There is potential that existing environmental stressors may worsen as a result of climate change due to increased occurrence of severe weather events (e.g. drought) and sea level rise. For example, drought can contribute to higher "first flush" pollutant loads once precipitation does occur, while at the same time reducing flows in streams, which generally increases water temperature and reduces ability to dilute pollutant loading in waterways. Reducing compounding stressors on water systems and watersheds (e.g., reducing pollution) may make these systems better able to withstand the impacts from climate change. Thus, reducing compounding stressors may increase adaptive capacity or resilience to climate change.

Cost-effective approaches to reducing pollutant loads, sources, and stressors is essential to bring listed water bodies into attainment of the standards, achieve Total Maximum Daily Load (TMDL) allocations, and prevent waters that currently meet the standards from slipping into non-attainment or from being placed on the Clean Water Act 303(d) list. Additional data and analysis are required to establish a correlation between the use of pollutant source controls and water quality improvements, which will assist in the identification of predominant pollutant sources.

An important management consideration in addressing pollutants and stressors within local water supplies is reservoir and lake management. Reservoir and lake management strategies, including natural treatment systems, can be considered as a way to reduce problems associated with poor water quality and treatability resulting from stressors such as nitrogen, phosphorus, iron, manganese, and sulfur. Natural treatment systems may also mitigate climate through carbon sequestration in vegetation and carbon burial in sediments.

Objective I: Protect, restore, and maintain habitat and open space.

Detailed Description of Objective I

Manage and acquire land to preserve open space and protect sensitive habitat for endangered, threatened, and locally-important plant and wildlife species. Invasive species management, habitat conservation, and water pollution prevention activities will help to maintain and enhance biological diversity. Utilize stormwater capture to support habitat and environmental needs.

The focus of this objective is to meet Goal 3/Natural Resources; it will also address Goal 4/Climate Resiliency by helping to mitigate climate change. The Region features biologically diverse and important habitats and has a high degree of biological diversity (biodiversity). In recent decades, however, development and population growth within the Region have resulted in the loss of open space and habitat. Additionally, remaining native habitat may be subject to impacts or stress from invasive species, water quality degradation, hydromodification, and climate change impacts.

Lower Otay Reservoir contains extensive wetlands habitats.
Photo credit: Jeff Pasek, City of San Diego

Determination and Rationale for Objective I: More bird and plant species live within San Diego County than in any other county in the contiguous United States; however, the reduction of available open space lands that can support wildlife habitats has reduced the number of native plants and animals living in the Region, and has reduced overall biodiversity. The trend of decreasing open space land within the Region is projected to continue, and it is anticipated that biodiversity in the Region will decrease as well.

Due to anticipated growth, development and climate change impacts, the preservation and maintenance of open space is an important component of ensuring protection of the Region's water quality, water availability, and protection of endangered and threatened species and habitats. Preserving and maintaining open space is also important for maintaining the Region's natural aesthetics, preserving and enhancing recreational opportunities, enhancing the quality of life for residents, and providing benefits relative to tourism and the economy. Protecting habitats and green spaces is also a climate adaptation strategy for extreme temperatures – natural habitats and green spaces can reduce temperature at the local level (e.g., reduce the heat island effect). Further, the *Water Quality Control Plan for the San Diego Basin* (Basin Plan) identifies several beneficial uses that address the needs of aquatic, wildlife, and marine habitats. Due to Basin Plan beneficial use designations pertaining to habitats, habitat management in the Region is a regulatory requirement that must be considered in water bodies that have such habitat-related beneficial uses, including Areas of Special Biological Significance (ASBS). Maintaining and expanding habitat can have an additional benefit of improving water quality, particularly when used to manage stormwater flows. Stormwater captured and used to sustain habitat and support local water supply often achieves dual benefits of water filtration (treatment) and infiltration (groundwater recharge). Natural habitat can also act as a carbon sink through sequestration, helping to mitigate the underlying cause of climate change in support of Assembly Bill 32, and the City's and County's Climate Action Plans.

Objective J: Advance water-based enriching experiences.

Detailed Description of Objective J

Protect and provide access to water-based enriching experiences such as education, outreach, swimming, fishing, boating, as well as picnicking and hiking along waterways, while ensuring that such activities do not adversely affect other beneficial uses of water. Improve public safety in water-based enrichment areas so that members of the Region can use them freely.

The focus of this objective is to meet Goal 5/Integration. The Basin Plan designates both water contact recreation (swimming, wading, tide pooling, water skiing, surfing) and non-contact recreation (boating, fishing, hiking, bird watching, kayaking) as key beneficial uses of inland and marine waters within the Region.

Determination and Rationale for Objective J: Water contact and non-contact recreation and enriching experiences are important components of the Region's quality of life and tourism-dependent economy. A considerable number of enrichment opportunities exist at the beaches, rivers, streams, lakes, marine and estuarine waters within the Region.

Urban and agricultural stormwater runoff, aging sanitary sewer infrastructure, spills, and maintenance issues frequently degrade the water quality of the Region's coastal waters, resulting in the posting of advisories of potential public health threats and beach closures. Controlling these pollutant-contributing activities is critical to enhancing and maintaining water-based enrichment opportunities within the Region.

The Region's inland lakes are all man-made water supply reservoirs. Many of these reservoirs permit recreational uses that may adversely affect water quality due to contamination from swimmers, boating equipment, camping activities, and littering. Enrichment activities within the Region's reservoirs must therefore be balanced with water supply and water quality protection needs. While optimizing enrichment opportunities is a Plan objective, restrictions on recreation (limiting public access, conservation easements, limiting certain recreational activities, or requiring implementation of best management practices) may be necessary to protect water supply and other beneficial uses.

Enriching experiences that are supported by Objective J are an essential component of engaging stakeholders in protection and restoration of water resources, as well as increasing their support for mechanisms to adapt to and mitigate the effects of climate change on local waters.

2.7.1 Prioritizing the IRWM Objectives

The 10 IRWM objectives described above will be used to evaluate potential projects for inclusion in the 2019 IRWM Plan and will therefore help to determine which projects are submitted in grant applications. The question of prioritizing objectives was discussed by stakeholders in the Priorities and Metrics Workgroup conducted during the 2013 planning effort, who ultimately recommended against prioritizing objectives in the IRWM Plan. While recognizing that prioritizing objectives could make project evaluation easier and more transparent, it was determined that the costs of prioritizing objectives, including limiting the potential breadth of water management activities, losing some of the flexibility of the IRWM Plan, and losing stakeholder support, outweighed the benefits. All 10 IRWM objectives were developed by stakeholders because they address an identified priority for water management in the Region. Balancing project selection such that all objectives are addressed through IRWM funding opportunities and therefore contribute to broader water resource sustainability is the approach that the IRWM Region will take.

2.7.2 Climate Change Considerations

The San Diego IRWM Region recognizes that climate change poses a significant threat to the Region's water resources, which has linked ecological, social, and economic consequences. While the Region typically experiences considerable natural variation in climate, increased greenhouse gases (GHGs) in the atmosphere are leading to more extreme climate variations. We are already seeing the effects of climate change in the region, with extreme drought, altered fire seasons, and moderate sea level rise. While the region is actively planning its water management around projections for future water needs and availability, including the impacts of climate change, and projects water supply reliability into the future, impacts of climate change are expected to affect water supplies as well as have other non-water supply impacts on water resources. The impacts of climate change are expected to increase in severity over coming decades, which has implications for water resources, ecosystems, and human communities that depend on them. The impacts of climate change on the water supply are being quantified in the San Diego Basin Study, which will be finalized in 2019.

Preparing for and responding to climate change will require an integrated approach to resource management, which makes the IRWM program uniquely suited to take action. A key benefit of the San Diego IRWM Program is that all Plan Objectives directly or indirectly support Goal 4/Climate Resiliency to build climate *resilience* through *adaptation* and *mitigation* (Table 2-1). We conceptualize climate resilience, adaptation, and mitigation as related concepts (Figure 2-1) and for the purposes of the IRWM Plan, these terms are defined as:

> *Climate Resilience:* Resilience is the capacity of any entity – an individual, a community, an organization, or a natural system – to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience (Resources Agency, 2017).
>
> *Climate Adaptation:* Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (USEPA, 2013).
>
> *Mitigation (climate):* A human intervention to reduce the human impact on the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks (e.g., carbon storage) (USEPA, 2013).

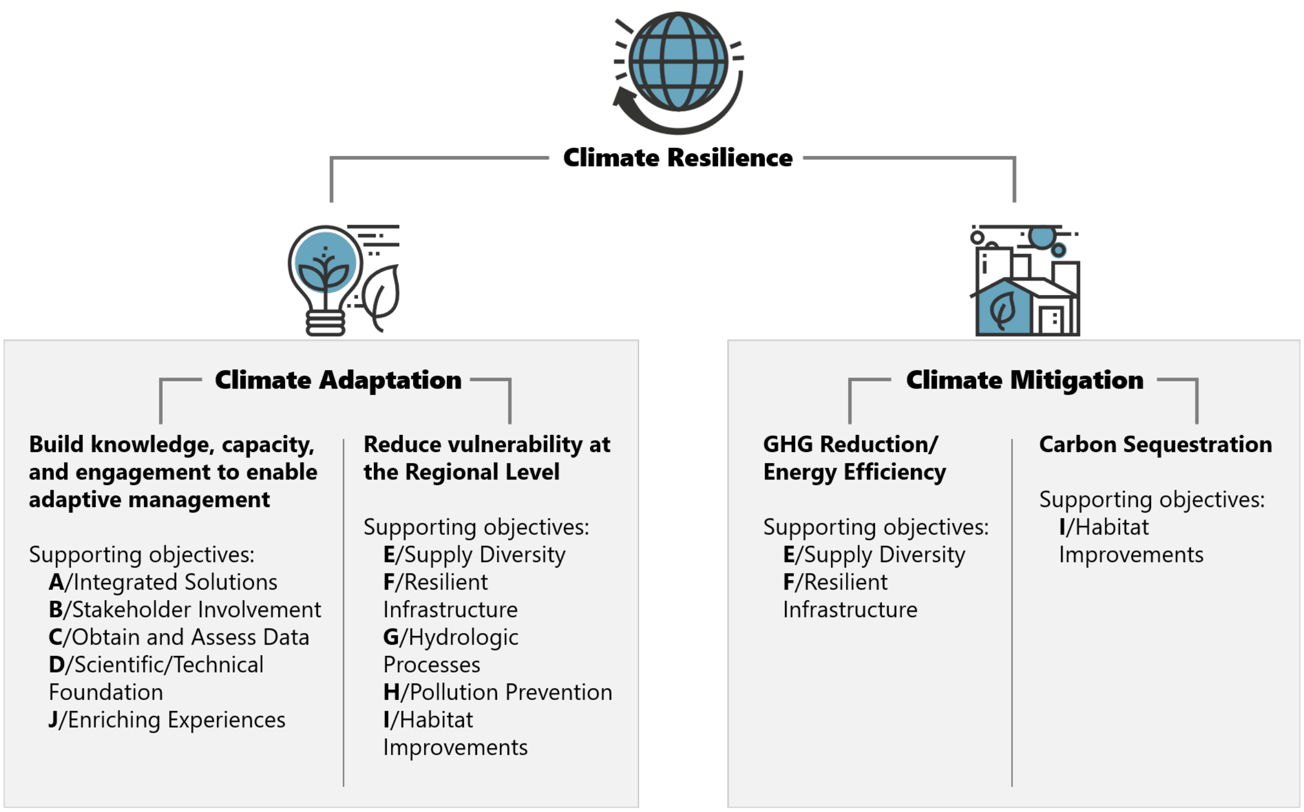
Mitigation (of disaster risk and disaster): The lessening of the potential adverse impacts of physical hazards (including those that are human-induced) through actions that reduce hazard, exposure, and vulnerability (International Panel on Climate Change, 2014).

Vulnerability: In the most general sense, a susceptibility to harm or change. More specifically, the degree to which a system is exposed to, susceptible to, and unable to cope with, the adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, as well as of non-climatic characteristics of the system, including its sensitivity, and its coping and adaptive capacity (Resources Agency, 2009).

Per DWR's 2016 Guidelines, the San Diego IRWM Region has identified vulnerabilities to climate change and prioritized which are of highest priority to address (see Table 7-16, *Chapter 7*). Management strategies to address these vulnerabilities and improve climate resilience have also been identified (Table 7-17, *Chapter 7, Regional Coordination*). All projects included in the IRWM Program will be evaluated on their ability to address the risks to water resources and infrastructure arising from climate change. Projects will be selected for regional grant funding in part by their ability to address the vulnerabilities or implement the resource management strategies identified by the San Diego IRWM Climate Change Planning Study (Appendix 7-D).

Expanding and integrating knowledge about climate change science and adaptation approaches is fundamental to achieving regional resiliency. IRWM serves as a venue to build knowledge, capacity, and coordination among diverse groups to address climate change through integrated solutions.

Figure 2-1: Climate Change Framework for San Diego IRWM Program



2.8 IRWM Planning Hierarchy

This chapter includes an overview of all aspects of the IRWM planning hierarchy. The IRWM planning hierarchy included in this 2019 IRWM Plan is consistent with the planning hierarchy originally developed for previous versions of the IRWM Plan.

The individual components of the planning hierarchy – as illustrated in Figure 2-2 – are explained in the previous sections and are applied consistently throughout the 2019 IRWM Plan.

Figure 2-2: IRWM Planning Hierarchy

2.9 Consistency with Statewide Priorities

The IRWM objectives included in the previous sections address issues specific to the San Diego IRWM Region as identified by and vetted with regional stakeholders. While the objectives address issues specific to the IRWM Region, they are also in conformance with the Statewide Priorities set forth by DWR in the 2016 IRWM Guidelines (DWR, 2016). Table 2-2 demonstrates how the IRWM objectives either directly or indirectly address each Statewide Priority included in the 2016 IRWM Guidelines.

2.10 IRWM Plan Targets

Each of the 10 IRWM objectives described above has a number of measurable targets designed to help evaluate how well each objective is being met. Each of these targets has one or more quantitative or qualitative metric to evaluate the targets. The targets and metrics for each objective are described in Table 2-3. The process of assessing attainment of each objective through the targets and metrics is detailed in *Chapter 11, Implementation.* Further, Table 2-3 indicates (with an "x") whether each measurable target can be implemented through the IRWM Program or through IRWM Projects, which are organized by project type in the table. Revisions to Table 2-3 made for the 2019 IRWM Plan considered DWR's Proposition 1 Success Metrics. Target and metric language varies to reflect the specific needs, issues, and objectives in the San Diego IRWM Region.

Table 2-2: Conformance of Plan Objectives with Statewide Priorities

San Diego IRWM Objectives	Statewide Priorities									
	Conservation as Way of Life	Regional Self-Reliance and Integrated Water Management	Co-Equal Goals for the Delta	Protect and Restore Important Ecosystems	Manage and Prepare for Dry Periods	Expand Water Storage Capacity and Improve Groundwater	Provide Safe Water for All Communities	Increase Flood Protection	Increase Operational and Regulatory Efficiency	Identify Sustainable and Integrated Financing Opportunities
Objective A: Encourage the development of integrated solutions to address water management issues and conflicts.	●	●	●	●	●	●	●	●	●	●
Objective B: Maximize stakeholder/community involvement and stewardship of water resources, emphasizing education and outreach.	●	○	○	○	○	○	○	○	○	
Objective C: Effectively obtain, manage, and assess water resource data and information.	○	○	○	○	○	○	○	○	○	○
Objective D: Further scientific and technical foundation of water management.	○	○	○	○	○	○	○	○	○	○
Objective E: Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies.	●	●	●	○	●	●	●	○	●	
Objective F: Construct, operate, and maintain a reliable and resilient infrastructure system.		●	○	○	●	●	●	●	●	○
Objective G: Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management.			○	●	○	○		●	●	
Objective H: Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment.	○			●		○	○	○	●	
Objective I: Protect, restore, and maintain habitat and open space.			○	●					○	
Objective J: Advance water-based enriching experiences.	○		○	○						○

● IRWM Plan objective directly supports the listed Statewide Priority
○ IRWM Plan objective indirectly supports the listed Statewide Priority

Table 2-3: IRWM Objectives, Targets, and Metrics

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type** Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
Objective A: Encourage the development of integrated solutions to address water management issues and conflicts.	1. Encourage the development of partnerships to implement water management projects.	• Number of IRWM-funded projects that have multiple partners	x	x	x	x	x	x	x	x	x
	2. Encourage the development of projects that achieve multiple IRWM Plan objectives.	• Number of IRWM-funded projects that contribute to attainment of multiple IRWM Plan objectives	x	x	x	x	x	x	x	x	x
	3. Encourage the development of projects that integrate multiple Resource Management Strategies.	• Number of IRWM-funded projects with multiple Resource Management Strategies	x	x	x	x	x	x	x	x	x
	4. Encourage the development of projects that provide regional or multi-watershed benefits.	• Number of IRWM-funded projects that provide multi-watershed or regional benefits	x	x	x	x	x	x	x	x	x
	5. Encourage the development of projects that consider multiple hydrologic functions.	• Number of IRWM-funded projects addressing multiple watershed functions considering the hydrology of the system (upstream/downstream, surface/groundwater)	x	x	x	x	x	x	x	x	x
	6. Realize efficiencies by implementing integrated approaches to water management.	• Number of benefits per IRWM-funded project	x	x	x	x	x	x	x	x	x

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type**							
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
Objective B: Maximize stakeholder/community involvement and stewardship of water resources, emphasizing education and outreach.	1. Maintain the regional IRWM website to provide centralized public access to IRWM program data and information.	• Regular updates to the website • Access provided • Number of website visits	x								
	2. Provide access (via active link) to the regional IRWM website to help inform the Region's population about the IRWM program.	• Access provided		x	x	x	x	x	x	x	
	3. Conduct education and outreach activities to obtain a measurable increase in the regional population's knowledge of sustainable water resources management, including the nexus between water and energy.	• Public workshops, meetings and presentations held • Outreach activities (brochures, fair booths, landscape contests); • Survey results	x	x	x	x	x	x	x	x	x
	4. Provide "hands-on" stewardship and volunteer opportunities in the Region's watersheds, including underserved and disadvantaged communities.	• Stewardship activities held • Number of participants (new vs. returning)		x	x	x	x	x	x	x	
	5. Encourage the use of partnerships and community contacts to collect and disseminate information on water management.	• Partners utilized to collect and disseminate information	x	x	x	x	x	x	x	x	x
	6. Increase DAC-EDA-URC-EJ participation and engagement	• Number of DAC-EDA-URC-EJ projects and dollars awarded • Number of participating DAC-EDA-URC-EJ residents or organizations • Number of new DAC-EDA-URC-EJs attending RAC or submitting projects • Percentage of IRWM-sponsored meetings (including funded project meetings) targeting DAC-EDA-URC-EJs	x	x	x	x	x	x	x	x	

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type**								
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
	7. Increase Tribal participation and engagement	• Number of Tribal projects and dollars awarded • Number of participating Tribal residents or organizations • Number of new Tribal representatives attending RAC or submitting projects • Percentage of IRWM-sponsored meetings (including funded project meetings) targeting Tribes	x	x	x	x	x	x	x	x	
Objective C: Effectively obtain, manage, and assess water resource data and information.	1. Provide centralized public access to key water management data sets related to the IRWM Program and contribute water resources data consistent with established standards to regional data management system (DMS)	• Regional DMS developed and populated • Data sets that meet quality standards contributed • Access to regional water quality sampling and reporting data for public health and environmental protection purposes	x	x	x	x	x	x	x	x	x
	2. Collect and evaluate water resources data in order to assess and document regional conditions, issues, and potential solutions.	• Collected data informs and supports decision-making	x	x	x	x	x	x	x	x	x
Objective D: Further scientific and technical foundation of water management.	1. Work with the San Diego Water Board to implement collaborative activities to update, improve, and validate the Basin Plan.	• Collaborative activities with San Diego Water Board • Development of alternative strategies (such as implementation plans) to maintain compliance with Basin Plan water quality objectives • Implementation of Regulatory Workgroup Strategies • Number of scientifically-based site-specific objectives developed	x	x	x	x	x	x	x	x	x

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type**							
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
	2. Work with regional flood managers to understand and encourage application of integrated flood management techniques.	• Studies/projects implemented	x	x	x	x	x	x	x	x	x
	3. Promote the inclusion of sustainable water resource management policies in land use plans.	• Number and diversity of water resource management policies included in land use plans	x								x
	4. Expand the technical foundation of reusing local supplies (i.e. potable reuse, stormwater capture, greywater).	• Study outcomes • Guidelines or specifications developed • Research and development, pilot testing, or conceptual design projects implemented • New technologies used	x	x	x	x	x	x	x	x	x
	5. Apply innovative approaches to understanding the connectivity between regional groundwater and surface water supplies.	• Study outcomes • Research and development, pilot testing, or conceptual design projects implemented	x	x	x	x	x	x	x	x	x
	6. Expand the technical foundation of using riparian habitat for greenhouse gas mitigation.	• Study outcomes	x							x	x
	7. Explore innovative Low Impact Development concepts and develop new solutions to manage runoff.	• Study outcomes • Research and development, pilot testing, or conceptual design projects implemented	x					x			x
	8. Engage with the scientific community to synthesize and translate research in a management-relevant context.	• Study outcomes	x	x	x	x	x	x	x	x	x

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type**							
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
Objective E: Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies.	1. Conserve or reuse water to meet aggregated retail agency SBX7-7 demand target of 167 gallons per capita day (gpcd) for the region by 2020.	• AFY of water conserved • AFY of recycled water produced for beneficial reuse or used by customers • Urban and agricultural water conservation programs implemented		x		x					x
	2. Increase local supply development (recycled water, groundwater, desalinated water, surface water) in urban areas.	• AFY of seawater desalinated • AFY of recycled water used • Number of new recycled water connections • AFY of potable reuse (purified water) used • Number of potable reuse projects studied, designed, or implemented • AFY of groundwater produced or recharged • Maintenance of groundwater levels		x	x	x	x				x
	3. Implement Colorado River conservation and transfer programs to augment local supply development.	• AFY of Colorado River water delivered		x							x
	4. Encourage efficient technologies, water conservation, and recharge area protection in rural areas in order to assure a sustainable long-term supply of groundwater.	• AFY of groundwater produced or recharged • Maintenance or increase of groundwater levels • AFY of water conserved • Water use audits performed • Well meters installed • Studies/projects implemented		x		x	x				x

Objectives *Specific observable outcomes.*	Targets *Measurable and tangible actions to achieve the objectives.*	Metrics *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	Project Type							
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
	5. Develop and implement effective and cost efficient approaches for drinking water source protection.	• Studies/projects implemented • Improved local water supply quality		x	x	x	x	x	x	x	x
	6. Protect water supply from invasive Quagga mussels.	• Number of sites with Quagga mussels present • Amount of Quagga mussels removed, eradicated, or avoided									
Objective F: Construct, operate, and maintain a reliable and resilient infrastructure system.	1. Develop facilities and manage supplies to ensure adequate emergency and carry-over deliveries.	• AFY of emergency and carry-over supply • % of reservoir storage capacity used • Increase in operational flexibility		x							
	2. Develop, maintain, and optimize infrastructure and water quality for delivering water, collecting wastewater, capturing stormwater, and transporting stormwater and flood flows.	• Infrastructure developed • Length of conveyance pipe installed • Construction or maintenance projects implemented • Water quality projects that maintain use of infrastructure		x	x	x	x	x	x		x
	3. Encourage innovative approaches to sustain or increase groundwater supplies in rural areas.	• AFY of groundwater produced or recharged • Infrastructure developed • Soil humidity		x	x	x	x				x
	4. Create, restore, protect, and maintain habitats that also serve a water resources management function.	• Acreage of habitat associated with water resources • Acreage of functioning wetlands • Volume of transitory flood storage		x				x	x	x	x

Objectives *Specific observable outcomes.*	Targets *Measurable and tangible actions to achieve the objectives.*	Metrics *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	Project Type							
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
	5. Enable small water systems to effectively construct and maintain their infrastructure.	• AFY of supply impacted by project • Infrastructure developed • Small water systems brought into drinking water compliance • Management plans developed		x	x		x				
Objective G: Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management.	1. Integrate cost-effective flood management benefits into water supply and water quality projects.	• Integrated projects implemented • AFY of stormwater captured, treated, or reused		x			x	x	x	x	x
	2. Enhance or restore healthy hydrologic processes in the Region's watersheds, notably reducing the negative effects of impervious surfaces.	• Decrease in peak flow or total runoff • Reduction in flood claims • Reduction in road closures due to flooding • Acreage of impervious surface restored • Acreage of functioning wetlands • Volume of transitory flood storage						x	x	x	x
	3. Promote watershed management and land use planning that mitigates or avoids typical hydromodification impacts associated with urbanization.	• Policies • Acreage of permeable surface protected • Acreage of riparian or floodplain buffer protected	x					x	x	x	x

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type** Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
Objective H: Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment.	1. Maintain or improve the water quality entering local reservoirs, groundwater, recharge areas, watersheds, and other local water resources.	• AFY flow reduction to ocean outfalls • Decrease in pollutant concentrations • Pounds of trash removed • Pounds of trash prevented from entering water ways • Acreage of buffer vegetation planted • Strategies employed • TMDL implementation plans developed • Number of 303(d)-listed water bodies that are de-listed • Measured decreases in pollutant concentrations • Improved or maintained water quality from MS4 discharges • BMPs implemented		x	x	x	x	x	x	x	
	2. Implement 3-6 individual groundwater basin plans with stakeholder involvement that adhere to the Salinity/Nutrient Management Guidelines that will assist in the preservation of the quality of the Region's water resources.	• Groundwater basin plans implemented		x		x	x		x	x	
	3. Develop and implement effective and cost efficient source management strategies to address regionally-significant constituents (e.g., pathogens, nutrients, sediments, solid waste).	• Volume of applied fertilizer/pesticide reduced or eliminated • Amount of organic versus chemical fertilizer applied • Decrease in sediment transport • Decrease in solid waste • Strategies employed		x	x	x	x	x		x	

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type**							
				Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
	4. Implement wastewater improvements that reduce the frequency and volume of sanitary sewer overflows within the Region.	• Number of sewer overflows • Reduced beach postings • Volume of sewer overflows per mile of pipe			x						
	5. Implement Low Impact Development (LID) practices to reduce non-stormwater runoff.	• Decrease in peak flow or total runoff • Volume of water retained						x			
	6. Plan and implement stormwater or natural treatment systems on a watershed scale to improve water quality.	• Decrease in pollutant concentrations • Reduced beach postings • Acreage of functioning wetlands						x	x	x	
	7. Protect and improve groundwater quality in rural basins to ensure compliance with drinking water standards.	• Decrease in pollutant concentrations • Compliance with MCLs		x		x	x				
Objective I: Protect, restore, and maintain habitat and open space.	1. Identify, conserve, protect, and restore habitat, open space, and sensitive species associated with water resources, including functional aquatic, riparian, and wetland habitat and associated buffer habitat, which may serve as refugia to climate change impacts.	• Acreage of habitat or open space • Number of parcels acquired • Number of sensitive species with potential to occur on site • Presence/ absence of sensitive species • Carbon stored by protected habitats		x				x	x	x	
	2. Reduce, remove, and control sources of sediment and trash	• Pounds of trash diverted • Pounds of trash collected • Metric for sediment						x			
	3. Remove and control non-native invasive plants that are impacting regional water resources.	• Acreage of invasive plants • % of native planting survival • % percent increase in flow capacity • Water resources affected						x	x	x	

Objectives *Specific observable outcomes.*	**Targets** *Measurable and tangible actions to achieve the objectives.*	**Metrics** *Measurements that can be used to evaluate the actions – may be quantitative or qualitative.*	**IRWM Program**	**Project Type** Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat / Open Space	Climate Resilience
	4. Monitor, manage, control, and prevent establishment of nuisance aquatic species in the Region.	• Water resources affected • Increase in operational time due to control		x						x	
Objective J: Advance water-based enriching experiences.	1. Develop water-based education, outreach or recreational open space that is open to the public and focuses on underserved areas and ensures equal access for disadvantaged communities.	• Acreage of open space • Number of visitors • Number of education/outreach events									
	2. Develop new public access points (boat launch facilities, fishing floats or piers, swim beaches, trails, stairs, parking areas, or similar) to recreational surface waters.	• Number of public access points • Number of visitors • Length of trail • Connectivity between existing open spaces		x				x	x	x	
	3. Improve quality of recreation through interpretation, signage, and ADA access.	• Number/length of wheelchair accessible trails • Number of visitors utilizing interpretation resources • Number of interpretive signs • Amount of trees and urban forests									

2.11 References

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3 Region Description

The San Diego IRWM Region (Region) as defined by this 2019 IRWM Plan consists of eleven parallel and similar watersheds within the County of San Diego that discharge to coastal waters. Figure 3-1 provides an overview of the Region's watersheds and *Chapter 5, Watershed Characterizations* provides a detailed discussion of the water resources within each watershed. The Region boundaries were selected primarily on the basis of water management regulatory and political jurisdictional boundaries. Other factors that influenced IRWM Plan boundary selection included similarities in hydrology and watershed characteristics and a common imported water supply.

3.1 Region Overview

Population

The Region addressed by this 2019 IRWM Plan includes all but a small fraction of the County's population. Table 3-1 presents existing and projected population within the County and Water Authority service area. Table 3-1 also presents a population breakdown by ethnicity and age. Population within the Region is projected to increase by approximately 22% by the year 2040.

Table 3-1 also illustrates that nearly all of the County's population is within the Water Authority service area. The portion of the County's population outside the Water Authority service area is mainly dependent on local groundwater supply.

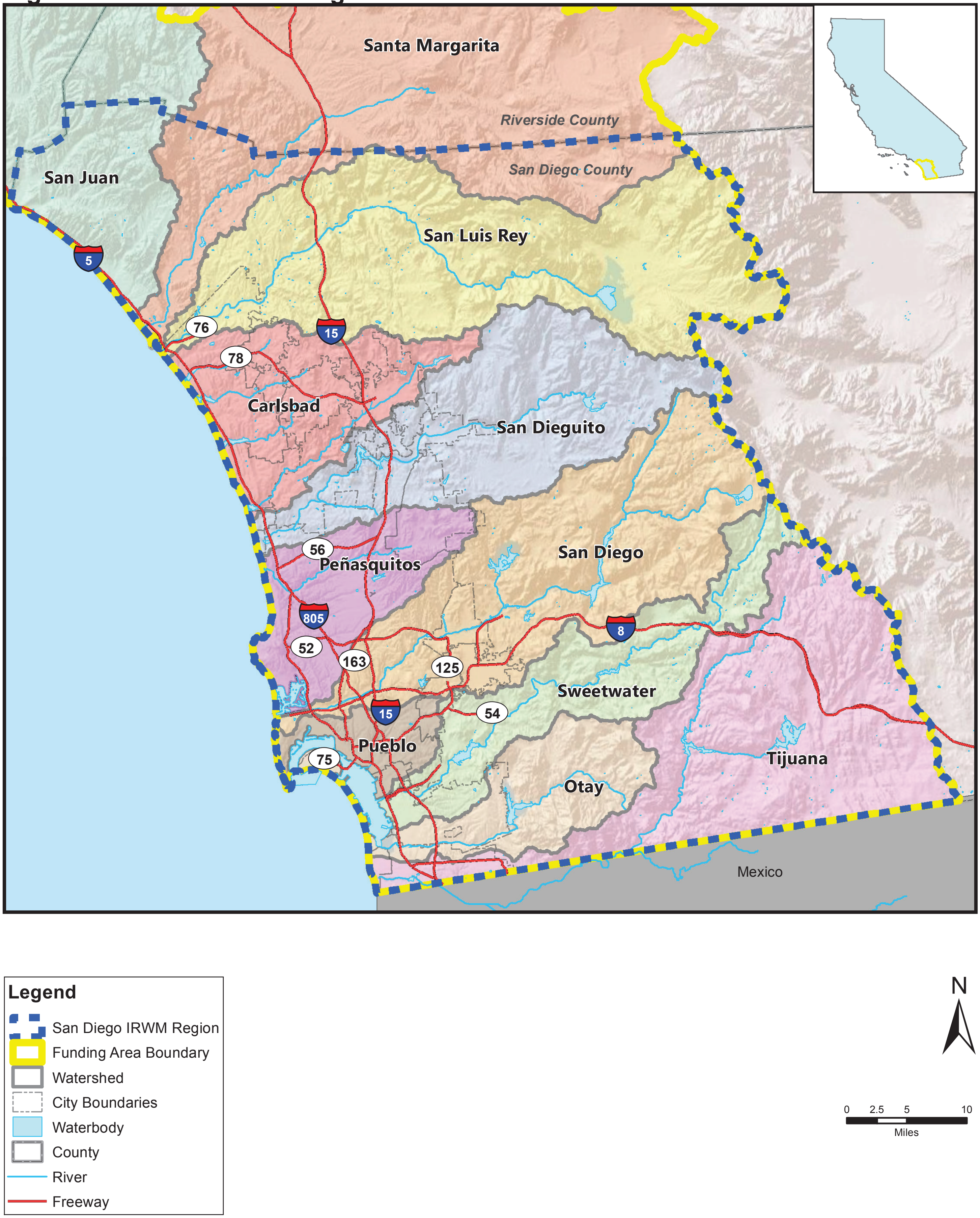
Social and Cultural Makeup

The Region is culturally diverse and features national and ethnic communities from throughout the world, including large and active national and ethnic communities from Mexico, Central and South America, the Caribbean, Africa, Europe, former Eastern bloc nations, the Middle East, India, China, Southeast Asia, and the Pacific Islands.

As shown in Table 3-1, the Region's diverse ethnic groups comprise a majority of the County's population. Population gains are projected within all ethnic communities.

By numbers, Hispanics represent the fastest growing segment of the population, and currently comprise roughly one-third of the Region's population. The Region also features a diverse Asian population that includes large communities that celebrate heritage from China, Southeast Asia, and India. Pacific Islander populations within the County are projected to show the greatest percentage increase in the next twenty years (SANDAG, 2013).

Figure 3-1: Overview of Region's Watersheds



RMC

Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-1_Overview of Regions Watersheds_060713.mxd

Table 3-1: Existing and Projected Population

Category	Demographic Parameter	2015[2]	2020	2025	2030	2035	2040
Population (millions)	San Diego County[1]	3,223,096[3]	3,435,713	3,601,158	3,741,666	3,853,698	3,937,280
	Water Authority Service Area[4]	3,146,771	3,340,594	3,495,978	3,630,542	3,745,684	3,825,041
	Percent of San Diego County	97%	97%	97%	97%	97%	97%
San Diego County Population Breakdown by Age[1]	Percent Age 0-19	26%	26%	26%	25%	25%	24%
	Percent Age 20-39	30%	30%	29%	28%	27%	27%
	Percent Age 40-59	25%	24%	23%	23%	24%	24%
	Percent Age 60+	18%	21%	22%	24%	24%	24%
San Diego County Population Breakdown by Ethnicity[1]	Percent White	46%	44%	41%	39%	36%	34%
	Percent Hispanic	34%	36%	38%	40%	41%	43%
	Percent Asian	11%	11%	12%	13%	13%	14%
	Percent Black	4%	4%	4%	4%	4%	4%
	Percent Native American	<1%	<1%	<1%	<1%	<1%	<1%
	Percent Pacific Islander	<1%	<1%	1%	1%	1%	1%
	Percent Other/Mixed	3%	4%	4%	4%	4%	4%

1 From SANDAG *2050 Regional Growth Forecast* (SANDAG, 2013), except 2015 data. Percent values rounded to nearest 1%. Populations that were less than 1% are so indicated.

2 2015 demographic data was estimated based on changes from 2012 to 2020 from SANDAG's *2050 Regional Growth Forecast* (SANDAG, 2013)

3 From 2011-2015 American Community Survey (ACS) (ACS, 2015).

4 From Water Authority *2015 Urban Water Management Plan* (Water Authority, 2016), except 2010 data.

The County includes 18 Tribal Nation Reservations, more than any other county in the United States. Native Americans within the Region comprise four tribal groups: the Luiseño, Cupeño, and Cahuilla groups from North San Diego County, and the Kumeyaay/Diegueño tribal group. Only a small percentage of the Region's Native American population of 17,000 lives within the Tribal Reservation lands (SANDAG, 2010). Tribal nations are detailed further in *Chapter 4, Tribal Nations of San Diego County*.

Table 3-2 summarizes language use within the County. English and Spanish are the dominant languages within the Region. English is the sole language of approximately two-thirds of the population, and nearly a quarter of the population speaks Spanish.

Table 3-2: Culture/Language Use (2016)

Language	Principal Language Spoken at Home	Percent who Speak English Less than "Very Well"
English	62.5%	NA
Spanish	24.7%	9.7%
Other Indo-European	3.2%	0.9%
Asian/Pacific Islander	8.1%	3.7%
Other Languages	1.6%	0.8%
Totals	100%	15%

From 2012-2016 ACS data for people over the age of 5 (ACS, 2016).

Table 3-3 summarizes the range of education within the adult population of the County. Approximately 37% of the adult population has a 4-year college degree, and more than 14% of the population has a graduate degree. Less than 12% of the adult population did not graduate from high school.

Table 3-3: Education (2016)

Highest Level of Education Attained	Percent	Cumulative Percent
Graduate Degree	14.2%	14.2%
Bachelor's Degree	23.0%	37.2%
Associates Degree	8.8%	46.0%
Attended College	22.9%	68.9%
High School Graduation	19.2%	88.1%
Attended High School	6.7%	94.8%
Less than High School	5.2%	-

From 2012-2016 ACS data for adults over the age of 25 (ACS, 2016).

Housing

Table 3-4 summarizes projected housing units and types within the Region. Approximately 60% of the population resides in single-family units, though the percentage of households living in multiple-unit structures is projected to increase in the next 20 years as new housing is increasingly multi-family.

Table 3-4: Existing and Projected Housing[1]

Housing within the County[2]	2012	2030	2050	Change 2012 – 2050	
Occupied Units	1,103,034	1,279,823	1,407,869	304,835	28%
Households in Single Family Units (percent of total)	672,496 (61%)	724,236 (57%)	730,020 (52%)	57,524	9%
Households in Multiple Family Units (percent of total)	391,534 (35%)	519,612 (41%)	645,548 (46%)	254,014	65%
Households in Mobile Homes (percent of total)	39,004 (4%)	35,975 (3%)	32,301 (2%)	-6,703	-17%

1 From San Diego Association of Governments (SANDAG), *2050 Regional Growth Forecast*, Series 13 (SANDAG, 2013).

2 The Region addressed in this IRWM Plan includes all of the Water Authority Service Area and almost all of the County's population. Only a small fraction of the County's population is within the Colorado River watershed and is outside the Region addressed in this IRWM Plan.

Land Use

Figure 3-2 presents land use within the Region. Table 3-5 summarizes existing and projected land use acreages within the County. Significant residential development within the Region is projected to occur within the next 25 years. Approximately 15% of the County is currently classified as vacant developable land. By year 2050, vacant developable land is projected to decrease to 8% of the total San Diego County land. Residential lands within the County are projected to increase by more than 50% by year 2050.

Table 3-5: Existing and Projected Land Use within the County (Acres)

Land Use	Existing (2012)	2020	2035	2050	Change 2012 - 2050	
Residential	340,162	405,264	497,494	531,217	191,055	56%
Institutional	12,568	12,941	13,383	13,717	1,149	9%
Commercial/Industrial/Office	72,871	76,732	80,015	83,950	11,079	15%
Other	88,943	91,706	91,709	91,712	2,769	3%
Parks and Military	222,850	225,489	226,399	226,806	3,956	2%
Agricultural and Extractive	109,490	107,046	105,478	104,931	-4,559	-4%
Undeveloped Land[1]	1,880,068	1,807,774	1,712,475	1,674,618	-205,450	-11%
Total	2,726,952	2,726,952	2,726,953	2,726,951	-1	0%

Sources: SANDAG 2013
1 Undeveloped land includes constrained acres (those that cannot be developed due to geography or land use restrictions [e.g., conservation area]). Constrained acres total 1,455,691.

Agricultural and extractive lands are projected to be reduced by 4% between 2012 and 2050. The agricultural lands shown in Table 3-5 include both irrigated agriculture and non-irrigated (cattle grazing) lands across the entire County, as well as areas designated for extractive uses. Most irrigated agriculture that occurs within the Region is within the Water Authority's service area. As documented within the Water Authority's *2015 Urban Water Management Plan*, agricultural water demands decreased 58% between 2007 and 2015, with an additional 11% reduction projected between 2020 and 2040 (Water Authority, 2016).

The United States military owns more than 6% of the Region's land. Major bases that include significant open space or undeveloped lands include United States Marine Corps (USMC) Camp Pendleton, Fallbrook Naval Weapons Annex, and Miramar Air Station. The military acts as a steward of the open space environment and coordinates with local jurisdictions for watershed planning and environmental protection.

Other large federal land holdings within the Region include recreational lands owned and managed by the United States Bureau of Land Management (BLM) and the United States Forest Service (USFS), including Otay Mountain Wilderness, and California Desert Conservation Area (BLM) and Cleveland National Forest (USFS).

Regional Economy

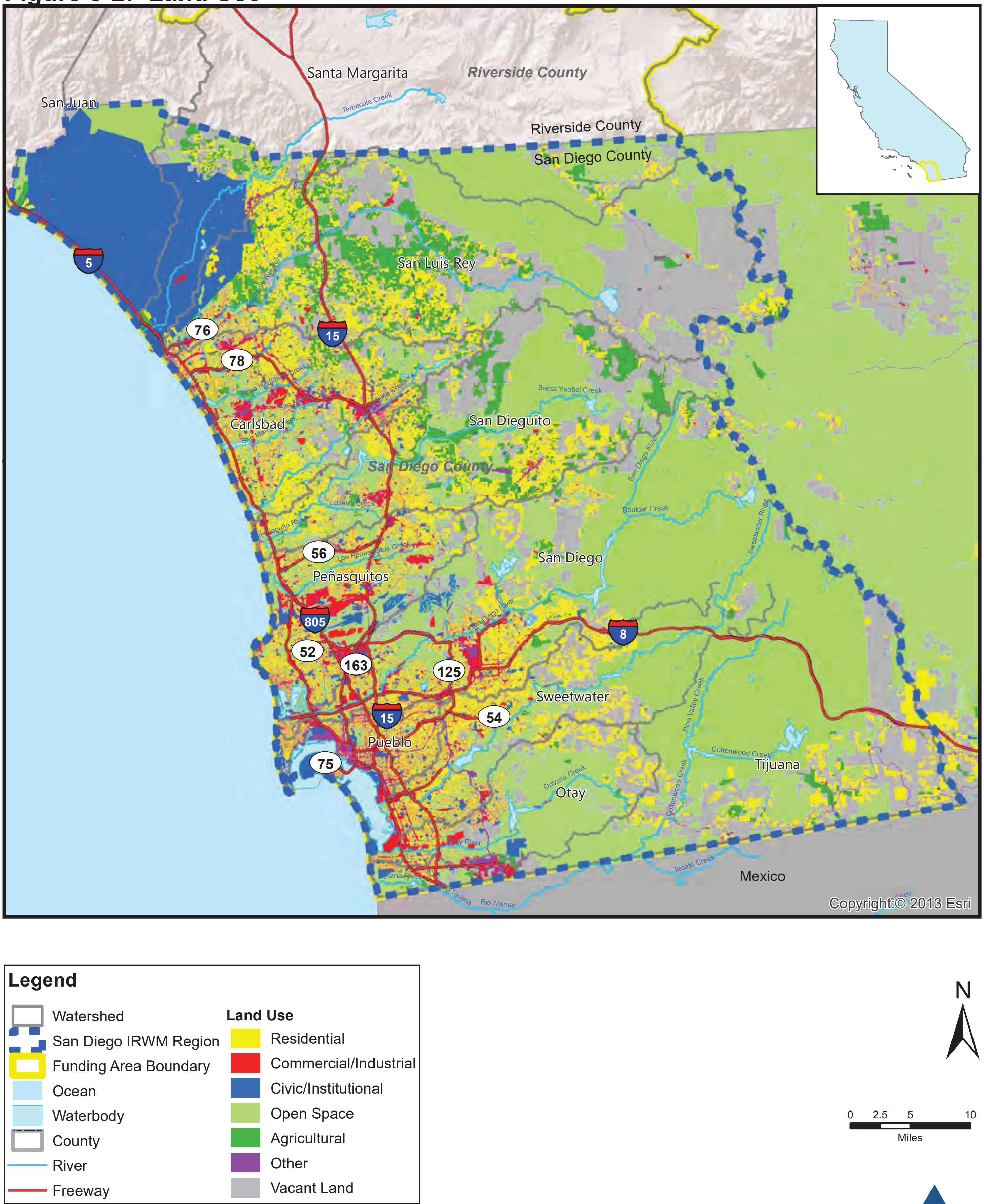
Table 3-6 summarizes projected jobs within the Region. Employment is forecast to increase by 34% through 2050.

Table 3-6: Existing and Projected Jobs within the County[1]

Jobs within the County[2]	2012	2030	2050	Change 2012 – 2050	
Jobs	1,346,969	1,613,619	1,807,461	460,492	34%

1 From San Diego Association of Governments (SANDAG), *2050 Regional Growth Forecast* (SANDAG, 2013).
2 The Region addressed in this IRWM Plan includes all of the Water Authority Service Area and almost all of the County's population. Only a small fraction of the County's population is within the Colorado River watershed and is outside the Region addressed in this IRWM Plan.

Figure 3-2: Land Use



Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse Dec 2012
Parks, Cleveland Nat'l Forest, MCSP & MHPA, SANGIS, Available: http://www.sangis.org/Download_GIS_Data.htm
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Table 3-7 summarizes the County's Gross Domestic Product (GDP) for the past five years. The County's GDP exceeded $215 billion during 2016 (U.S. Department of Commerce, 2017). Historically dependent on military spending, the Region's economy has diversified during the past 25 years. The economic recession during 2007 – 2009 resulted in a decline of GDP, but has seen gains since 2010. Manufacturing is the largest economic contributor to the local economy, accounting for $23 billion of the Gross Regional Product. Leading industries within the region include telecommunications, electronics, computers, industrial machinery, aerospace, shipbuilding, biotechnology, and instruments. In 2016, 4,000 tech companies in the region employed 60,800 workers (San Diego Economic Development Corporation, 2017).

Table 3-7: Gross Regional Product within the County

Year	San Diego Region Gross DomesticProduct[1] ($ billions)	Percent Increase from Prior Year
2012	189.33	-
2013	198.5	4.86%
2014	205.11	3.32%
2015	210.77	2.73%
2016	215.3	2.18%

1 GDP data from U.S. Department of Commerce, Bureau of Economic Analysis for the San Diego-Carlsbad Metropolitan Region. All values in current dollars.

Tourism is the second largest industry in the Region. In 2016, tourism had an $18.3 billion impact on the region. Defense represents the third largest industry, and more than a dozen USMC and Navy bases and support facilities exist within the County (San Diego Regional EDC, 2017).

Agriculture ranks as the fourth largest industry in the Region. The 2016 annual crop value within the County (almost all of which is irrigated agriculture) exceeded $1.74 billion. This represents a 2.6% increase from 2015's total of $1.70 billion. Although the value increased, the acreage devoted to commercial agriculture decreased by approximately 0.2% (400 acres) (San Diego County Department of Agricultural Weights and Measures, 2017). The County has the 12th largest agricultural economy in the country (San Diego County Farm Bureau, n.d.a.). With limited precipitation and local water sources, agriculture within the Region is dependent on imported water.

Climate and Precipitation

The Region experiences a Mediterranean climate characterized by mild temperatures year-round at the coast. Inland area weather patterns are more extreme, with summer temperatures often exceeding 90 degrees Fahrenheit and winter temperatures occasionally dipping below freezing. Average annual rainfall is approximately 10 inches per year on the coast, and in excess of 33 inches per year in the inland mountains. More than 80% of the region's rainfall occurs between December and March (Water Authority, 2016). Figure 3-3 presents the geographic distribution of mean annual precipitation within San Diego County, demonstrating that annual precipitation in the region follows a pattern of increased precipitation with increased elevation.

Significant variation in precipitation also occurs from year to year. Table 3-8 summarizes annual precipitation for a 155-year period at the San Diego Lindbergh Field and City of Escondido precipitation stations. Annual precipitation totals range from more than double the annual mean to less than half the annual mean.

Table 3-8: Annual Variation in Precipitation at San Diego Lindbergh Field, 1850-2012

Parameter		San Diego Lindbergh Field, 1940-2017[1]		Escondido, 1940-2017[2]	
		Annual Precipitation (inches)	Percent of Annual Mean	Annual Precipitation (inches)	Percent of Annual Mean
Maximum Observed Value		24.9	252%	30.7	223%
Percentile Values:	5%	18. 8	190%	25.8	187%
	10%	16.3	165%	24.9	180%
	25%	12.1	114%	17.7	128%
	50%	8.9	90%	12.7	92%
	75%	6.9	70%	9.7	70%
	90%	5.3	53%	5.9	42%
	95%	4.2	43%	2.7	20%
Minimum Observed Value		3.4	35%	0.2	1%
Mean Annual Value		9.8	---	13.8	---

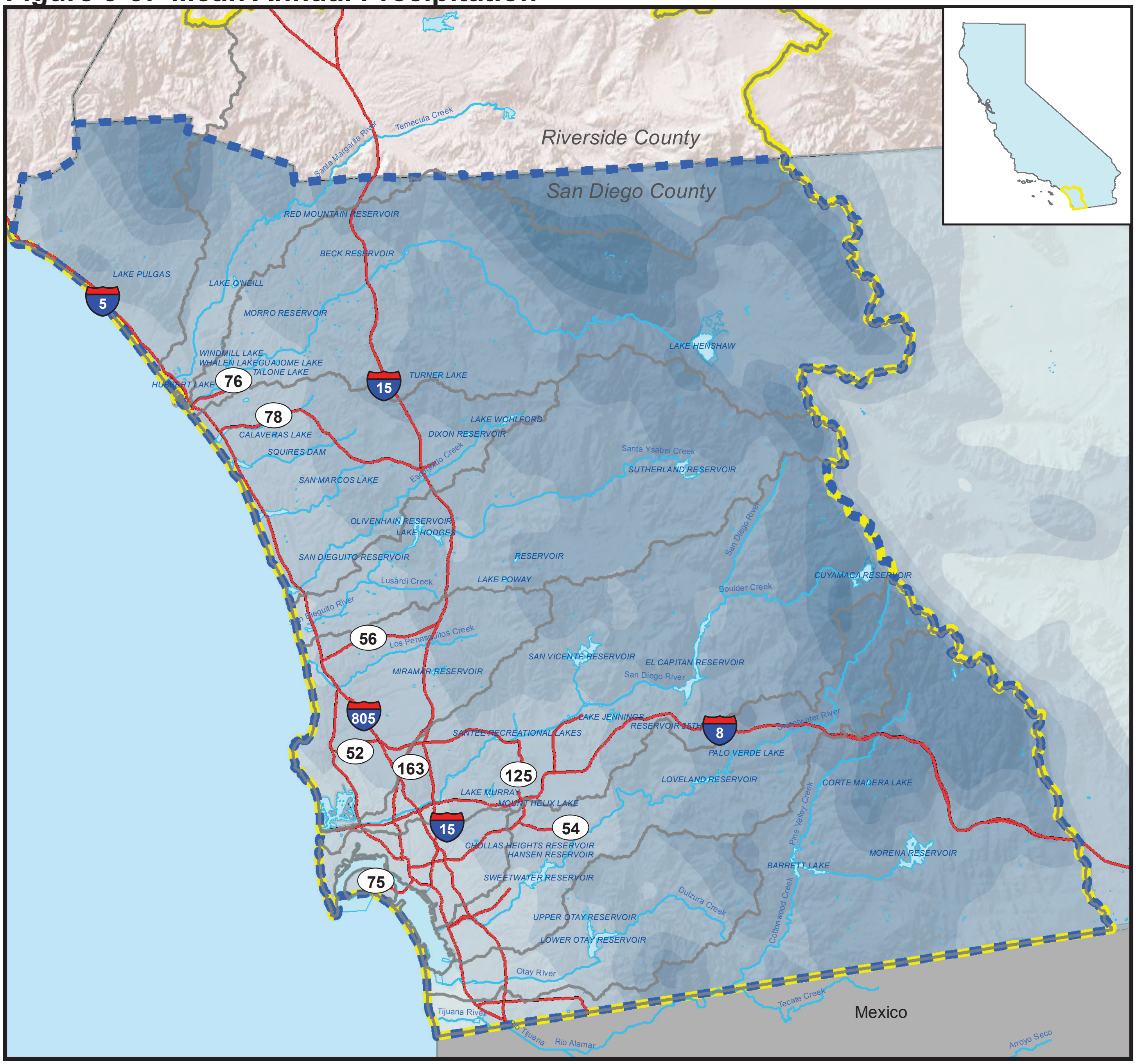
1 Annual calendar year precipitation at San Diego Lindbergh Field (Station 047740) for the period 1940 through 2017. From NOAA Northeast Regional Climate Center (2018).

2 Annual calendar year precipitation at Escondido Station (Station 042863) for the period 1940 through 2017. From NOAA Northeast Regional Climate Center (2013).

While the mean annual precipitation at the Escondido station is 40% greater than at the San Diego Lindbergh Field station, Table 3-8 demonstrates that both stations exhibit a similar statistical distribution about the mean. This is due to the fact that most of the San Diego winter precipitation occurs as a result of eastward-moving frontal storm systems that affect the entire Region. The mean is skewed by a few years of exceptionally high precipitation; as such, precipitation totals above the annual mean occurred only 45% of the time at the two precipitation stations. San Diego Lindbergh Field precipitation was between 6.9 inches (70% of normal) and 12.1 inches (114% of normal) during approximately 50% of the years, while Escondido precipitation was between 9.7 inches (70% of normal) and 17.7 inches (128% of normal) during 50% of the years. For comparison, the South Coast Hydrologic Region, which includes the San Diego IRWM Region north through Los Angeles and Ventura Counties, averages 16.9 inches of precipitation, while the Sacramento River Hydrologic Region, which includes the City of Sacramento, averages over 37 inches per year (DWR, ND).

While all but a fraction of the Region's precipitation occurs during November through April, a significant majority of the potential evaporation (which is approximately equal to the evapotranspiration rate of grass) occurs during summer and autumn months. More than 80% of the potential evaporation occurs during the months of March through October. Potential evaporation within the region ranges from approximately 3.7 feet per year in coastal valleys to more than 4.2 feet per year in inland valleys (DWR, 1986; DWR, 2010). As a result of the effects of climate change, the region may experience longer seasonal dry periods, with spring and fall drier than historically observed (Climate Science Alliance, 2018). Increased dryness is expected to increase evaporation in the region.

Figure 3-3: Mean Annual Precipitation



Legend

- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- Ocean
- Waterbody
- County
- River
- Freeway

Mean Annual Precipitation (in.)

- 3 to 9 inches
- 9 to 12 inches
- 12 to 15 inches
- 15 to 18 inches
- 18 to 21 inches
- 21 to 24 inches
- 24 to 30 inches
- 30 to 35 inches

N

0 2.5 5 10
Miles

WOODARD & CURRAN

Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-3_Mean Annual Precipitation 060713.mxd

3.2 Defining Boundaries for the Region

The San Diego Region as defined by this IRWM Plan consists of eleven parallel and similar watersheds within the County of San Diego that discharge to coastal waters. The regional boundaries were selected primarily on the basis of regulatory, jurisdictional, and political boundaries. Other factors that influenced IRWM Plan boundary selection included similarities in hydrology and watershed characteristics, and a common imported water supply.

Watersheds, Hydrologic Units, Hydrologic Areas, and Watershed Management Areas

A watershed is an area of land that drains downslope to a common point. A hydrologic unit (HU) is a drainage area delineated by DWR that may include one or more individual sub-watersheds. Within this IRWM Plan, 'watershed' refers to HU. An HU is further subdivided into hydrologic areas (HA), each of which may represent one or more sub-watersheds.

The San Diego Region is comprised of eleven westward draining, DWR-designated HUs, four of which (San Juan, Carlsbad, Peñasquitos, and San Diego Bay WMA) are comprised of smaller parallel sub-watersheds that drain to common coastal waters. Seven of the Region's HUs constitute watersheds for the Region's primary rivers: Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Otay, and Tijuana.

The Regional Board defines a watershed management area (WMA) as a drainage area that may include one or more HUs or watersheds. As designated by the Regional Board, three HUs (Pueblo, Sweetwater, and Otay) are combined to form the San Diego Bay WMA. The Peñasquitos HU is composed of the Mission Bay WMA and the Los Peñasquitos WMA. The Region's remaining seven hydrologic units constitute their own individual WMAs.

Appropriateness of Region

The San Diego IRWM Region is appropriate for regional water management. The selected regional boundaries take into account the San Diego Regional Water Quality Control Board (San Diego Water Board) jurisdiction, political jurisdictions, physical and hydrologic characteristics, the imported water supply service area, and wastewater service considerations.

San Diego Regional Water Quality Control Board Jurisdiction

The Region is entirely within the jurisdiction of the San Diego Water Board (designated as Region 9 among California's Regional Water Quality Control Boards). Water quality and wastewater discharges within the Region are regulated by policies and regulations established in the San Diego Water Board's *Water Quality Control Plan for the San Diego Basin* (Basin Plan). Ocean and marine water quality is regulated by policies and regulations established in the Basin Plan (San Diego Water Board, 1994, last updated 2016), Ocean Plan (State Board, 2015), and Enclosed Bays and Estuaries Plan (State Board, 2009).

Municipal stormwater runoff within the Region is regulated through a single National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit issued by the San Diego Water Board to designated Copermittees (refer to *Section 3.6.4* for complete list of Copermittees for the San Diego County area). Two of the three Regional Water Management Group (RWMG) agencies (County of San Diego and City of San Diego) comprise the largest land area among the regulated Copermittees.

The San Diego Water Board's jurisdiction includes the southern portions of Orange and Riverside Counties. The IRWM Plan boundaries, however, are limited to the County of San Diego on the basis of political jurisdictions, development and land use trends, land use regulatory authority, water supply, and stormwater regulation and control (see insert above).

Political Jurisdictions

The Region is located entirely within the County of San Diego. The County is comprised of five Board of Supervisor Districts, each represented by one elected official. Districts 1, 3, and 4 are entirely within the Region, and approximately the western two-thirds of Districts 2 and 5 are within the Region. Through authorities delegated by the State Board and its Division of Drinking Water (DDW), the County maintains local regulatory oversight within the Region on drinking water wells, monitoring wells, small water systems, recycled water use, and the beach recreational water quality program. The County also regulates on-site wastewater systems through an agreement with the San Diego Water Board.

Eighteen incorporated municipalities exist within the Region, including the Cities of Carlsbad, Chula Vista, Coronado, Del Mar, El Cajon, Encinitas, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, Poway, San Diego, San Marcos, Santee, Solana Beach, and Vista.

The San Diego Association of Governments (SANDAG) is the regional planning agency for San Diego County and provides a forum for regional decision making. SANDAG's Board of Directors includes representatives from each of the 18 municipalities as well as the County. Some SANDAG activities include regional population, land use, and demographic projections, transportation planning and construction, and extensive GIS database management for regional jurisdictional, demographic, and infrastructure data.

Other special districts in the Region include the San Diego County Regional Airport Authority and the San Diego Unified Port District, among others.

Physical and Hydrologic Characteristics

Each of the Region's east-west-trending watersheds flows from elevated regions in the east toward coastal lagoons, estuaries, or bays in the west. Each of the watersheds features similar habitats at similar elevations, and all watersheds share habitat restoration and protection needs. A significant majority of the volume of surface flow in each of the watersheds is comprised of runoff from seasonal precipitation that predominantly occurs during the winter and spring months. Surface flows during summer and fall months are typically low, and consist of urban runoff, agricultural runoff, and surfacing groundwater. Each of the watersheds has similar water quality characteristics and faces similar water quality problems.

Imported Water Supply

Imported water supplied by the Water Authority is the predominant source of supply within the Region. The Region's imported water supply infrastructure crosses watershed and jurisdictional boundaries and requires coordination among local agencies and entities to address water supply, water quality, and habitat issues. This broader perspective promotes funding for regional projects and increases the economy of scale for the Region's local supply development projects.

Wastewater Service

Wastewater generated in the Region is either locally recycled or exported to one of the regional ocean outfall disposal systems. The Region's urban wastewater agencies have organized – through the formation of Joint Powers Authorities (JPAs) and interagency contracts – into five multi-jurisdictional wastewater systems based around the Region's five deep-water ocean outfalls. This shared infrastructure requires a high level of collaboration and coordination between local agencies within the Region. Some of the Region's agencies are collaborating with the International Boundary and Water Commission (IBWC) to address cross border issues, including trash and wastewater pollution in the shared Tijuana River watershed.

3.3 Disadvantaged Communities, Economically Distressed Areas, and Underrepresented Communities

Disadvantaged Communities (DACs) are low income communities that are given special consideration in IRWM planning and funding. Economically Distressed Areas (EDAs) and Underrepresented Communities (URCs) may or may not be a DAC, but still represent communities that may face additional barriers to participation in the IRWM Program or in addressing priority water-resource issues and needs. Each of these types of communities is described here, followed by general information regarding some of the highest priority water-related issues and needs of these communities.

The San Diego IRWM Plan acknowledges that not all of the issues apply to all DAC, EDA, and URC communities, and that some communities that are considered as DAC, EDA, or URC per the state's definitions, may not accept that designation. Additionally, the 2019 IRWM Plan includes communities experiencing environmental justice (EJ) issues as deserving of special concern on par with DACs, EDAs, and URCs, and are referred to as EJs, a subset of URCs.

Concurrently with the 2019 IRWM Plan Update – Phase 1, the RWMG is completing a Water Needs Assessment (in partnership with the Tri-County FACC). The 2018 Water Needs Assessment includes mapping of DACs, EDAs, URCs, and EJ communities, as well as targeted outreach to mapped DAC, EDA, URC, and EJ communities and a questionnaire about specific water and wastewater system needs. As a result of the Water Needs Assessment, the Region anticipates improving its understanding of DAC, EDA, URC, and EJ water resource-related needs and priorities, identifying DAC, EDA, URC, and EJ communities that are not captured using standard mapping techniques with Census data, and improving its understanding of how to better engage with DACs, EDAs, URCs, and EJ communities. A Needs Assessment is also required by DWR to remain eligible for reserved DAC funding.

DACs, EDAs, URCs, and EJs

DACs, EDAs, and URCs are terms used by DWR and some may be defined using easily-mappable data. DACs are communities with an MHI 80% or less of statewide MHI and can be mapped using U.S. Census data or other income data. EDAs are similar to DACs, in that they must meet certain population and economic thresholds but must also meet at least one other criteria – 1) low population density, 2) unemployment rate 2% higher than statewide, or 3) economic hardship.

In the San Diego IRWM Plan, the term "EJ" is used to mean "communities experiencing water-related EJ issues". URCs and EJs are both harder to map than EDAs and DACs, and in many ways cannot be truly mapped, as they are more likely to be made of communities of individuals with shared experiences or backgrounds, rather than a physical, location-based community. However, URCs and EJs are both communities that do not have equal access to water resource-related decision-making, or historically have not been involved in such decision-making. For the San Diego IRWM Program, an EJ is considered a subset of URCs.

3.3.1 Disadvantaged Communities

DACs are defined by DWR as communities with a combined Median Household Income (MHI) of less than 80% of the statewide MHI (DWR and State Board, 2016). The 2016 IRWM Guidelines define DACs based on data from the 2010-2014 American Community Survey (ACS). Based on the most recent ACS data (2012-2016 5-year estimates) DACs are those areas with an MHI of $51,026. DWR has also defined Severely Disadvantaged Communities (SDAC) as Census geographies having less than 60% of the annual Statewide MHI. Based on the 2012-2016 ACS data, the SDAC MHI threshold is $37,091.

The DAC information presented in Figure 3-4A and Figure 3-4B and discussed in the following sections represents the best available data on the location and nature of economically disadvantaged communities in the Region and does not constitute final or complete representation of DACs due to the scale of the data available. Additional income survey and other reliable data sources that demonstrate the location and nature of DACs in the Region may be used to further refine the data set and can be used for purposes of justifying grant eligibility based on DAC criteria.

3.3.2 Economically Distressed Areas

As defined by DWR, an EDA is a municipality with a population of 20,000 persons or less, a rural county, or a reasonably isolated and divisible segment of a larger municipality with a population of 20,000 persons or less, with a MHI that is less than 85% of the Statewide MHI, and with one or more of the following conditions:

1) Financial hardship
2) Unemployment rate at least 2% of higher than statewide average
3) Low population density

The San Diego IRWM Program further defined the above terms and conditions. In this 2019 IRWM Plan, a reasonably isolated and divisible segment is defined as either:

- A community, Census block, tract, or other area within a larger municipality that is separated by major transportation corridors, waterbodies, or other physical barriers; or
- A segment with separate (disconnected from municipal services) water or wastewater services or other jurisdictional boundaries, such as senior living, fixed income, or other communities, where more than a quarter of the population does not have access to an automobile, or where more than a quarter of the population are non-English speakers.

The San Diego IRWM Program defines financial hardship as when the MHI for a community is less than 80% of the statewide annual MHI, or the MHI for a community is less than 85% of the regional or local MHI. Income data may be calculated using U.S. Census data, American Community Survey (ACS) data, income surveys, or other justifiable local knowledge (e.g., neighborhood has been designated low-income by its municipality, or community is a state- or federally-designated Colonia).

The statewide average unemployment rate was 5.4% as of August 2017, and thus communities having 7.4% and higher unemployment rates would meet the criterion of having an unemployment rate at least 2% higher than the statewide average. Local unemployment rates may use U.S. Census data, ACS data, or local economic agencies, so long as the data use a reasonable scale.

Low population density is defined as less than 100 persons per square mile, consistent with DWR's EDA mapping tool's methodology. Population density may be determined using ACS data, or local data.

While Figure 3-4C shows the location of some EDAs, others are difficult to map on a regional scale. As such, stakeholders are encouraged to explain how a community meets these EDA criteria when submitting projects for funding consideration or at other times when knowing an area's EDA status may be of use.

3.3.3 Underrepresented Communities and Environmental Justice

DWR does not formally define URCs but recognizes Native American Tribes as traditionally underrepresented. The San Diego IRWM Program defines URCs as communities that currently have little or no representation in water policy decision-making and/or water resource management projects, or who historically have disproportionately less representation in public policy or decision-making forums. All Native American Tribes are considered URCs under the state's IRWM Program, regardless of their economic status.

The U.S. EPA defines Environmental Justice as:

> *…the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies…It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.*

Environmental justice seeks to ensure that land use plans, policies, and actions do not disproportionately affect low income and minority communities. Environmental justice is achieved when everyone, regardless of race, culture, or income, enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work. The 2019 IRWM Plan considers a community experiencing EJ issues as one that is mapped with an EJ Index of 80-100 percentile for any EJ Index compared to the State on the EPA's EJScreen tool (https://ejscreen.epa.gov/mapper/). EJ indices consider a variety of air quality impacts to human health (particulate matter, air toxic cancer risk, and respiratory hazard), traffic proximity and noise, lead paint, superfund and hazardous waste locations, and wastewater discharges, among others. EJs may also be mapped using CalEviroScreen, maintained by the California Office of Environmental Health Hazard Assessment (OEHHA). A community is considered to experience EJ issues by the 2019 IRWM Plan if it falls within the 80-100% percentiles in CalEnviroScreen.

Figure 3-4C shows the location of easily mapped URCs and EJs. Similar with EDAs, not all URCs or EJs may be shown in the map, and stakeholders are encouraged to explain how a community is considered a URC or EJ when submitting projects. In many cases, URCs are communities in the sense of people with common experiences, backgrounds, or reasons for underrepresentation, rather than a physical location, and therefore may be found anywhere within the Region. Further, it can be difficult to come to consensus on the types of people-based communities (versus location-based communities) that may be considered URCs.

3.3.4 DAC, EDA, and URC Considerations

Several communities and rural areas within the Region have an average MHI that is less than 80% of Statewide. The 2019 IRWM Plan uses various geographic designations to analyze DACs, including cities, County of San Diego community planning areas, and City of San Diego community planning areas. However, the use of larger planning areas can at times cause smaller portions of the planning area that are economically disadvantaged to be overlooked. For the 2018 Water Needs Assessment, being completed concurrently with the 2019 IRWM Plan, MHI values were assessed at the Census Place, tract, and block-group levels to identify smaller pockets of DACs for potential outreach. Figure 3-4A illustrates the community planning areas (CPAs) within the Region that meet the MHI criteria for DACs. Figure 3-4B shows those areas within the City of San Diego that meet the DAC MHI criteria defined by DWR. Figure 3-4A also demonstrates the location of DACs with respect to the Water Authority's service area, which is used to distinguish Urban and Rural DACs as described below. Based on the 2012-2016 ACS data, nine of the County's 18 incorporated cities are considered DACs or contain DACs; these cities are El Cajon, Imperial Beach, Oceanside, Carlsbad, Escondido, San Marcos, Vista, National City, and San Diego. Additionally, based on the same data, 24 of the 58 City of

San Diego CPAs and 17 of the 30 County CPAs are considered DACs or contain areas that qualify as DACs.

Table 3-9 summarizes communities (by planning area) within the Region that meet DWR and State Board criteria for designation as DACs. For the 2019 IRWM Plan, this table was updated to also show EDAs and URCs. The CPAs shown in the table are all CPAs in the Region that contain at least some DAC areas. Some CPAs are entirely or primarily DAC, while others (denoted by an asterisk) only contain small pockets of DACs. The table also shows how the DAC status for these areas has changed since 2000. The DACs are geographically distributed throughout the Region.

2012-2016 ACS data indicated that numerous Census tract and block-group neighborhoods in many of the Region's planning areas (both in incorporated and unincorporated areas) have MHIs that are less than 80% of the statewide MHI. The San Diego IRWM Program has relied on engagement of organizations who serve DACs as the primary means of engaging with DACs. Under the 2018 Water Needs Assessment, targeted outreach was made to DACs, EDAs, and URCs, with additional effort to identify and engage with DACs, EDAs, and URCs with no or limited previous participation in IRWM. To this purpose, the RWMG partnered with two non-governmental organizations (NGOs), Climate Science Alliance (CSA) and Rural Community Assistance Corporation (RCAC), to leverage their existing relationships in the Region and expand the Region's stakeholder list. Following distribution of information about IRWM to the expanded DAC, EDA, and URC contact list, the RWMG arranged a series of Community Meetings to provide additional information about how to participate in the IRWM Program, explain the benefits of doing so, improve understanding of barriers to participation, and solicit information on individual communities' water resource issues and needs. These Community Meetings are also an opportunity to identify potential DAC, EDA, URC, and EJ communities that are not shown on the current maps.

DAC advocates have indicated that additional efforts to validate DACs in the Region are necessary, because U.S. Census data often may not fully capture the true economic conditions of various communities in San Diego County, particularly those communities with a high number of undocumented residents, tribal communities, or other residents that may not fully participate in providing information to the U.S. Census. DAC, EDA, and URC (including EJ) maps are in the process of being developed for the 2019 IRWM Plan, and following completion of the 2018 Water Needs Assessment, will be presented at a series of DAC Workshops planned for Fall 2018. These workshops are intended to solicit input from DAC, EDA, URC and EJ residents on the findings of the 2018 Water Needs Assessment, including mapping results. Further, the addition of EDAs and URCs has expanded the State's understanding of those communities that may require additional support to address their water resource concerns. As stated earlier, not all EDAs and URCs are easily mapped; therefore, the 2019 IRWM Plan encourages stakeholders and project proponents to explain how their community or project area comprises EDAs or URCs as defined in this 2019 IRWM Plan or in appropriate governmental guidelines. This allows local understanding of an area to supplement State and federal data, and allows for additional nuance not previously available.

Table 3-9: Economically Disadvantaged Communities

HU[1]	Name[2]	Disadvantaged City or Community Planning Area (CPA)[3]	Jurisdiction	2000 DACs[4]	2010 DACs[4]	2013 DACs[4]	2019 DACs, EDAs, or URCs[4]
901 902	San Juan Santa Margarita	Pendleton-DeLuz CPA	County	✓	✓	✓	✓
902 903	Santa Margarita San Luis Rey	Palomar Mountain CPA	County		✓	✓	✓
		Fallbrook CPA*	County		✓	✓	✓
903	San Luis Rey	North Mountain County CPA	County	✓	✓	✓	✓
		Pala-Pauma CPA	County		✓		
903 904	San Luis Rey Carlsbad	City of Oceanside*	City of Oceanside		✓	✓	
		City of Carlsbad*	City of Carlsbad		✓	✓	
904	Carlsbad	North County Metro CPA	County		✓	✓	✓
		Twin Oaks CPA*	County		✓	✓	✓
		City of San Marcos	City of San Marcos		✓	✓	
		City of Escondido	City of Escondido		✓	✓	
906	Peñasquitos	Miramar Air Station CPA	City of San Diego		✓		
		Mission Bay Park CPA	City of San Diego		✓	✓	
		Rancho Peñasquitos CPA*	City of San Diego		✓	✓	
		University CPA*	City of San Diego		✓	✓	✓
		La Jolla CPA*	City of San Diego		✓	✓	
		Clairemont Mesa CPA*	City of San Diego		✓	✓	✓
		Pacific Beach CPA*	City of San Diego		✓	✓	
905 906	San Dieguito San Diego	Ramona CPA*	County		✓	✓	✓
907	San Diego	Bostonia County/Lakeside CPA*	County	✓	✓	✓	✓
		Central Mountain CPA	County		✓		✓
		Julian CPA	County		✓	✓	✓
		City of El Cajon	City of El Cajon	✓	✓	✓	✓
		Rancho Bernardo CPA*	City of San Diego		✓	✓	
907 908	San Diego Pueblo	Normal Heights CPA	City of San Diego	✓	✓	✓	✓
		College Area CPA	City of San Diego	✓	✓	✓	✓
		Ocean Beach CPA	City of San Diego	✓			✓
		Midway CPA	City of San Diego	✓	✓	✓	✓
		County Islands CPA	County		✓	✓	
		Old San Diego CPA	City of San Diego	✓	✓	✓	✓
		Kensington-Talmadge CPA*	City of San Diego		✓	✓	✓
907 909	San Diego Sweetwater	Alpine CPA*	County		✓		✓
		Cuyamaca CPA	County		✓		✓
		Descanso CPA*	County		✓		
908	Pueblo	Barrio Logan CPA	City of San Diego	✓	✓	✓	✓
		Centre City CPA	City of San Diego	✓			
		Spring Valley CPA	County		✓	✓	✓
		City Heights CPA	City of San Diego	✓	✓	✓	✓
		Eastern Area CPA	City of San Diego	✓	✓	✓	✓
		Greater Golden Hill CPA	City of San Diego	✓	✓	✓	✓
		Greater North Park CPA	City of San Diego	✓			✓
		Encanto CPA	City of San Diego	✓	✓	✓	✓
		Lindbergh Field CPA	City of San Diego	✓	✓		
		Southeastern San Diego CPA	City of San Diego	✓	✓	✓	✓
		Uptown CPA*	City of San Diego		✓	✓	✓
908	Pueblo	City of National City	City of National City	✓	✓	✓	✓

HU[1]	Name[2]	Disadvantaged City or Community Planning Area (CPA)[3]	Jurisdiction	2000 DACs[4]	2010 DACs[4]	2013 DACs[4]	2019 DACs, EDAs, or URCs[4]
909	Sweetwater	Skyline-Paradise Hills CPA*	City of San Diego		✓	✓	✓
910 911	Otay Tijuana	City of Imperial Beach	City of Imperial Beach	✓	✓	✓	✓
		Otay Mesa - Nestor CPA	City of San Diego		✓	✓	✓
911	Tijuana	San Ysidro CPA	City of San Diego	✓	✓	✓	✓
		Mountain Empire CPA	County	✓	✓	✓	✓
		Desert CPA	County		✓	✓	
911 909	Tijuana Sweetwater	Pine Valley CPA	County		✓	✓	✓
80% Statewide Median Household Income				*$37,520*	*$48,706*	*$46,979*	*$51,026*

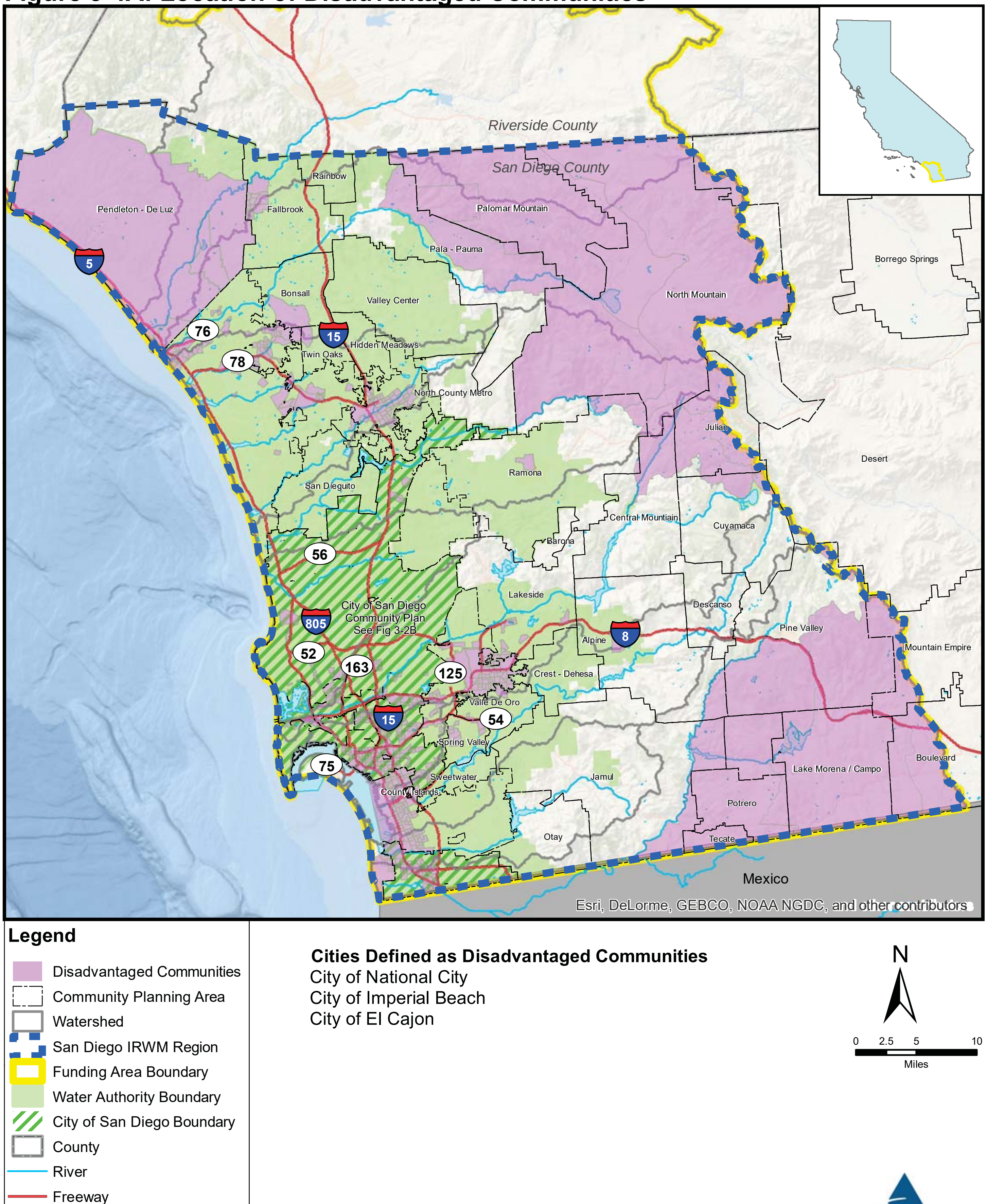
1 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

2 Some planning areas fall within multiple watersheds

3 * denotes a CPA that contains small pocket(s) of DAC

4 DACs are defined by DWR as communities with an MHI of 80% or less than statewide MHI. As statewide incomes change and local incomes changes, the DAC status of a community, as defined by DWR, may also change. EDAs and URCs are new to the IRWM Program under the 2016 IRWM Guidelines.

Figure 3-4A: Location of Disadvantaged Communities



Cities Defined as Disadvantaged Communities

City of National City
City of Imperial Beach
City of El Cajon

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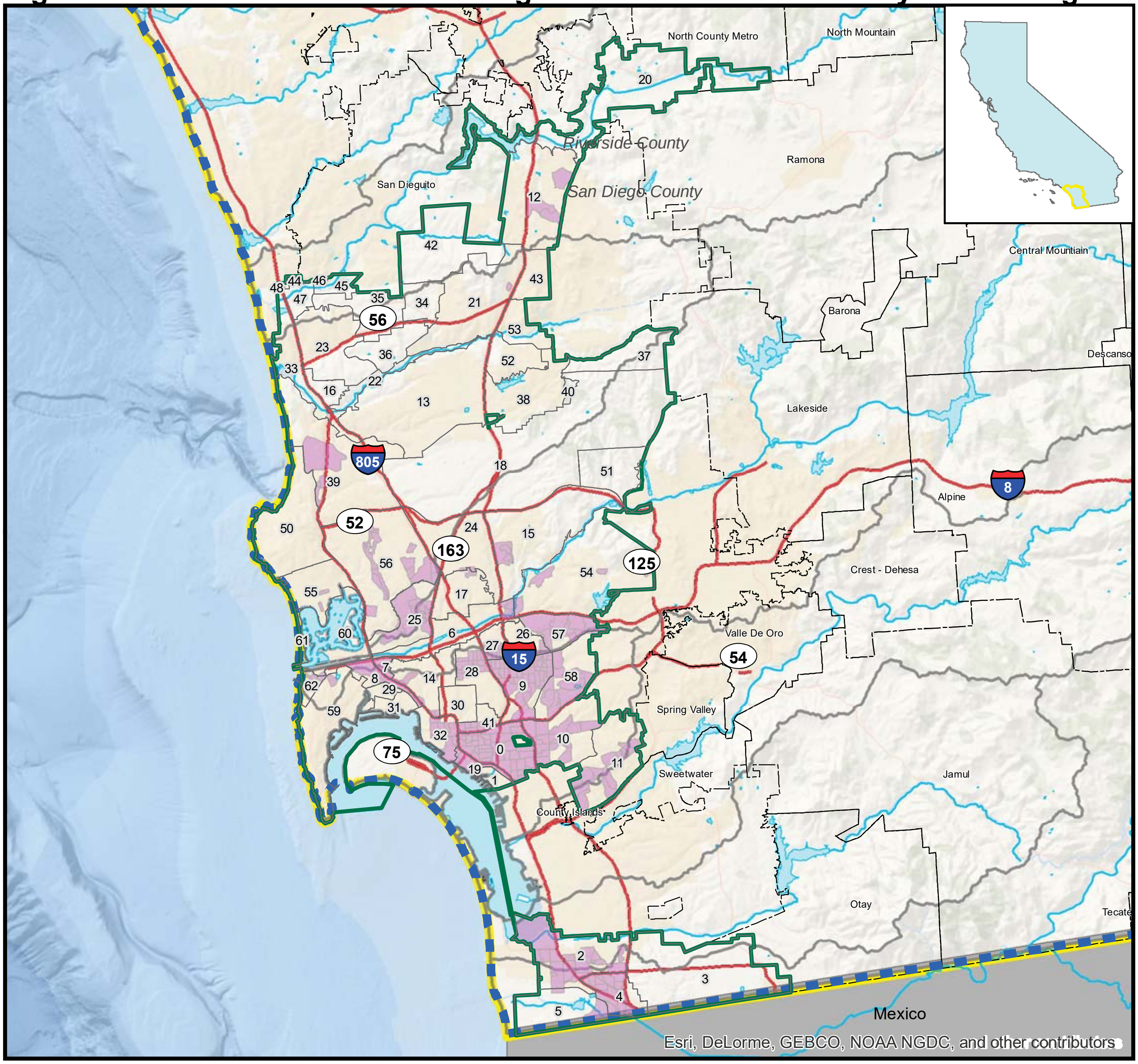
Based on 2010-2014 American Community Survey (ACS) Data. DAC defined as a block group with a median household income (MHI) of less than $51,026 (80% of the Statewide MHI).

Document Path: \\woodardcurran.net\shared\Projects\RMC\SD\Projects_GIS\0188-003 SDIRWM Plan Update\DAC Involvement_April 2016\MXDs\SDIRWM_Fig3-4A_DACMap_16Aug18.mxd

Figure 3-4B: Location of Disadvantaged Communities within City of San Diego



Legend

- Disadvantaged Communities
- Community Planning Area
- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- City of San Diego Boundary
- County
- River
- Freeway

Community Planning Areas Defined as DACs

2 - Barrio Logan CPA
6 - Clairemont Mesa
8 - Greater Goldern Hill CPA
11 - Encanto CPA
14 - Midway CPA
24 - Old San Diego CPA
25 - Otay Mesa-Nestor CPA
28 - Greater North Park CPA
33 - San Ysidro CPA
37 - Southeastern San Diego CPA
38 - College Area CPA
42 - Uptown CPA
44 - Skyline-Paradise Hills CPA
56 - City Heights CPA
57 - Eastern Area CPA
58 - Kensington-Talmadge CPA
59 - Normal Heights CPA
62 - Ocean Beach CPA
99 - University CPA

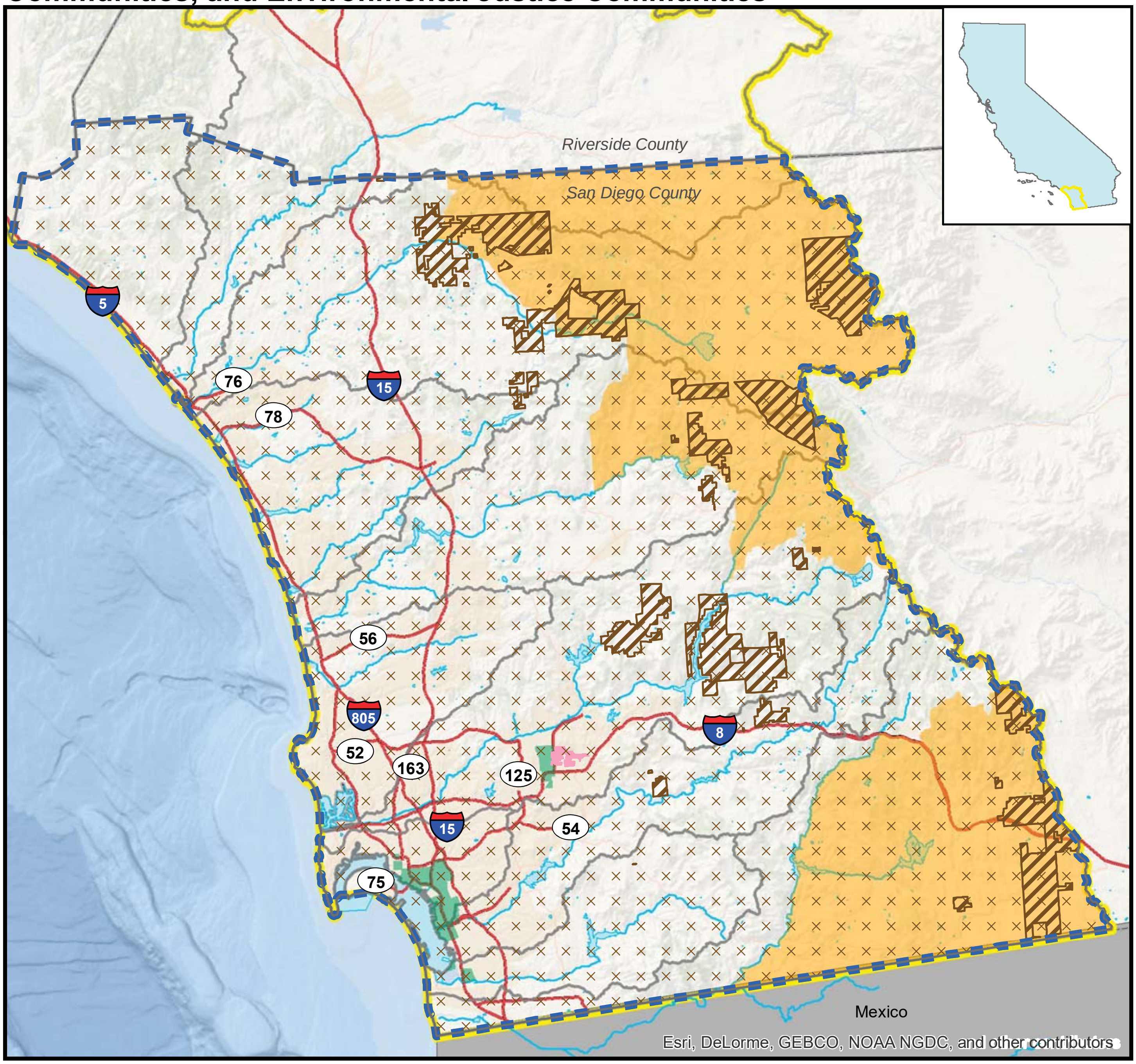
N

0 1.25 2.5 5
Miles

WOODARD & CURRAN

Based on 2010-2014 American Community Survey (ACS) Data. DAC defined as a block group with a median household income (MHI) of less than $51,026 (80% of the Statewide MHI).
Document Path: \\woodardcurran.net\shared\Projects\RMC\SD\Projects_GIS\0188-003 SDIRWM Plan Update\DAC Involvement_April 2016\MXDs\SDIRWM_Fig3-4B_DACMap_16Aug18.mxd

Figure 3-4C: Location of Economically Distressed Areas, Underrepresented Communities, and Environmental Justice Communities



Legend

- < 85% CA MHI; Pop </= 20K with Unemp 2% > CA Avg. (EDA)
- < 85% CA MHI; Pop </= 20K with Low Pop Density (EDA)
- Underrepresented Community (URC)*
- Tribal Lands
- Environmental Justice Index 80-100 Percentile (EJ)
- Watershed
- San Diego IRWM Region
- Funding Area Boundary
- County
- River
- Freeway

N

0 2.25 4.5 9
Miles

WOODARD & CURRAN

Based on 2010-2014 American Community Survey (ACS) data. EDA is a municipality with a population of 20,000 persons or less, a rural county, or a reasonably isolated and divisible segment of a larger municipality with a population of 20,000 persons or less, with a median household income (MHI) that is less than 85% of the Statewide MHI, and with one or more of the following conditions: 1) Financial hardship, 2) Unemployment rate at least 2% of higher than statewide average, or 3) Low population density.

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DAC/EDA/URC Assistance

Over the last decade, the RWMG has worked directly with many organizations that are involved with addressing water-related issues of DACs, EDAs, and URCs (including EJ communities) within the Region, including: San Diego Coastkeeper, Environmental Health Coalition, RCAC, Jacobs Center for Neighborhood Innovation, Groundwork San Diego-Chollas Creek, WildCoast, and others. Outreach has focused on identifying DAC, EDA, and URC issues, needs, and concerns, as well as ensuring representation on the RAC.

Organizations working in the Chollas Creek area, which flows through a disadvantaged community, have received grants to improve surface water quality and habitat.

Photo credit: Leslie Reynolds, Groundwork San Diego-Chollas Creek

Within the San Diego IRWM Region, DACs, EDAs, and URCs are typically classified as either Urban – those communities that are located within the Water Authority's service area (with municipal water and wastewater service), or Rural– those communities that exist outside the bounds of a city or are not served by a Water Authority member agency. This distinction aids planners in addressing the true needs of DACs, EDAs, and URCs in the Region, as Rural and Urban DACs, EDAs, and URCs face different issues and challenges. Some areas are rural in nature due to their distance from the Region's urban core, although they are served by large public water systems and therefore have characteristics of both Rural and Urban DACs, EDAs, and URCs. One such community, which includes Ramona, is provided water services by Ramona MWD, a Water Authority member agency.

In 2010, 2012, 2013, 2017, and 2018 targeted outreach to DACs was undertaken by the RWMG (EDAs and URCs were targeted in 2017 and 2018 as part of the 2018 Water Needs Assessment). The purpose of this outreach effort was to develop an understanding of the water needs in DACs, EDAs, and URCs within the Region, and increase awareness of IRWM funding opportunities.

Urban DACs/EDAs/URCs Issues and Needs

As described above, Urban DACs, EDAs, and URCs fall within the service area of a water or wastewater agency. There are some DACs, EDAs, and URCs that have rural characteristics but still receive municipal services. For the purposes of this IRWM Plan, such DACs, EDAs, and URCs are considered Urban. Of the communities in the Region that have been identified as DACs, EDAs, and URCs using 2012-2016 ACS data, the majority are Urban DACs. EJs are concentrated in the central portion of the City of San Diego, as well as central El Cajon, and overlie DACs.

Areas that include Urban DACs, EDAs, URCs, and EJs include:

- Miramar Air Station CPA*
- Mission Bay Park CPA***
- City of El Cajon
- Normal Heights CPA
- Old San Diego CPA
- Barrio Logan CPA
- Eastern Area CPA
- College Area CPA
- Midway CPA
- Twin Oaks CPA†
- North County Metro CPA
  - City of Escondido***
  - City of San Marcos***
- Bostonia County/Lakeside CPA†
- City of Oceanside†***
- City of Carlsbad†***
- Pacific Beach CPA†***
- Rancho Bernardo CPA†***
- Uptown CPA†
- Ocean Beach CPA City Heights CPA
- Encanto CPA
- Lindbergh Field CPA*
- Southeastern San Diego CPA
- City of National City
- City of Imperial Beach
- San Ysidro CPA
- Otay Mesa-Nestor CPA**
- Greater Golden Hill CPA
- Ramona CPA†
- Spring Valley CPA
- County Islands CPA***
- Fallbrook CPA†
- Rancho Peñasquitos CPA†***
- University CPA†
- La Jolla CPA†***
- Clairemont Mesa CPA†
- Kensington-Talmadge CPA†
- Skyline-Paradise Hills CPA†
- Greater North Park CPA†

** Area meeting 2010 DAC criteria but not 2013 or 2019 criteria | **Area meeting 2013 DAC criteria but not 2010 criteria | ***Area meeting 2010 and 2013 DAC criteria but not 2019 criteria | †CPA containing only a small pocket(s) of DAC | As income levels change over time across the state and within communities, a given community's DAC status may change*

Because Urban DACs, EDAs, and URCs are located within water agency service areas, their water resources needs are generally centered on community development and surface water quality issues, rather than drinking water quality or drinking water supply issues, as they receive safe drinking water through their water agency. Historically, DWR's definition of a critical water supply or water quality need of a DAC, EDA, or URC has often failed to encompass what the Urban DACs, EDAs, and URCs (and their relevant planning agencies) consider a critical water supply or water quality need. Therefore, it can be challenging to obtain funding for Urban DAC, EDA, and URC water projects, as they may not qualify for the funding match waivers frequently provided for DAC, EDA, and URC projects. While Urban DACs, EDAs, and URCs in the Region receive safe drinking water from local water agencies, increases in water rates (refer to *Section 3.10* for more information) can have a disproportionate impact on DAC and EDA residents, because they tend to spend a larger percentage of their income on water compared to those in higher-income communities. Some URCs may also experience disproportionate impacts associated with policy decisions due to underrepresentation in the decision-making process.

Urban DACs and EDAs may also be characterized by aging and undersized infrastructure, constrained or realigned drainage ways, erosion, over-growth of invasive species, and illegal dumping. These can result in adverse changes in water quality and flooding. Urban DAC and EDA areas may also be more prone to flooding from introduction of impervious surfaces associated with development and the typically lesser amount of parks or other non-paved recreation lands. To improve surface permeability while not restricting economic growth potential in Urban DACs and EDAs, more assistance is needed for such measures as de-channelization, hydro-modification, and implementing Low Impact Development (LID) projects to reduce stormwater runoff and associated flooding. These types of projects may also enhance the opportunities to provide increased access to recreational areas, which is much needed in most Urban DACs and EDAs.

Water quality concerns in urban creeks can result from illegal dumping, invasive species, and constituents conveyed by stormwater and other runoff.
Photo credit: Leslie Reynolds, Groundwork San Diego-Chollas Creek

Rain events convey pollutants to drainage facilities, creeks, and other downstream receiving waters. Stormwater runoff (as well as dry weather urban runoff) may thus convey pollutants contributing to the poor surface water quality in Urban DACs and EDAs, similar to how runoff conveys pollutants in other urban and developed areas. Although many of the residents of Urban DACs and EDAs are aware of the pollution problems, and TMDLs have been developed for some streams that traverse Urban DACs and EDAs, challenges remain. For example, while TMDLs for metals and bacteria in Chollas Creek have been developed, illegal dumping (especially of large trash items such as mattresses) in creeks and watersheds is a common problem that contributes to water quality issues in Urban DACs and EDAs. In June 2017, the San Diego Water Board issued Order No. R9-2017-0077, which applied to the MS4 Copermittees. This order implemented statewide requirements to address the impacts of trash on surface waters. Copermittees are in the process of identifying which BMPs should be implemented to eliminate trash and comply with the order. Future MS4 permits are anticipated to include trash requirements and compliance milestones and schedules. Watershed stakeholders have reported that homelessness presents water quality issues throughout the Region, especially in homeless encampments located alongside the Region's water bodies that are prone to becoming a place for trash and other illegally-dumped items to accumulate, as well as a source of human waste entering local waterways.

Pollution of San Diego Bay (Bay) waters also substantially impacts Urban DACs and EDAs, many of which are located adjacent to the Bay, near industrial areas. Bay pollution from industry, runoff, and other activities has negatively impacted fishermen, many of whom are residents of Urban DACs and EDAs. Although huge investments have been made to date, additional water quality monitoring in Bay wetlands, again many of which are located near or in Urban DACs and EDAs, is needed to fully understand and address water quality issues. Low-lying Urban DACs and EDAs near the Bay will also suffer disproportionately from the effects of sea level rise as a result of climate change compared to their non-DAC or EDA counterparts that may also be directly affected by sea level rise. These areas will be more susceptible to floods and inundation from storm surges, which are anticipated to be larger and more frequent.

One of the biggest issues facing Urban DACs, EDAs, and EJs is food security. Food security is one of the highest priorities in these areas and must be addressed before full DAC, EDA, and EJ involvement in other issues, including water quality. Some Urban DACs, EDAs, and EJs use community gardens to help offset food needs, and irrigation costs may impact their ability to care for such gardens. An IRWM-funded project, Chollas Home Makeovers, is helping to install water efficient systems, including rainwater capture and greywater systems, in homes within the Encanto DAC. The water made available by this project is used to irrigate landscaping on the property, including newly planted fruit trees, which help to increase access to fresh and healthy food options.

Urban DACs, EDAs, and URCs, like their rural counterparts, frequently lack the financial and technological resources to design, implement, operate, and maintain water projects or enhance existing infrastructure. Because of this, they require financial assistance for project implementation, particularly to support ongoing operation and maintenance (O&M) costs. NGOs that propose projects in Urban DACs, EDAs, and URCs should consider the long-term stewardship of the projects in question, and determine post-project ownership of any acquired land at the outset of the projects, to ensure the resources necessary to achieve the long-term benefits associated with the projects. For creek restoration projects, or those projects that improve recreational or access opportunities, public safety should always be considered. In Urban DACs, EDAs, and URCs, there may be a need for additional park rangers or security officers to ensure public safety in recreation areas.

Effective water conservation, watershed, and stormwater management outreach and education could be improved in Urban DACs, EDAs, and URCs. The need for additional outreach and education needs, as well as what kinds of outreach may be most effective for these communities will be explored in the Water Needs Assessment currently under development. Generally, outreach and education efforts that come from the community or peers are more effective than top-down through an agency. Outreach efforts should also aim to raise awareness of the existence of surface waters in Urban DACs, EDAs, and URCs, which will assist in improving stewardship of these resources. These efforts should be tailored to the community and be multilingual when targeting communities with high rates of non-English speaking households.

Priority projects in Urban DACs, EDAs, and URCs include those with education, creek restoration, passive recreation, hydro-modification, stormwater management/pollution prevention, public safety, and those that address sea level rise adaptation components.

Rural DACs/EDAs/URCs Issues and Needs

Rural DACs, EDAs, and URCs are located outside of the jurisdictional boundaries of the Region's water and wastewater agencies and are not provided municipal water supply or wastewater infrastructure. Of the communities in the Region that have been identified as DACs, EDAs, or URCs using 2012-2016 ACS data, the following are Rural DACs, EDAs, or URCs:

- North Mountain County CPA
- Pala-Pauma CPA*
- Palomar Mountain CPA
- Pendleton-DeLuz CPA
- Pine Valley CPA
- Mountain Empire CPA
- Alpine CPA†○
- Central Mountain CPA*○
- Cuyamaca CPA*○
- Descanso CPA*†
- Julian CPA
- Desert CPA***

** Area meeting 2010 DAC criteria but not 2013 or 2019 criteria | **Area meeting 2013 DAC criteria but not 2010 criteria | ***Area meeting 2010 and 2013 DAC criteria but not 2019 DAC criteria | †CPA containing only a small pocket(s) of DAC | ○ Area meeting 2010 and 2019 DAC criteria but not 2013 DAC criteria | As income levels change over time across the state and within communities, a given community's DAC status may change*

It should be noted that more rural communities may be designated as DACs, EDAs, or URCs following the 2018 Water Needs Assessment, and additional efforts may be taken to characterize DACs, EDAs, and URCs in the Region. No EJs are mapped within the rural areas of the San Diego IRWM Region.

Unlike their urban counterparts, Rural DACs, EDAs, and URCs are not consistently supplied with a safe source of municipal drinking water. Due to infrastructure, source water quality, and other issues, the primary water-related concern of Rural DACs, EDAs, and URCs is meeting drinking water needs with a safe, reliable source of potable water. Rural DACs, EDAs, and URCs often lack access to much-needed infrastructure and financing, as well as the resources to adequately maintain existing system facilities. As a result, drinking water systems in Rural DACs, EDAs, and URCs often face significant challenges in complying with longstanding and new drinking water rules (EPA, 2007).

Small water systems are defined by USEPA as those serving fewer than 10,000 people. Within San Diego County, the County's Department of Environmental Health regulates those systems under 200 connections, while larger systems are regulated by the State Board's DDW. Three major problems that impede the sustainability of small community water systems include:

1) contamination of drinking water source water from wastewater intrusion, agricultural influences, naturally occurring contaminants, and/or contaminant spills from industrial activities;
2) seasonal weather changes resulting in floods or droughts may require design options to bypass treatment during rain and storm events and identification of alternative water supplies (including water reuse sources) to increase capacity during droughts; and
3) deteriorating collection and distribution systems compromise source water quality and increase the cost of water treatment.

Rural communities within the San Diego IRWM Region's unincorporated areas have water supply and water quality issues that may be exacerbated by climate change, poor economies, and lack of community expertise. Inadequate water supply to support existing communities is a public health risk, especially considering that the rural portions of the Region are also those that are particularly susceptible to wildfires. The majority of drinking water maximum containment level (MCL) violations in the Region occur with small public water systems, and inadequate wastewater treatment can result in unplanned discharge events.

Some Rural DACs, EDAs, and URCs in the San Diego IRWM Region are faced with inadequate supplies to support existing connections. They may also face water quality issues that remain unresolved because it is costly to provide supplemental treatment processes to improve the quality of contaminated source waters. It is also difficult for small DAC, EDA, and URC systems to afford improvements because they have fewer ratepayers to share the costs. Further, Rural DACs, EDAs, and URCs may lack the technical expertise and financial stability to access available funding programs that could be implemented to address cost-related issues. Because of the lack of internal capacity for small water systems, a supporting agency that can provide capacity (such as engineering) to support necessary improvements for Rural DAC, EDA, and URC systems can be an invaluable partner for implementing solutions. The lack of technical capacity and support from agencies also contributes to the high cost of DAC projects through an inability to adequately perform O&M activities during the life of a system.

Aging storage tanks can lead to contamination of rural water supplies.

Photo credit: Dave Harvey, Rural Community Assistance Corporation

Some of the other issues facing Rural DACs, EDAs, and URCs include groundwater contamination, potentially from leaking septic tanks. Leaking or improperly sited septic tanks also pose a public health hazard, though the conversion from septic to sewer is expensive, and Rural DACs, EDAs, and URCs often struggle to find assistance in funding such projects. The San Dieguito and San Diego groundwater basins have experienced contamination, as has the Otay/San Diego Formation, which is being considered by U.S. Geological Survey (USGS) for groundwater use. While water agencies may be able to achieve economies of scale that allow projects to pump and clean contaminated groundwater for use by their customers to be economically feasible, similar systems for Rural DACs, EDAs, and URCs may be impractical or infeasible.

Drinking water supplies for some Rural DACs, EDAs, and URCs have also been contaminated with ash from recent wildfires. It is anticipated that the projected increase in wildfire frequency and intensity resulting from climate change will inordinately affect Rural DACs, EDAs, and URCs, which are more likely to be located near fire-prone areas and less likely to have the ability to defend against fires. Some Rural DACs, EDAs, and URCs lack sufficient water supplies for fire protection, further increasing the danger.

Illegal dumping, especially of chemicals or hazardous wastes in creeks and watersheds, is a common problem reported in Rural DACs and EDAs. Awareness of existing programs such as the County's permanent Household Hazardous Waste Collection Facilities in Ramona and El Cajon and the County's collection events that travel throughout unincorporated areas of the County can help to reduce illegal dumping and associated water quality impacts.

The infrastructure needs of Rural DACs, EDAs, and URCs are so extensive that there is not enough currently available funding to meet the needs of Rural DACs, EDAs, and URCs throughout the Region. The State Board has a lengthy list of communities requesting funding from the Clean Water and Drinking Water State Revolving Fund programs for drinking water and wastewater improvements in its 2017 Intended Use Plan (including two small community systems in San Diego County, of seven total projects from the San Diego IRWM Region). Additional challenges to obtaining funding for Rural DAC, EDA, and URC projects include a regulatory burden that is often too difficult for Rural DACs, EDAs, and URCs to meet as well as difficulties in providing matching funds.

To meet the needs of Rural DACs, EDAs, and URCs, the San Diego IRWM Region will need to identify solutions that recognize that the needs of Rural DACs, EDAs, and URCs differ from those of Urban DACs, EDAs, and URCs. To be most effective, the Region may develop and implement targeted, multilingual outreach to Rural DACs, EDAs, and URCs that is tailored to the community being addressed. For the 2018 Water Needs Assessment, the RWMG and its NGO partners are conducting targeted outreach to Rural DACs, EDAs, and URCs to further the Region's understanding of needs specific to their communities. Finally, appropriate support must be provided to enable Rural DACs, EDAs, and URCs to develop projects, secure funding for projects, and properly operate and maintain their systems.

Community Support for DACs, EDAs, URCs, and EJs

In addition to the efforts of the San Diego IRWM Program, a variety of organizations in the IRWM Region work to address the needs of DACs, EDAs, URCs, and EJs:

San Diego Coastkeeper

The San Diego Coastkeeper's mission is to protect and restore fishable, swimmable, and drinkable waters in San Diego County. Coastkeeper enhances public awareness of water quality and other water-related issues through their extensive community outreach and participation program that involves hands-on stewardship activities such as beach cleanups and water quality sampling.

Rural Community Assistance Corporation

RCAC focuses its San Diego-based efforts in the rural portions of the Region that generally do not receive municipal water or wastewater services. RCAC completes a variety of work to address the needs of DACs and EJs, including providing technical assistance, training, and funding support.

California Rural Water Association

California Rural Water Association (CRWA) works to provide on-site technical assistance and specialized training for rural water and wastewater systems. Similar to RCAC, CRWA focuses its work on the rural portions of the Region that do not receive municipal water or wastewater.

Environmental Health Coalition

The Environmental Health Coalition (EHC)is a community-based organization founded in Barrio Logan, an Urban DAC. It works to achieve environmental and social justice through leader development, organizing, and advocacy. EHC focuses on green energy and jobs, healthy kids, border environmental justice, and toxic-free neighborhoods.

Groundwork San Diego

Groundwork San Diego–Chollas Creek works with the communities surrounding Chollas Creek to improve the creek and communities. It strives to create opportunities for people to learn new skills and take action, help businesses grow, and create safer and healthier neighborhoods. It achieves these goals through three overarching programs: 1) Environmental education, 2) Clean creeks and healthy habitats, and 3) Thriving communities.

Jacobs Center for Neighborhood Innovation

The Jacobs Center for Neighborhood Innovation seeks to create community change by teaming up with residents in under-invested communities. It seeks to empower residents to take ownership of the change they wish to see in their communities, and provide financial, technical, and other forms of support. The Jacobs Center works in Chollas View, Emerald Hills, Lincoln Park, Mountain View, Mount Hope, North Encanto, Oak Park, South Encanto, Valencia Park, and Webster.

Jacobs Center for Neighborhood Innovation serves an important role in improving creek conditions in Southeast San Diego.
Photo credit: Charles Davis, Jacobs Center for Neighborhood Innovation

Civic San Diego

Civic San Diego is a public non-profit founded by the City of San Diego following the dissolution of the Redevelopment Agency of the City of San Diego in 2012. Its main responsibility has been the redevelopment and subsequent revitalization of Downtown San Diego, though it also works in the surrounding neighborhoods, including four Urban DACS: Barrio Logan, City Heights, Southeastern, and San Ysidro.

3.4 Watersheds

As shown in Figure 3-1, the Region addressed in this IRWM Plan is composed of eleven watersheds that are tributary to coastal waters. The runoff captured within these watersheds meets approximately 15% of the region's overall water demands. The region supports a diversity of ecosystems, from coastal wetlands to inland mountains, which support more threatened and endangered species than any other comparable land area in the country (City of San Diego, 2016). Table 3-10 summarizes the characteristics of the eleven watersheds, which are described in greater detail in *Chapter 5, Watershed Characterizations*. As noted in the call-out box on page 3-10, the terminology used to describe watersheds and drainage areas can vary depending on the context. Within this IRWM Plan, the term "watershed" refers to a DWR-delineated hydrologic unit (HU), which may include one or more individual sub-watersheds. One or more sub-watershed may comprise a hydrologic area (HA), and some HAs are further broken down into hydrologic subareas (HSAs).

Table 3-10: Summary of the Region's Watersheds[1]

HU[2]	Name	Watershed Area (sq. miles)	Primary Watercourses or Hydrologic Areas	Approximate Length[3] (miles)	Elevation Range[4] (feet MSL)	Coastal Receiving Waters
901	San Juan	150[5]	San Mateo Creek San Onofre Canyon Las Pulgas Canyon	21	0 - 3575	Coastal estuaries/marshes Pacific Ocean
902	Santa Margarita River	200[6]	Santa Margarita River	55	0 – 6190	Santa Margarita Estuary Pacific Ocean
903	San Luis Rey River	558	San Luis Rey River	52	0 – 6530	San Luis Rey River Mouth Pacific Ocean
904	Carlsbad	210	Loma Alta Creek	8	0 – 460	Loma Alta Slough Pacific Ocean
			Buena Vista Creek	11	0 – 1670	Buena Vista Lagoon Pacific Ocean
			Encinas HA	4	0 - 350	Pacific Ocean
			Aqua Hedionda Creek	10	0 – 1300	Agua Hedionda Lagoon Pacific Ocean
			San Marcos Creek	14	0 – 1670	Batiquitos Lagoon Pacific Ocean
			Escondido Creek	24	0 – 2330	San Elijo Lagoon Pacific Ocean
905	San Dieguito River	346	San Dieguito River	42	0 – 5720	San Dieguito Lagoon Pacific Ocean
906	Peñasquitos	100	Los Peñasquitos Creek Rose Creek Tecolote Creek	18	0 – 2700	Los Peñasquitos Lagoon Mission Bay
907	San Diego River	440	San Diego River	44	0 – 6510	San Diego River Estuary Pacific Ocean
908	Pueblo	60	Chollas Creek	8	0 – 830	San Diego Bay Pacific Ocean
909	Sweetwater River	230	Sweetwater River	41	0 – 6510	Sweetwater River Estuary San Diego Bay
910	Otay River	160	Otay River	23	0 – 3720	San Diego Bay
911	Tijuana River	470[7]	Tijuana River	47	0 – 6380	Tijuana River Estuary Pacific Ocean

1 Adapted from basin descriptions presented in Comprehensive Water Quality Control Plan Report (San Diego Water Board, 1976).
2 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
3 Approximate distance of eastern end of the watershed (within the USA) to the Pacific Ocean.
4 Approximate range of elevation in feet above mean sea level (MSL) within the watershed.
5 The San Juan Watershed comprises approximately 476 square miles. The lower 150 square miles of this watershed is within the County and the Region addressed within this IRWM Plan; this area includes four hydrologic areas: San Mateo, San Onofre, Las Pulgas, and Stuart Mesa. The upper portion of the watershed lies within Orange County and is addressed by that Region's IRWM Plan.
6 The Santa Margarita River Watershed area is approximately 750 square miles. The lower 200 square miles of this watershed is within the County and the Region addressed within this IRWM Plan. The remainder of the Santa Margarita River Watershed lies within Riverside County, and includes the communities of Temecula and Murrieta.
7 The Tijuana River Watershed is approximately 1,750 square miles; approximately 27% of the land area is within the Region.

3.5 Water Management Systems

This section includes an overview of the various water management systems in the San Diego IRWM Region, including water supply, wastewater, water reuse, stormwater, and flood control.

Table 3-11 presents a breakdown of member agency water supplies in 2015. Approximately 14% of the overall regional supply was from local sources (groundwater, local surface water, and recycled water). A total of ten member agencies use local surface water sources, of these nine develop potable supplies from the local surface waters, and ten member agencies develop local groundwater supplies. Additionally, 17 of the 24 Water Authority member agencies provide recycled water supply for irrigation purposes and other non-potable uses within their respective service areas. Table 3-12 provides an average supply breakdown for agencies reported in their 2005, 2010, and 2015 UWMPs.

Table 3-11: Member Agency Water Supply – Water Authority Service Area

Water Authority Member Agency	2015 Water Supply[1] (Acre-feet per Year)			Percent of Supply from Local Sources	Source of Member Agency Local Supply		
	Total Agency Supply	Water Authority Imported Supply	Member Agency Local Supply[2]		Recycled Water	Local Surface Water	Ground-water
Carlsbad MWD	20,609	16,403	4,206	20.41%	✓		
City of Del Mar	1,097	961	135	12.35%	✓		
City of Escondido	22,265	21,062	1,203	5.40%	✓	✓	
Fallbrook PUD	12,331	11,729	602	4.88%	✓	✓	
Helix Water District	31,145	30,852	293	0.94%		✓	✓
Lakeside Water Dist.	3,739	2,858	880	23.55%			✓
City of National City[3]	5,676	2,718	2,958	52.12%		✓	✓
City of Oceanside	26,449	23,082	3,367	12.73%	✓		✓
Olivenhain MWD	22,222	19,549	2,673	12.03%	✓		
Otay Water District	34,485	30,299	4,186	12.14%	✓		
Padre Dam MWD	11,322	10,437	886	7.82%	✓		
Camp Pendleton	8,026	220	7,806	97.26%	✓		✓
City of Poway	11,127	10,660	466	4.19%	✓		
Rainbow MWD	20,173	20,173	0	0.00%			
Ramona MWD	6,142	5,492	651	10.59%	✓	✓[4]	✓
Rincon Del Diablo MWD	8,882	5,744	3,138	35.33%	✓		
City of San Diego	191,674	184,493	7,181	3.75%	✓	✓	✓
San Dieguito Water Dist.	7,110	5,749	1,361	19.15%	✓	✓	
Santa Fe Irrigation Dist.	11,199	9,865	1,334	11.91%	✓	✓	
South Bay Irrigation Dist.[3]	13,555	11,236	2,319	17.11%		✓	✓
Vallecitos Water District	15,297	15,297	0	0.00%	✓		
Valley Center MWD	25,985	25,598	387	1.49%	✓		
Vista Irrigation District	17,833	16,216	1,618	9.07%		✓	✓
Yuima MWD	11,017	4,470	6,547	59.43%			✓
Total	**539,361**	**485,162**	**54,199**	**10.05%**			

Table 3-12: 10-Year Average Member Agency Water Supply – Water Authority Service Area

Water Authority Member Agency	2005-2015 Average Water Supply (Acre-feet per Year)			Percent of Supply from Local Sources	Source of Member Agency Local Supply		
	Total Agency Supply	Water Authority Imported Supply[1]	Member Agency Local Supply[2,3]		Recycled Water	Local Surface Water	Ground-water
Carlsbad MWD	21,417	17,902	3,516	16.42%	✓		
City of Del Mar	1,217	1,111	105	8.67%	✓		
City of Escondido	25,292	18,965	6,327	25.01%	✓	✓	
Fallbrook PUD	14,615	13,552	1,063	7.28%	✓	✓	
Helix Water District	33,225	28,462	4,763	14.34%		✓	✓
Lakeside Water Dist.	2,596	1,996	600	23.13%			✓
City of National City[3]	4,001	906	3,095	77.36%		✓	✓
City of Oceanside	29,608	25,385	4,223	14.26%	✓		✓
Olivenhain MWD	22,586	20,146	2,440	10.80%	✓		
Otay Water District	36,956	33,262	3,694	10.00%	✓		
Padre Dam MWD	15,022	13,987	1,036	6.90%	✓		
Camp Pendleton	10,372	637	9,735	93.86%	✓		✓
City of Poway	12,258	11,712	546	4.45%	✓		
Rainbow MWD	23,814	22,469	1,345	5.65%			
Ramona MWD	8,034	7,265	769	9.57%	✓	✓[5]	✓
Rincon Del Diablo MWD	8,815	6,482	2,333	26.47%	✓		
City of San Diego	202,707	183,506	19,201	9.47%	✓	✓	✓
San Dieguito Water Dist.	8,887	4,499	4,388	49.38%	✓	✓	
Santa Fe Irrigation Dist.	11,551	8,466	3,086	26.71%	✓	✓	
South Bay Irrigation Dist.[4]	16,332	10,110	6,222	38.10%		✓	✓
Vallecitos Water District	17,064	16,715	350	2.05%	✓		
Valley Center MWD	32,844	31,161	1,683	5.13%	✓		
Vista Irrigation District	20,428	15,269	5,159	25.26%		✓	✓
Yuima MWD	6,114	3,140	2,974	48.64%			✓
Total	**585,757**	**497,103**	**88,655**	**15.14%**	-	-	-

1 Imported supply data from Water Authority's Comprehensive Annual Financial Report (Water Authority, 2015) and 2010 UWMP (Water Authority, 2011b).
2 Local supply data from Comprehensive Annual Financial Report and 2005 UWMP (Water Authority, 2015 and 2007).
3 Includes local recycled water, surface water, and groundwater supplies. Does not reflect conserved water. Also does not include groundwater pumped by private well owners or surface water outside the Water Authority's service area.
4 Local water supply is from Sweetwater Authority (a joint powers agency comprised of the South Bay Irrigation District and City of National City).
5 Ramona MWD uses local surface water along with imported raw water for irrigation customers. Ramona MWD currently does not treat local surface water for potable use.

Local hydrologic conditions (precipitation, evaporation, and surface flows) influence both the quantity of water demand and the availability of local supplies within the Region. Total water use can also be influenced by local economic conditions, which contributed to the reduction in demands between 2007 and 2012. Drought conditions from 2012 through 2016 reduced supply availability and led to mandatory use restrictions. Demands in those years were lower than average, particularly 2014-2016, following the Governor's drought declaration in January 2014. Table 3-13, below, summarizes the variation in Region's local water supplies from 1999-2016.

Water Supply outside Water Authority Service Area

All but a small fraction of the Region's over 3.2 million residents live within the service areas of the Water Authority's 24 member agencies (refer to Table 3-1). Rural residences and small communities that exist outside the Water Authority service area are entirely dependent on groundwater resources and rely exclusively on individual groundwater wells or community water wells operated by small community water systems or private water companies.

While the Region's groundwater-dependent population is relatively small (compared to the population served by the Water Authority), the population is spread over a significant geographic portion of the Region. The availability of groundwater in the portion of the Region that lies east of the Water Authority's service area is limited by (1) available precipitation recharge, (2) recharge infiltration limitations, (3) low aquifer yields, and (4) limited groundwater storage capacity. The majority of this area is underlain by fractured rock aquifers. Such aquifers typically have well yields no more than several gallons per minute. Shallow alluvial valleys exist along several of the river and stream valleys in portions of the eastern section of the Region. Groundwater production from these shallow aquifers, however, is constrained by the limited aquifer storage. Overall, the factors listed above that limit groundwater yield severely constrain the potential of additional growth and development in this area of the County. Groundwater resources are discussed in more detail in *Section 3.5.6* Groundwater Resources.

While some community well systems outside the Water Authority's service area maintain records of overall water production, very few wells are required to be metered for production. As a result, it is difficult to estimate the overall quantity of water supplies used. The low-density residential population in this area uses a small fraction of water when compared to the overall Water Authority supply. However, non-residential water use within this area (e.g. agriculture, golf courses, campgrounds, resorts, retreat centers, public parks, casinos, hotels, and industrial uses) can represent a sizable demand on available groundwater resources.

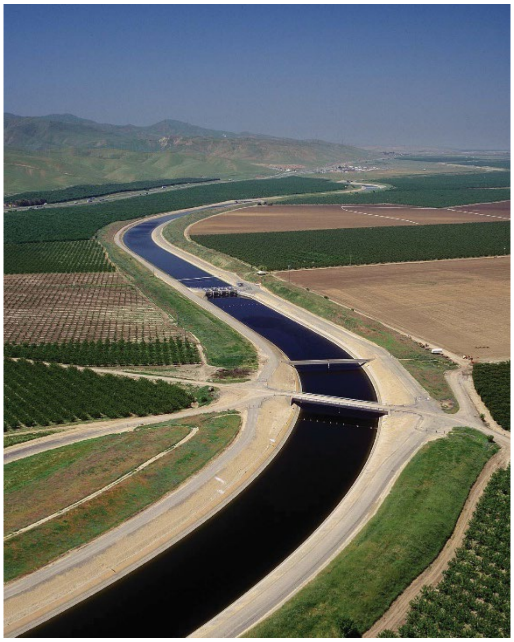
3.5.1 Water Authority Supplies

The Water Authority purchases water from four main sources: 1) Metropolitan Water District of Southern California (Metropolitan), 2) conserved agricultural water from the Imperial Irrigation District (IID), 3) conserved water from projects that lined the All-American and Coachella Canals, and 4) desalinated seawater from the Claude "Bud" Lewis Carlsbad Desalination Plant (Carlsbad Desalination Plant). The Water Authority has also acquired spot water transfers to offset reductions in supplies from Metropolitan during water shortage years.

Imported Water

Metropolitan is Southern California's wholesale water agency, and the Water Authority is the largest customer among Metropolitan's 26 member agencies. Metropolitan derives its water supply from two sources: the Colorado River and the State Water Project (SWP). Metropolitan owns and operates the Colorado River Aqueduct to deliver Colorado River water to Southern California. Metropolitan is the largest of the State Water Contractors that receive supplies from the SWP, with SWP water (originating from the Bay Delta) delivered to Metropolitan via the California Aqueduct.

In 1998, the Water Authority entered into a transfer agreement with IID to purchase conserved agricultural water. Through the agreement, the Water Authority received 70,000 acre-feet (AF) in 2010 and will receive an annually-increasing volume up to 200,000 AF by 2021. The volume then remains fixed for the remainder of the 75-year agreement. Metropolitan conveys the IID transfer water to the Water Authority via an exchange agreement. Through the 2003 Quantification Settlement Agreement (QSA) on the Colorado River and conserved water from lining of the All-American and Coachella Canals, the Water Authority has rights to 80,200 AFY (Water Authority, 2016).



Imported water provides approximately 80% of the Region's water supply.

Photo credit: San Diego County Water Authority

As shown in Table 3-13 and Figure 3-5, imported water supplies provided through the Water Authority have comprised between 80 and 90% of the Region's water supply in recent years. Except during periods of extreme drought, Water Authority supplies typically comprise approximately 85% of the Region's water supply.

The Water Authority takes delivery of the Metropolitan/IID transfer and canal lining project supplies at a point located six miles south of the San Diego County-Riverside County border. The Water Authority conveys imported water to its member agencies through two aqueducts that consist of five large-diameter pipelines. Figure 3-7 shows the locations of the Water Authority aqueducts. The aqueducts follow general north-to-south alignments, and the water is delivered largely by gravity. The First Aqueduct includes Pipelines 1 and 2, which are located in a common right-of-way and are operated as a unit. These pipelines have a combined capacity of 180 cubic feet per second (CFS). Pipelines 3, 4, and 5 form the Second Aqueduct. These pipelines are operated independently and are located in separate rights-of-way from the First Aqueduct. Pipelines 3, 4, and 5 have respective capacities of 280 CFS, 470 CFS, and 500 CFS. Key appurtenant facilities to the aqueduct system include flow control facilities, pump stations, control valves, and air release mechanisms. The Water Authority delivers the imported supply to member agencies via 88 turnouts along the aqueduct system.

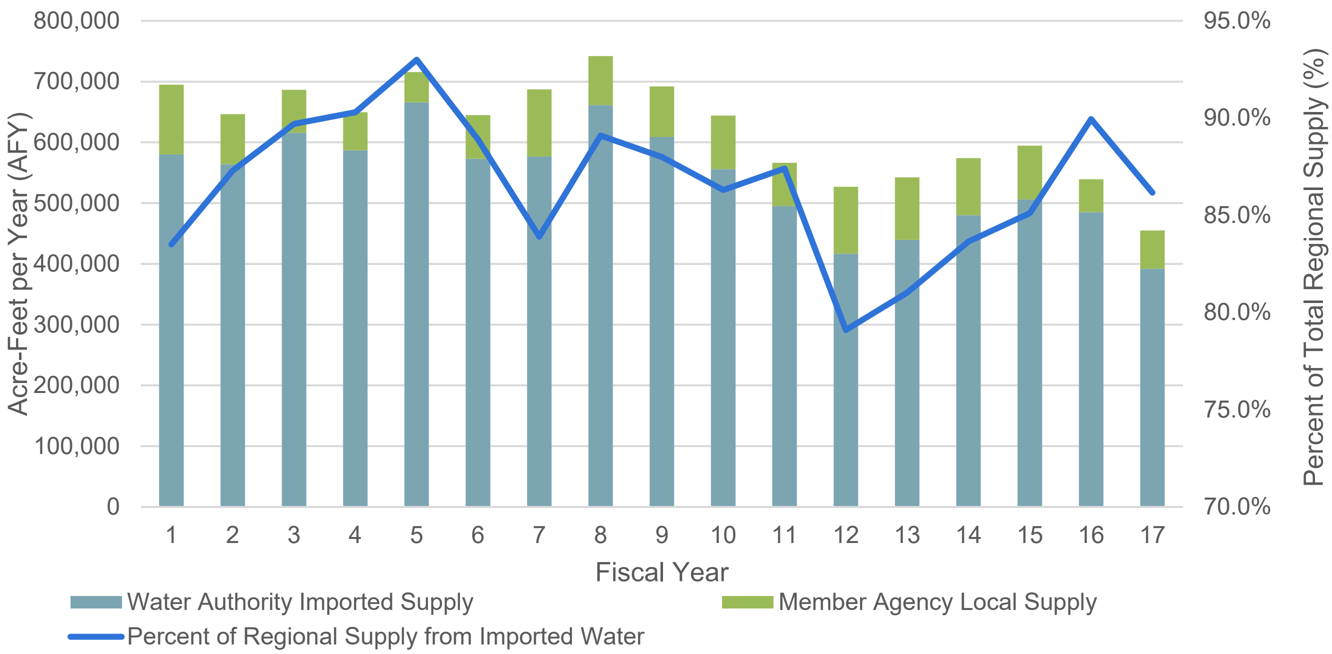
The five pipelines of the First and Second Aqueducts allow the Water Authority to take delivery of both treated (filtered and disinfected) and untreated water from Metropolitan. The Water Authority's treated water supplies come from its own Twin Oak Valley Water Treatment Plant, purchases from Metropolitan's Skinner Water Treatment Plant, and purchases from the Helix Water District's R.M. Levy Water Treatment Plant. These supplies are delivered directly to member agency potable water distribution systems. Untreated water supplies are delivered to member agency surface reservoirs or water treatment facilities.

Table 3-13: Imported Water Reliance within the Region, 1999-2016

Fiscal Year	Water Supply in Acre-feet per Year[1]			Percent of Regional Supply from Imported Water[2]
	Total Regional Supply[2]	Water Authority Imported Supply	Member Agency Local Supply[3]	
1999-2000	694,995	580,118	114,877	83.5%
2000-2001	646,387	564,140	82,247	87.3%
2001-2002	686,529	615,572	70,957	89.7%
2002-2003	649,622	586,849	62,773	90.3%
2003-2004	715,763	666,008	49,755	93.0%
2004-2005	644,845	573,048	71,797	88.9%
2005-2006	687,253	576,620	110,633	83.9%
2006-2007	741,893	661,309	80,584	89.1%
2007-2008	691,931	608,903	83,029	88.0%
2008-2009	643,900	555,789	88,211	86.3%
2009-2010	566,443	494,960	71,484	87.4%
2010-2011	526,945	416,844	110,101	79.1%
2011-2012	542,438	439,552	102,886	81.03%
2012-2013	573,901	480,048	93,853	83.65%
2013-2014	594,536	505,985	88,551	85.11%
2014-2015	539,361	485,162	54,199	89.95%
2015-2016	454,963	392,003	62,961	86.16%

1 From *Water Authority Comprehensive Annual Reports* for Fiscal Year 2015-2016(Water Authority, 2016a).
2 Regional supply provided by water agencies within the Water Authority service area. As noted in Table 3-1 all but a small fraction of the Region's population is within the Water Authority service area. Local groundwater is the source of water supply in rural areas outside the water distribution networks of the Water Authority member agencies.
3 Includes local recycled water, surface water, and groundwater supplies. Does not reflect conserved water. Also does not include groundwater pumped by private well owners.

Figure 3-5: Imported Water Reliance within the Region



Desalinated Seawater

Seawater desalination plays a key role in the region's local water supply. The Claude "Bud" Lewis Carlsbad Desalination Plant (Carlsbad Desalination Plant), owned by Poseidon Resources in a public-private partnership with the Water Authority, began operation in December 2015. The Water Authority constructed a 10-mile-long pipeline that delivers water from the plant to the Water Authority's Second Aqueduct. The Second Aqueduct then conveys desalinated water to the Water Authority's Twin Oaks Valley Water Treatment Plant, where it is blended with existing drinking water supplies for regional distribution. The Carlsbad Desalination Plant is permitted to produce up to 56,000 acre feet per year (AFY) of desalinated water and is the largest seawater desalination facility in the Western Hemisphere (see Table 3-14).

Poseidon Resources owns and operates the facility and assumes risks associated with constructing, maintaining, and operating the facility. Poseidon Resources also ensures that water quality meets standards specified within the agreement. The Water Authority, in turn, has agreed to purchase the water that meets specified standards at a set price during the 30-year agreement period. Additionally, the agreement specifies that the Water Authority can purchase the desalination plant for one dollar at the end of the 30-year agreement. The Water Authority owns and operates the 10-mile conveyance pipeline. Two of the Water Authority's member agencies, Carlsbad Municipal Water District and the Vallecitos Water District, have agreed to purchase a total of 6,000 AFY of the desalinated water through independent purchase agreements.

The Water Authority improved its regional water delivery and treatment system to integrate desalinated water. These system improvements (see Figure 3-6) allow the Water Authority to blend the desalinated supply into treated water in Pipelines 3 and 4 of the Second Aqueduct. The Second Aqueduct then conveys desalinated water to the Water Authority's Twin Oaks WTP, where it is blended with existing drinking water supplies for regional distribution.

The Water Authority also is evaluating a potential seawater desalination project in collaboration with the U.S. Marine Corps Base Camp Pendleton. Early feasibility studies suggest potential for a seawater desalination plant that could produce 100 million to 150 million gallons per day.

Figure 3-6: Conveyance Facilities for Carlsbad Desalination Project

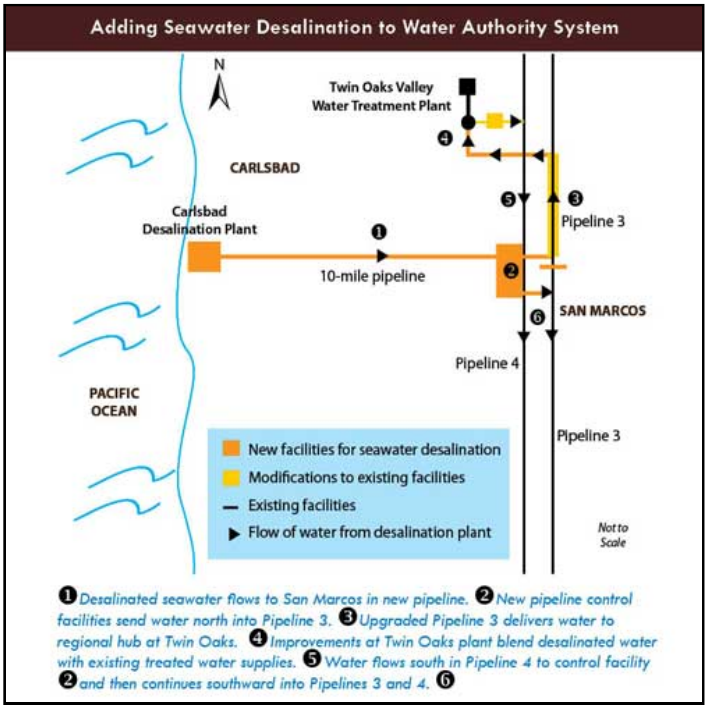


Table 3-14: Desalination Plant

HU[1]	Watershed	Desalination Plant	Operating Agency	Capacity (AFY)	Source of Water
904	Carlsbad	Carlsbad Desalination Plant	San Diego County Water Authority	56,000	Pacific Ocean

1 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).

3.5.2 Regional Water Supply Infrastructure

Figure 3-7 presents the location of key local water supply infrastructure within the Region. The 24 surface water reservoirs located within the Region are summarized in Table 3-15. All of the reservoirs collect local stormwater and many are connected to the Water Authority aqueduct system and so receive imported water as well. Local water supply reservoirs exist within nine of the Region's eleven watersheds, and local surface water supplied 51,700 AF of water in 2015 (Water Authority, 2016a). A total of 16 reservoirs are currently connected to the Water Authority's aqueduct system. In 2014, the Water Authority completed a 117-foot dam raise at San Vicente Reservoir. This raise more than doubled the reservoir's capacity, increasing it from just over 90,000 AF to nearly 250,000 AF (a 276% increase). The expanded reservoir represents over one-third of the region's total reservoir storage capacity.

<<INSERT FIG. 3-6 HERE>>

Table 3-16 summarizes regional water treatment facilities operated by the Water Authority and its member agencies and identifies associated sources of filtration plant raw water supply.

Table 3-15: Principal Surface Water Reservoirs[1]

HU[2]	Watershed	Reservoir	Operating Agency	Capacity (Acre-Feet)	Aqueduct Connection[3]
902	Santa Margarita River	Red Mountain	Fallbrook Public Utility District	1,335	✓
		Morro Hill	Rainbow Municipal Water District	465	✓
903	San Luis Rey	Turner[5]	Valley Center Municipal Water Dist.	1,612[4]	
		Henshaw	Vista Irrigation District	51,774	
904	Carlsbad	Maerkle	Carlsbad Municipal Water District	600	✓
		Dixon	City of Escondido	2,606	✓
		Wohlford	City of Escondido	6,506	
		Olivenhain[6]	Water Authority and Olivenhain Municipal Water District	24,774	✓
		San Dieguito	San Dieguito Water District and Santa Fe Irrigation District	883	✓
905	San Dieguito	Hodges	City of San Diego	30,633	✓
		Sutherland	City of San Diego	29,508	
		Ramona	Ramona Municipal Water District	12,000	✓
		Poway	City of Poway	3,330	✓
906	Peñasquitos	Miramar	City of San Diego	6,682	✓
907	San Diego	Murray	City of San Diego	4,684	✓
		San Vicente	City of San Diego	249,358	✓
		El Capitan	City of San Diego	112,807	✓[7]
		Cuyamaca	Helix Water District	8,195	
		Lake Jennings	Helix Water District	9,790	✓
909	Sweetwater	Loveland	Sweetwater Authority	25,400	
		Sweetwater	Sweetwater Authority	28,079	✓
910	Otay	Lower Otay	City of San Diego	47,067	✓
911	Tijuana	Barrett	City of San Diego	34,806	
		Morena	City of San Diego	50,694	

1 From *2015 Urban Water Management Plan* (Water Authority, 2016).
2 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
3 Bullets indicate which reservoirs are connected to the Water Authority's San Diego Aqueduct to receive untreated aqueduct water.
4 Reservoir is not currently used as a source of raw potable water supply.
5 Reservoir is out of service for maintenance and scheduled to return online in 2012.
6 Reservoir jointly owned and operated by the Water Authority and Olivenhain Municipal Water District. Reservoir is part of the Water Authority's Emergency Storage Program.
7 El Capitan Reservoir is indirectly connected, via San Vicente Reservoir, to the Water Authority's aqueduct.

Table 3-16: Potable Water Treatment Facilities[1]

HU[2]	Watershed	Treatment Facility	Operating Agency	Capacity (mgd)	Aqueduct Connection[3]
903	San Luis Rey River	Weese	City of Oceanside	25	✓
904	Carlsbad	Escondido/Vista[4]	City of Escondido Vista Irrigation District	90	✓
		Badger[5]	San Dieguito Water District Santa Fe Irrigation District	40	✓
		McCollom[5]	Olivenhain Municipal Water District	34	✓
		Twin Oaks Valley	San Diego County Water Authority	100	✓
905	San Dieguito River	Berglund	City of Poway	24	✓
		Barger	Ramona Municipal Water District	5[6]	
906	Peñasquitos	Miramar	City of San Diego	144[7]	✓
907	San Diego River	Alvarado[7,8]	City of San Diego	120	✓
		Levy	Helix Water District	106	✓
909	Sweetwater	Perdue	Sweetwater Authority	30	✓
910	Otay	Lower Otay	City of San Diego	34.2[9]	✓

1 From *2015 Urban Water Management Plan* (Water Authority, 2016b).
2 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
3 Bullets indicate which treatment plants are connected to receive untreated water from the Water Authority's San Diego Aqueduct.
4 Treatment plant is physically located within the Carlsbad Watershed, but receives untreated water from Lake Henshaw (Vista Irrigation District) within the San Luis Rey River (903) watershed.
5 Treatment plant is located within the Carlsbad Watershed, but receives surface water supplies from imported water sources and from Hodges Reservoir within the San Dieguito Watershed (905).
6 The Bargar Water Treatment Plant has not been in operation since 2007 when it could not meet new requirements. In 2011 the Ramona Water District Board of Directors agreed not to pursue a plan to bring the out-of-service plant into operation during times of emergency.
7 The Miramar Water Treatment Plant has the ability to increase to 215 million gallons per day (mgd) in the future with approval from CDPH based upon results of a future treatment process study (high Filtration Rate Study) that is yet to be performed (City of San Diego, 2011).
8 Water from Sutherland Reservoir (within the San Dieguito River Watershed) can be directed to San Vicente Reservoir (within the San Diego River Watershed) (San Diego River Watershed Work Group 2005). San Vicente Reservoir is one of the sources of untreated water supply for the Alvarado Water Treatment Plant.
9 The Lower Otay Treatment Facility has the hydraulic capacity to increase to 60 mgd in the future.

Emergency Storage Program

Recognizing the Region's dependence on timely delivery of imported water supplies, the Water Authority initiated an Emergency Storage Project (ESP) designed to provide water to the Region during imported water interruptions of up to two months of complete loss of imported supplies or six months of partial outage.

The ESP consists of storage and conveyance facilities that allow the Water Authority to maintain a 75% service level to member agencies during a prolonged interruption of imported water deliveries. ESP facilities are located in the north and east portions of the Water Authority service area and were constructed in phases. Table 3-17 summarizes existing and planned ESP facilities.

Table 3-17: Emergency Storage Program Facilities and Schedule

Key Facilities	Facility Components and Details	Scheduled Completion
Olivenhain Dam/Reservoir, Pipeline and Pump Station	A. 318-foot tall Olivenhain Dam B. Olivenhain pipeline to connect the Olivenhain Reservoir to the Water Authority's Second Aqueduct C. Water transfer pump station	A. Completed in 2003 B. Completed in 2002 C. Completed in 2005
Hodges Reservoir Pipeline and Pump Station	A. Pipeline connecting Olivenhain Reservoir to Hodges Reservoir B. Electrical facilities to deliver power locally C. Pump station to generate power and move water between Hodges Reservoir and Olivenhain Reservoir	A. Completed in 2007 B. Completed in 2008 C. Operational in 2012
San Vicente Pipeline and Pump Station	A. 11-mile pipeline to connect the San Vicente Reservoir to the Water Authority's Second Aqueduct B. Pump station and other facilities to move water from San Vicente Reservoir to the Second Aqueduct	A. Completed in 2010 B. Completed in 2010
San Vicente Dam Raise	A. Additional 117 feet added to the existing San Vicente Dam to provide additional storage capacity for emergency use and during times of water scarcity	A. Completed in 2014
North County Pump Station	A. Pump station to move emergency water supplies to the northern-most areas of the County	A. Anticipated for completion by 2018

Hydroelectric Power Generation

Several reservoirs within the Region are operated as hydroelectric power generation facilities: the Bear Valley Facility which is connected to Lake Wohlford and operated by the City of Escondido, two facilities (Roger Miller and David C. McCollom) that are operated by the Olivenhain Municipal Water District and connected to the Olivenhain Reservoir, and a forty megawatt (40 MW) power generation facility that was constructed as part of a pumped storage project that links Olivenhain Reservoir and Hodges Reservoir.

3.5.3 Surface Water Resources

There are over 200 streams and creeks in San Diego County, converging into five primary rivers: the Santa Margarita, San Luis Rey, San Dieguito, San Diego, and Sweetwater Rivers.

Streamflow

A major element of the water cycle, streamflow refers to the flow of water in streams, rivers, and other channels. By volume, most of the surface flow in streams and rivers within the San Diego Region is from precipitation runoff (storm events). The amount of storm precipitation that becomes streamflow depends on (1) topography, land uses, and soil permeability; (2) the frequency and timing of storm events; and (3) stormwater management practices. Streamflows during non-storm periods ("dry weather flows") are the result of urban runoff, agricultural runoff, and surfacing groundwater. Dry weather flows, though small by volume, are significant in that they may carry pollutant loads and can alter the seasonal nature of aquatic and riparian habitats.

Stream gaging stations monitored as part of the USGS network currently exist in all but two of the Region's watersheds. Table 3-18 summarizes permanent streamflow monitoring stations within the region. More than 50 years of streamflow data are available from twelve of the Region's streamflow gages. Table 3-18 also presents mean and median annual streamflow at each of the existing USGS stream gaging stations.

Table 3-18: U.S. Geological Survey Surface Flow Gaging Stations

HU[1]	Watershed	No. Gaging Stations in Watershed[2]	Currently Operating Stream Gages[2]	Annual Streamflow[2] (cubic feet per sec.)		Period of Record[2]
				Median Daily Flow	Mean Annual Flow	
901	San Juan	11[3]	Las Flores Creek at Las Pulgas Canyon Las Flores Creek near Oceanside San Onofre Creek at San Onofre Cristianitos Creek above San Mateo Ck. San Mateo Creek near San Clemente	0.2 0.0 0.0 0.0 0.1	1.5 1.6 1.8 3.1 11.3	1999 - 2012 1952 - 2017[4] 1947 -2010[5] 1993 - 2017 1953 - 2017[6]
902	Santa Margarita River	10[7]	Santa Margarita River at Ysidora Santa Margarita River near Fallbrook O'Neill Spillway near Fallbrook Lake O'Neill outlet near Fallbrook Lake O'Neill trib. near Fallbrook Fallbrook Creek near Fallbrook DeLuz Creek near DeLuz DeLuz Creek near Fallbrook Rainbow Creek near Fallbrook Sandia Creek near Fallbrook	7.1[8] 6.3[10] 0.0 0.4 0.0 0.3 0.3 0.0 0.33 3.5	55.9[8] 38.4[10] 0.2 1.6 0.1 1.3 10.0 4.3 3.2 8.6	1923 - 2017[9] 1924 - 2017[10] 1998 - 2017 1998 - 2017 2001 - 2005[11] 1993 - 2017 1992 - 2017 1951 - 2005[12] 1989 - 2017 1989 - 2017
903	San Luis Rey River	11	San Luis Rey River at Oceanside	2.5	34.5	1940 - 2017[13]
904	Carlsbad	1	[None currently operating]	NA	NA	NA
905	San Dieguito River	9	Santa Maria Creek near Ramona Guejito Creek near San Pasqual Santa Ysabel Creek near Ramona	0.0 0.1 0.0	6.3 2.6 9.9	1912 - 2017[14] 1946 - 2017[15] 1955 - 2017
906	Peñasquitos	10	Los Peñasquitos Creek at Poway	2.0	11.0	1964 - 2017
907	San Diego River	5	San Diego River at Fashion Valley San Diego River at Mast Blvd. Los Coches Creek near Lakeside Padre Barona Creek near Lakeside	6.0 2 0.4 0.0	36.2 24.2 1.8 1.4	1982 - 2017 1912 - 2017 1984- 2017 2005 - 2008
908	Pueblo	0	[None currently operating]	NA	NA	NA
909	Sweetwater	3	Sweetwater River near Descanso Sweetwater River near Dehesa	0.3 0.0	8.4 8.0	1957 — 2017 2006 - 2017
910	Otay	2	Jamul Creek near Jamul	0.1[16]	12.8[16]	1940 - 2017
911	Tijuana River	7	Tijuana River near Dulzura Campo Creek near Campo	0.2 0.1	1.8 3.1	1936 - 1990 1937 - 2017

1 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
2 From USGS (2018). Many of the historical gaging stations were temporary and were operated for short periods of time as part of special streamflow investigations. Streamflow records summarized above are for gaging stations that remain in operation and for gaging stations that were discontinued in recent years.
3 All USGS stream gages within the San Juan HU (901) are within the Region.
4 Stream gage not in operation during 1978-1993.
5 Stream gage not in operation during 1968-1998. Stream gage discontinued in 2010.
6 Stream gage not in operation during 1968-1993.
7 A total of ten historic gaging stations (all currently still operational) are in the San Diego County portion of the Santa Margarita River Watershed. An additional ten historical gaging stations have existed in Riverside County within the Santa Margarita River Watershed. Seven of these stations are currently in operation, including: Santa Margarita River at Temecula (1923-present), Temecula Creek near Aguanga (1957-present), Pechanga Creek near Temecula (1987-present), Murrieta Creek near Murrieta (1997-present), Warm Springs near Murrieta (1987-present), Santa Gertrudis Creek at Temecula (1987-present), and Murrieta Creek near Temecula (1930-present).
8 Listed mean and median are for 1981-2012. Mean and median flow during 1923-1948 was 43.3 CFS and 1.6 CFS, respectively, but these flows are not equivalent to the post-1980 flows due to construction of downstream conservation ponds (see USGS, 2012).
9 Stream gage not in operation during 1975-1979 and 2000-2001.
10 A flood destroyed the original stream gage in 1980. The stream gage was relocated in 1989 to its current site near the Fallbrook Public Utility District sump. Listed mean and median streamflows are for the current gage station location (1989-2012).
11 Gaging station discontinued in 2005.
12 Stream gage not in operation during 1968-1990 and 1991-2003. Gaging station discontinued in 2006.
13 Stream gage not in operation during 1942-1946 and 1991-1993. The gaging station was also operated from 1912-1914 but flows from these years are not included in the above-listed mean and median statistics.
14 Stream gage not in operation during 1921-1946.
15 The stream gage was relocated in 1957.
16 Includes flow diverted to Jamul Creek by the City of San Diego from Barrett Reservoir (in the Tijuana River Watershed) via the Dulzura conduit. Stream gaging station not in operation from October 1978 through September 1984.

Santa Ysabel Creek just above the gorge.
Photo credit: Jeff Pasek, City of San Diego

Significant differences exist between mean and median streamflows. As previously noted the Region is categorized as a semi-arid climate and experiences few hydrologic events that contribute to surface flows. Mean streamflow is predominantly affected by sporadic extreme hydrologic events, whereas median streamflow is more representative of daily surface runoff for the Region.

Figures 3-8 through 3-10 present mean and median monthly streamflow for three of the largest watercourses within the Region. These three watercourses generate the same trend of peak streamflow in the February to March period. The figures also show the variance of mean and median streamflow. As indicated by the monthly mean values in the figures, nearly 90% of the streamflow volume in the Santa Margarita, San Luis Rey, and San Diego Rivers occurs during the months of December through May. The majority of streamflow occurs as a result of direct stormwater runoff from a few major storm events within each rainy season. Because significant precipitation within the region typically occurs over only 30 to 60 days of the year, streamflow on most days remains low.

Table 3-19 compares pre-1975 and post-1975 summertime streamflow at the Santa Margarita, San Luis Rey, and San Diego River gaging stations. A major cause of the increase in median monthly streamflow values from pre-1975 to post-1975 can be attributed to urbanization in the watershed, which has reduced soil percolation and absorption by increasing paved surfaces, thereby increasing runoff.

While runoff directly associated with precipitation contributes most of the annual volume of streamflow, streamflow decreases substantially during the dry season. Seepage from landscape irrigation in urban areas, agricultural runoff, and surfacing groundwater are the prime sources of surface flow during non-storm (dry weather) periods. Urbanization has increased use of imported water, which is generally high in salts (total dissolved solids, or TDS), and urban runoff contributing to dry weather flows can negatively impact local surface water quality. Additionally, the availability of imported water within the Water Authority service area has resulted in reduced groundwater use in the Region's coastal areas during recent decades, increasing the amount of surfacing groundwater that contributes to streamflow in the downstream areas of the region. As shown in Table 3-19, prior to 1975, San Diego River and San Luis Rey River median streamflows during July through October were zero. Since 1975, summertime streamflows of several cubic feet per second have occurred on a sustained basis.

Figure 3-8: Mean and Median Monthly Streamflows – Santa Margarita River at Fallbrook

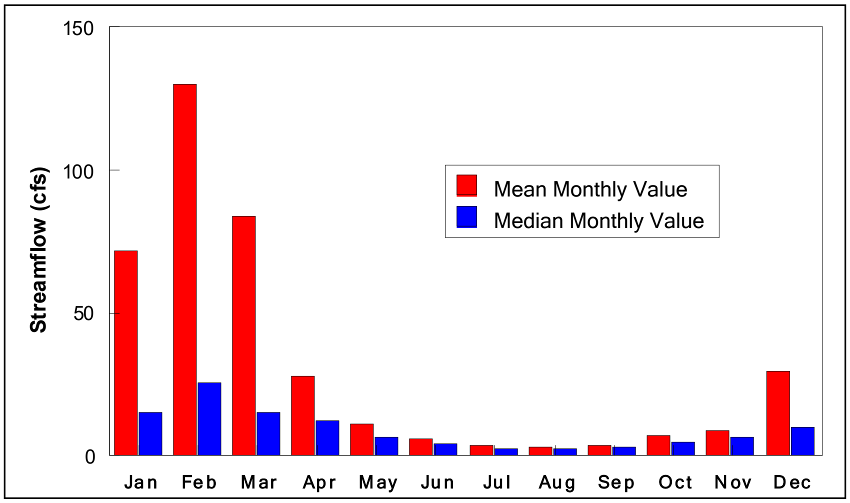


Figure 3-9: Mean and Median Monthly Streamflows – San Luis Rey River at Oceanside

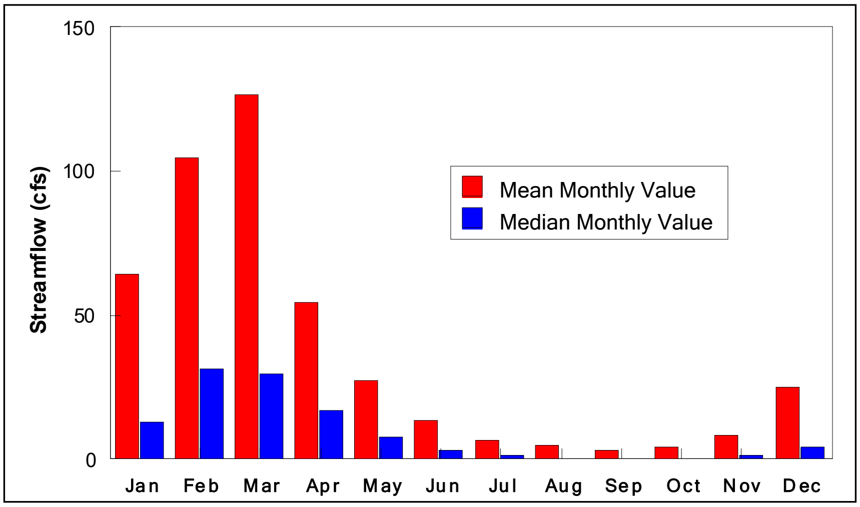


Figure 3-10: Mean and Median Monthly Streamflows – San Diego River at Mast Blvd.

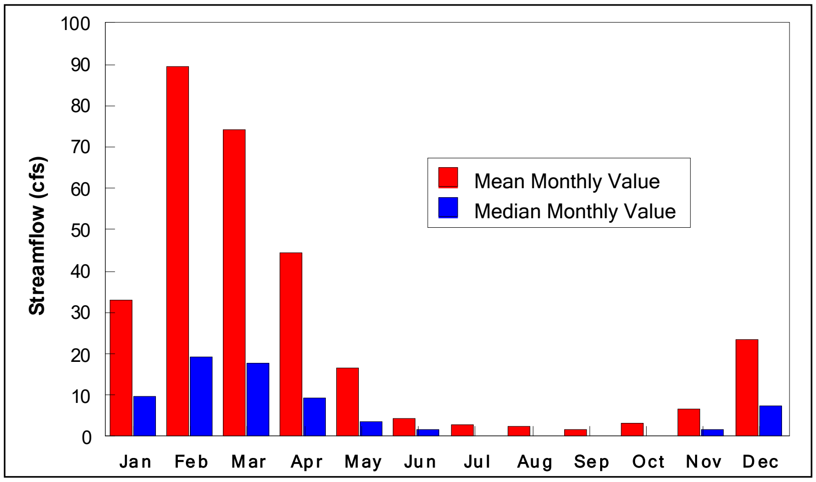


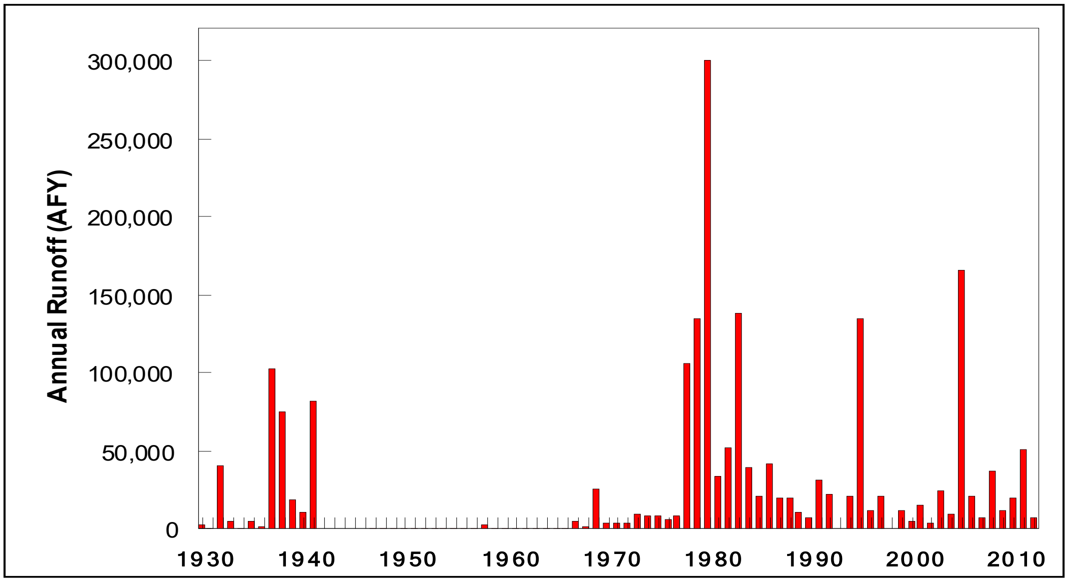
Table 3-19: Comparison of Pre-1975 and Post-1975 Median Monthly Summer Streamflow

Gaging Station	Median Monthly Summer Streamflow[1] in Cubic Feet per Second (CFS)	
	Prior to 1975	After 1975
Santa Margarita River at Fallbrook	1.5[2]	5.8[3]
San Luis Rey River at Oceanside	0.0[4]	8.6 [5]
San Diego River at Mast Boulevard	0.0[6]	6.2[5]

1 Mean of monthly streamflow values (CFS) for the summer months June through October, as reported by U.S. Geological Survey (2018).
2 Data period covering 1924 through 1974.
3 Data period covering 1989 through 2017.
4 Data period from 1929 through 1974.
5 Data period from 1975 through 2017.
6 Data period from 1912 through 1974.

Figure 3-11 presents annual runoff data for the San Luis Rey River at Oceanside that depicts the significant variation in annual runoff within the Region. While median annual runoff at the San Luis Rey River at Oceanside during 1929-2012 was 8,000 acre-feet per year (AFY), annual runoff has exceeded 100,000 AFY during seven years of the period of record. A total of 54% of the San Luis Rey River runoff during 1929-2012 occurred during these seven years.

Figure 3-11: Annual Runoff - San Luis Rey River at Oceanside



Coastal Waters

Each of the Region's eleven watersheds features coastal water resources that support wildlife habitat, endangered species, and recreational uses (see Appendix 3-A for a list of the designated beneficial uses of Region coastal waters).

The Region's coastal water resources represent a unique resource, and the Region features more coastal lagoons than any comparably-sized area in California. Eight of the Region's watersheds discharge to the following estuaries or brackish coastal lagoons:

- San Mateo Lagoon, San Onofre Lagoon, and Las Flores Lagoon (San Juan Watershed),
- Santa Margarita River Estuary (Santa Margarita River Watershed),
- San Luis Rey River Estuary (San Luis Rey River Watershed),
- Loma Alta Slough, Batiquitos Lagoon, Buena Vista Lagoon, Agua Hedionda Lagoon, and San Elijo Lagoon (Carlsbad Watershed),
- San Dieguito Lagoon (San Dieguito River Watershed),
- Los Peñasquitos Lagoon (Peñasquitos Watershed),
- San Diego River Estuary (San Diego River Watershed), and
- Tijuana River Estuary (Tijuana River Watershed).

A portion of the Peñasquitos Watershed (Rose and Tecolote Creeks) discharges to Mission Bay, a widely used regional recreational asset. Three watersheds (Sweetwater, Otay, and a portion of the Pueblo) discharge to San Diego Bay, an important regional commercial and recreational asset. Additionally, some of these watersheds include transitional wetlands at their outlets, and many of these wetlands are part of local, regional, or national refuges and wildlife areas.

State Board Resolution No. 74-28 requires Regional Water Quality Control Boards to designate coastal waters as Areas of Special Biological Significance (ASBS) if the waters contain "biological communities of such extraordinary, even though unquantifiable, value that no acceptable risk of change in their environment as a result of man's activities can be entertained."

The Basin Plan designates two ASBS within the Region, both of which are coastal waters of the Peñasquitos Watershed:

- La Jolla Ecological Reserve Area, and
- San Diego Marine Life Refuge Area.

Numerous recreational beaches, recreational areas and ecologic reserves (see *Sections 3-8* and *3-9*) exist within the Region's eleven watersheds.

3.5.4 Wastewater

The Region produces approximately 200 million gallons per day (mgd) of wastewater, which is treated at one of 32 wastewater treatment or water reclamation facilities. Wastewater is typically treated to secondary standards prior to ocean discharge, or to tertiary levels if intended for distribution for non-potable use. The processes through which wastewater is treated to higher levels and reused are discussed further in *Section 3.5.5*. Table 3-20 shows the permitted treatment capacity of wastewater and recycled water facilities in the Region.

Table 3-20: Wastewater and Recycled Water Treatment Facilities

HU[1]	Watershed	Agency	Name of Treatment Facility	Permitted Secondary Treatment Capacity (mgd)	Permitted Tertiary Treatment Capacity (mgd)	Recycled Water Use in 2015[2] (acre-feet)
902	Santa Margarita	Camp Pendleton	Northern Regional TTP		2.4[44]	450
		Camp Pendleton	STP 9	0.7[4]		
		Camp Pendleton	STP 11	3.15[5]		148[42]
		Camp Pendleton	STP 12	0.35[6]		148[42]
		Rainbow Municipal Water District	Oak Crest Mobile Estates	0.012[7]		
		California Department of Forestry and Fire Protection (CalFire)	Rainbow Conservation Camp	0.0125[8]		
903	San Luis Rey	Camp Pendleton	Southern Regional TTP		3.6[3]	450
		City of Oceanside	San Luis Rey	13.5[9]	0.7[9]	130
		Fallbrook Public Utility District	Plant No. 1		2.7[10]	600
		Valley Center Municipal Water District	Woods Valley Ranch		0.275[11]	47
		Valley Center Municipal Water District	Lower Moosa Canyon	1[12]		
		Skyline Ranch Country Club, LLC	Skyline Ranch	0.055[13]		
		Pauma Valley Community Service District	Pauma Valley	0.15[14]		
904	Carlsbad	Buena Sanitation District/City of Vista	Shadowridge[8]		1.16[15]	0[15]
		Carlsbad Municipal Water District	Carlsbad		7.0[16]	1,903
		Leucadia Wastewater District	Gafner		1.0[17]	247
		Vallecitos Water District	Meadowlark		5.0[18]	2,358
		City of Escondido	Hale Avenue		6.4[19]	3,900
		County of San Diego/Rincon Del Diablo Municipal Water District	Harmony Grove		0.54[43]	
		San Elijo Joint Powers Authority	San Elijo	5.25[20]	2.48[20]	1,470
		City of Oceanside	La Salina	5.5[21]		
		Encina Wastewater Authority	Encina	40.5[22]		
905	San Dieguito River	Olivenhain Municipal Water District	4-S Ranch		2.0[23]	915
		Ramona Municipal Water District	Santa Maria	1.0[24]	0.35[24]	230
		Rancho Santa Fe Community Services District	Santa Fe Valley		0.485[25]	140
		Rancho Santa Fe Community Services District	Rancho Santa Fe	0.45[26]		

HU[1]	Watershed	Agency	Name of Treatment Facility	Permitted Secondary Treatment Capacity (mgd)	Permitted Tertiary Treatment Capacity (mgd)	Recycled Water Use in 2015[2] (acre-feet)
		Whispering Palms Community Services District	Whispering Palms	0.2[27]		
		Fairbanks Community Services District	Fairbanks Ranch	0.275[28]		
		County of San Diego	San Pasqual Academy	0.05[29]		
906	Peñasquitos	City of San Diego	North City		32.0[30]	8,045
		City of San Diego	Metropolitan Biosolids Center	N/A[31]		
907	San Diego River	Padre Dam Municipal Water District	Ray Stoyer		2.0[32]	2,016
		Ramona Municipal Water District	San Vicente		0.75[33]	480
		County of San Diego	W.S. Heise Park	0.018[34]		
		County of San Diego	Julian	0.04[35]		
908	Pueblo	City of San Diego	Point Loma	240[36]		
910	Otay River[19]	Otay Water District	R.W. Chapman		1.3[37]	1,100
911	Tijuana River	City of San Diego	South Bay	15[39]	15.0[39]	4,466
		International Boundary and Water Commission	South Bay International	25[40]		
		County of San Diego	Pine Valley	0.04[41]		

1 Numerical watershed (hydrologic unit) and hydrologic area designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
2 Recycled water use for year 2015 as reported by member agencies in *2015 Urban Water Management Plan* (Water Authority, 2016a). Reporting criteria for recycled water use may vary on an agency-by-agency basis.
3 Permitted tertiary treatment capacity per San Diego Water Board Order No. R9-2013-0112.
4 San Diego Water Board Order No. 98-04
5 San Diego Water Board Order No. 97-13
6 San Diego Water Board Order No. 98-05
7 San Diego Water Board Order No. 93-69
8 San Diego Water Board Order No. R9-2009-0009
9 The San Luis Rey facility is permitted to discharge 13.5 mgd secondary effluent, or up to 15.4 mgd with written approval from the San Diego Water Board in accordance with its discharge permit. San Diego Water Board Order No. R9-2011-0016 as amended by R9-2012-0042.
10 San Diego Water Board Order No. R9-2012-0004.
11 San Diego Water Board Order No. R9-2015-0104. The listed recycled water use for 2010 does not include 336 acre-feet of secondary effluent from the Lower Moosa Canyon Water Reclamation Facility that is discharged to percolation ponds.
12 San Diego Water Board Order No. 95-32, as amended
13 San Diego Water Board Order No. R9-2005-0258
14 San Diego Water Board Order No. R9-2006-0049
15 San Diego Water Board Order No. 93-82 and Addenda Nos. 1 and 2. Facility is currently not in operation. Due to high production costs, the City of Vista suspended operations of the facility in 2003. A feasibility study was completed in 2009 to evaluate the feasibility upgrading the facility.
16 San Diego Water Board Order No. R9-2016-0183.
17 San Diego Water Board Order No. R9-2004-0223.
18 San Diego Water Board Order No. R9-2007-0018. Recycled water from the Meadowlark Water Reclamation Facility is purveyed by Carlsbad Municipal Water District and Olivenhain Municipal Water District.
19 San Diego Water Board Order No. R9-2015-0026. Recycled water from the Hale Avenue facility is purveyed by the City of Escondido and Rincon Del Diablo Municipal Water.
20 San Diego Water Board Order No. R9-2010-0087. Recycled water from the San Elijo facility is purveyed by the Santa Fe Irrigation District, San Dieguito Water District, and City of Del Mar.
21 San Diego Water Board Order No. R9-2011-0016 as amended by R9-2012-0042
22 The Encina Wastewater Pollution Control Facility is permitted to produce secondary water (up to 40.5 mgd), but sells up to 5 mgd of this to Carlsbad WRF (4 mgd) and Gaftner WRF (1 mgd) for tertiary treatment. San Diego Water Board Order No. R9-2011-0019
23 San Diego Water Board Order No. R9-2003-0007.
24 San Diego Water Board Order No. R9-2016-0154.

HU[1]	Watershed	Agency	Name of Treatment Facility	Permitted Secondary Treatment Capacity (mgd)	Permitted Tertiary Treatment Capacity (mgd)	Recycled Water Use in 2015[2] (acre-feet)

25 San Diego Water Board Order No. R9-2002-0013.
26 Rancho Santa Fe Community Services District (http://www.rsfcsd.com/aboutus.html), Accessed August 29, 2013.
27 San Diego Water Board Order No. 94-80
28 San Diego Water Board Order No. 93-05, as amended
29 San Diego Water Board Order R9-2009-0072
30 San Diego Water Board Order No. R9-2015-0091. Recycled water use per City of San Diego 2015 UWMP. Recycled water from the North City Water Reclamation Plant is purveyed by Olivenhain Municipal Water District, the City of Poway and City of San Diego.
31 The Metro Biosolids Center is a solids handling facility, dewatering sludge produced by North San Diego and Point Loma wastewater treatment facilities. As such, it does not have a permitted capacity.
32 San Diego Water Board Order No. 97-49 (recycled water irrigation) and Order No. R9-2016-0099, NPDES CA0107492 (lake replenishment). Recycled water is for replenishing Santee Lakes.
33 San Diego Water Board Order No. R9-2009-0005.
34 San Diego Water Board Order No. 93-09
35 San Diego Water Board Order No. 83-09, as appended
36 Point Loma is permitted to treat to Advanced Primary rather than Secondary. San Diego Water Board Order No. R9-2017-0007
37 Plant is located in Sweetwater Watershed, but recycled water use is in Otay Watershed. San Diego Water Board Order No. 92-25 and Addendum No. 1.
38 San Diego Water Board Order No. 93-112. However, this permit was rescinded in 2010.
39 Plant can discharge a total of up to 15 mgd, either secondary, tertiary, or some combination of the two. San Diego Water Board Order No. R9-2017-0023; San Diego Water Board Order No. 2000-203 and Addenda Nos. 1 and 2. Recycled water use per City of San Diego 2010 UWMP.
40 San Diego Water Board Order No. R9-2017-0024.
41 San Diego Water Board Order No. 94-161
42 Camp Pendleton reported the use of 148 AFY of secondary recycled water for percolation/seawater intrusion barrier in 2015. However, STP #11 and STP #12 have been replaced by the Southern Regional TTP.
43 San Diego Water Board Order No. R9-2012-0054.
44 San Diego Water Board Order No. R9-2014-0006.

Wastewater in the Region may undergo four levels of treatment. Primary treatment removes heavy solids through settling by gravity. Advanced primary treatment further removes solids using chemicals that cause clumping of smaller solids to allow solids to settle out of water for removal. Secondary treatment uses primary-treated water, and subjects it to biological treatment, wherein microbes are used to break down biological substances. Tertiary treatment filters secondary effluent through a medium such as cloth or sand/disinfection to reduce total dissolved solids (TDS) and other water quality impairments. Multiple agencies across the Region are in the process of constructing advanced water treatment (AWT) facilities to supplement existing recycled water supplies, including the Cities of San Diego's and Oceanside's Pure Water programs and Padre Dam Municipal Water District's Advanced Water Purification Program, discussed further in *Section 3.5.5 Water Reuse*.

The Region treats approximately 100 mgd of wastewater to primary standards, 100 mgd to secondary standards, and anticipates treating 70 mgd to tertiary standards by 2020. Planned projects would increase the Region's secondary and tertiary capacities to 270 mgd, and 230 mgd, respectively, by 2045 (Water Authority, 2016a). Water that is not treated to tertiary levels and reused as recycled water is discharged through one of the Region's five deep-water ocean outfalls, summarized in Table 3-21 and shown in Figure 3-12. As shown, there are four primary sewersheds within the Region – a sewershed is the area of land from which wastewater is collected and conveyed to a treatment facility. These sewersheds are:

1) the area that conveys wastewater to the Oceanside Ocean Outfall,
2) the area that conveys wastewater to the Encina Ocean Outfall,
3) the area that conveys wastewater to the San Elijo Ocean Outfall, and

4) the area that conveys wastewater from the Metropolitan (Metro) Wastewater System, including the Point Loma Ocean Outfall and the South Bay Ocean Outfall.

Please note that the Metro Wastewater sewershed (indicated in blue on Figure 3-12) conveys wastewater to both the Point Loma Ocean Outfall and the South Bay Ocean Outfall; however, the source of wastewater that is conveyed to each facility varies on a day-to-day basis depending on wastewater flow availability and various operational parameters.

In addition to providing means for wastewater and recycled water disposal, the outfalls can also be used as a salinity management asset. Four of the regional municipal wastewater outfalls are currently being used for disposal of saline or brackish water, including:

- Oceanside Ocean Outfall is used for disposal of demineralization brine from the City of Oceanside's groundwater desalter and demineralization brine from a local industry, as well as brine from Camp Pendleton's advanced water treatment RO system,
- Encina Ocean Outfall is used for the disposal of demineralization brine from the City of Carlsbad Water Reclamation Facility when demineralization facilities are operational,
- San Elijo Ocean Outfall is used for disposal of brackish cooling tower water from the Palomar Energy Plant in Escondido via the City of Escondido Industrial Brine Collection System, and demineralization brine from the San Elijo Joint Powers Authority Water Reclamation Facility, and
- Point Loma Ocean Outfall is used for disposal of demineralization brine from the City's North City Water Reclamation Plant.

Table 3-21: Municipal Wastewater Ocean Outfalls[1]

HU[2]	Name	Outfall	Operating Agency	Discharge Distance Offshore (ft)	Permitted Discharge Flow (mgd)	Agencies Served
903	San Luis Rey River	Oceanside	City of Oceanside	8,050	22.9[3]	City of Oceanside
					3.6[4]	USMC Base Camp Pendleton
					2.4[5]	Fallbrook Public Utility District
904	Carlsbad	Encina	Encina Wastewater Authority	7,800	43.3[6]	Encina Wastewater Authority[7]
		San Elijo	San Elijo Joint Powers Authority[8]	8,000	18.0[9]	City of Escondido
					5.25[10]	San Elijo JPA[11]
908	Pueblo	Point Loma	City of San Diego	23,470	240[12]	San Diego Metropolitan Sewerage System[13]
911	Tijuana River	South Bay	City of San Diego[16]	23,600	15[14]	San Diego Metropolitan Sewerage System [13,15]
					25[17]	U.S. Boundary and Water Commission[17]

1 Compiled from adopted recycled water discharge permits adopted by the San Diego Water Board. See footnotes below.
2 Numerical watershed (hydrologic unit) and hydrologic area designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
3 City of Oceanside per San Diego Water Board Order No. R9-2009-0016, NPDES CA0107433. The permitted discharge is the combined discharge from the San Luis Rey Water Reclamation Facility, La Salina Wastewater Treatment Plant and waster brine from the Mission Bay Desalting Facility.
4 U.S. Marine Corps Base Camp Pendleton per San Diego Water Board Order No. R9-2012-0041 and Addendum No. 1, NPDES CA0109347.
5 Fallbrook Public Utility District per San Diego Water Board Order No. R9-2012-0004, NPDES CA0108031.
6 Encina Wastewater Authority per San Diego Water Board Order No. R9-2011-0019, NPDES CA0107395. The permitted discharge is the combined discharge from the Encina Water Pollution Control Facility, Meadowlark Water Reclamation Plan, Shadowridge

Water Reclamation Plant and Carlsbad Water Reclamation Facility

7 Encina Wastewater Authority member agencies include Buena Sanitation District, City of Carlsbad, City of Encinitas, Leucadia County Water District, Vallecitos Water District, and City of Vista.

8 The San Elijo Ocean Outfall is jointly owned by the City of Escondido and San Elijo Joint Powers Authority.

9 City of Escondido per San Diego Water Board Order No. R9-2010-0086, NPDES CA0107981.

10 San Elijo Joint Powers Authority per San Diego Water Board Order No. R9-2010-0087, NPDES CA0107999.

11 San Elijo Joint Powers Authority member agencies include the City of Solana Beach and City of Encinitas.

12 Point Loma Ocean Outfall per San Diego Water Board Order No. R9-2009-0001, NPDES CA0107409.

13 The City of San Diego serves as operating agency for the San Diego Metropolitan Wastewater System (Metro System). The Metro System serves the following agencies: City of Coronado, City of Chula Vista, City of Del Mar, City of El Cajon, City of Imperial Beach, City of La Mesa, City of National City, City of Poway, City of San Diego, Lemon Grove Sanitation District, Padre Dam Municipal Water District, Otay Water District, Lakeside/Alpine Sanitation District, Spring Valley Sanitation District, East Otay Sewer Maintenance District and Winter Gardens Sewer Maintenance District.

14 South Bay Ocean Outfall per San Diego Water Board Order No. R9-2013-0006, NPDES CA0109045.

15 Metro System member agencies tributary to the South Bay Ocean Outfall include the City of San Diego, City of Imperial Beach, and City of Chula Vista.

16 South Bay Ocean Outfall is jointly owned by the City of San Diego and the U.S. Government (International Boundary and Water Commission).

17 IBWC South Bay International Treatment Plant that treats up to 25 mgd of wastewater from Tijuana, Mexico. The IBWC discharge to the South Bay Ocean Outfall is regulated by San Diego Water Board Order No. 95-50 (NPDES CA0108928) and Cease & Desist Order No. 96-52.

For communities or individuals who are not served by a wastewater agency or sanitary district, wastewater is disposed of and treated through on-site septic systems. Septic systems can be effective wastewater treatment systems when properly sized, sited, and maintained and are more likely to be found in rural areas, though can be found occasionally in urbanized areas that were formerly rural and did not convert to sewer. When improperly sized, sited, or maintained, septic systems can fail, and pose public health risks including surfacing of wastewater and impacts to groundwater quality.

3.5.5 Water Reuse

> *Since its inception, the IRWM Program has provided over $33 million to a variety of water reuse projects. In total, approximately 40% of San Diego's IRWM implementation grant funding has been awarded to water reuse projects.*

Beneficial reuse of wastewater is an important component of the Region's local water resources, both now and in the future. Water reuse includes non-potable reuse and potable reuse – in both cases secondary treated wastewater receives additional treatment to match its quality to the intended use. Non-potable reuse involves production of tertiary-treated recycled water in accordance with Title 22 of the California Code of Regulations. Non-potable recycled water, discussed in detail below, is used today throughout the Region for irrigation, toilet flushing, and industry. Potable reuse involves advanced treatment of tertiary-quality recycled water to create purified water, which is similar in quality to distilled water, and as its name suggests, can be added to drinking water supplies. Although potable reuse is not currently part of the Region's water supply, it is being actively pursued in the Region, with potable reuse projects anticipated to begin deliveries by 2020 (Water Authority, 2016).

Water reuse can increase water supply reliability by increasing the availability of local supplies and reducing the need to import water from outside the Region. The benefits of water reuse can include cost savings, energy savings, reduced wastewater discharges, avoidance of the need for peak surface water treatment capacity, improved water quality, and reduced fertilizer application needs when used for irrigation.

Non-Potable Reuse

During 2015, Water Authority member agencies reported the reuse of approximately 29,000 AF of non-potable recycled water. The use of non-potable recycled water within the Region is projected to increase to approximately 47,000 AFY by 2040 (Water Authority, 2016a).

Recycled water is primarily used to irrigate commercial landscaping, parks, campgrounds, golf courses, freeway medians, greenbelts, athletic fields, crops, orchards, and nursery stock. Recycled water is also used to augment supplies in recreational or ornamental lakes or ponds, control dust at construction sites, recharge groundwater basins, fire suppression, and for industrial cooling water. Because tertiary treated recycled water is higher in nutrients than potable water, this water source can also reduce the amount (and therefore the costs) of fertilizer application.

Since current recycled water is predominantly used for irrigation, recycled water demands vary substantially throughout the year, increasing in the dry summer months and decreasing in the wet winter months. A key and necessary component of water recycling is providing means of disposal or storage of excess recycled water supplies during periods of reduced demand. Local agencies may utilize either storage or regional ocean outfall facilities to handle excess recycled water or wastewater flows during periods of wet weather or limited demand. An exception to this is Padre Dam MWD, which has a permit to discharge recycled water to the Santee Lakes, which overflows to the San Diego River.

Figure 3-12 presents the location of all wastewater and recycled water infrastructure within the Region. Table 3-20 summarizes the Region's existing wastewater and water recycling facilities and indicates which of the Region's water reclamation plants are capable of treating water to tertiary standards for non-potable reuse.

Since non-potable reuse doesn't require the pumping associated with water from the SWP or the Colorado River, it typically has lower energy needs and greenhouse gas emissions compared to imported potable water. In addition, recycled water supplies are less sensitive to temporal and seasonal variability, as well as external forces, as compared to imported water, supporting the Region's local water supply reliability goals.

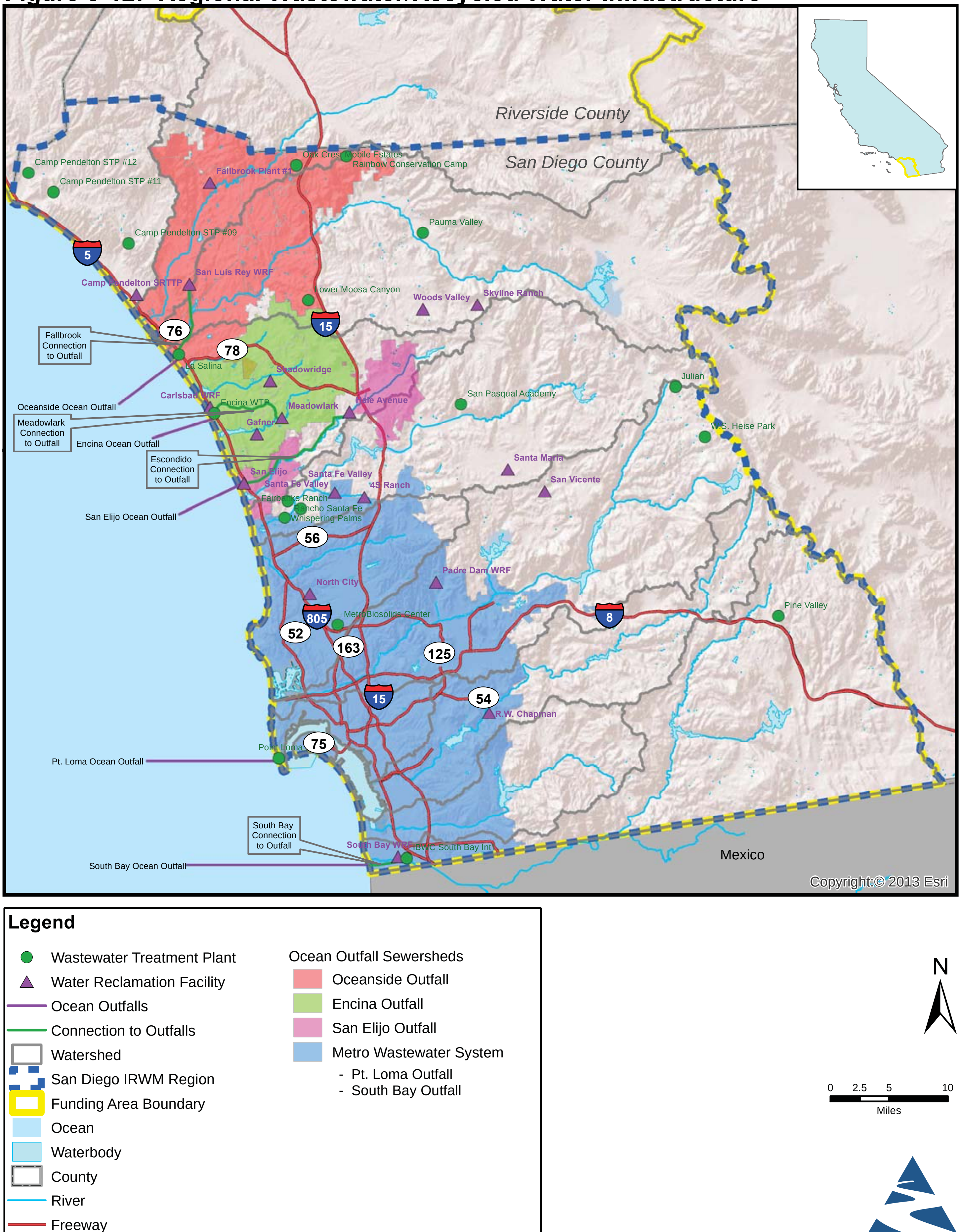
Despite the cost and energy savings associated with non-potable reuse, it also requires additional work by the local water agency, thus additional cost, for regulatory compliance. Because tertiary treated recycled water is a non-potable resource, it must be segregated from potable water and delivered through a separate distribution system. While such facilities may exist for potable water, separate infrastructure must be constructed and operated for recycled water, and there must be infrastructure and agency programs to ensure that the non-potable recycled water does not mix with potable water. This recycled water distribution system is commonly referred to as the "purple pipe" system. The purple pipe system includes not only pipelines, but also all other water conveyance infrastructure such as pumps, valves, and storage tanks. Additionally, higher levels of TDS in recycled water compared to potable water can lead to accelerated corrosion, requiring more frequent infrastructure replacement than in potable systems or use of demineralization facilities to reduce salinity, which adds cost to system operations.

The IRWM Program has been supportive of expanding non-potable reuse in the Region by funding treatment plant improvements, distribution system expansions, inter-connections, use site retrofits, and outreach to educate customers on the benefits of non-potable reuse.

Recycled water is used primarily for irrigation.

Photo credit: City of San Diego

Figure 3-12: Regional Wastewater/Recycled Water Infrastructure



Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
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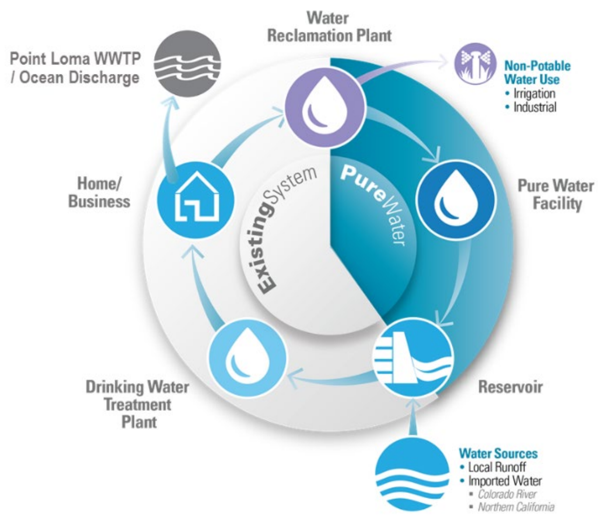
Potable Reuse

Although non-potable reuse is widespread in the Region, non-potable reuse alone does not achieve the full potential for beneficial reuse of wastewater. Potable reuse involves advanced treatment of tertiary-quality recycled water to produce purified water, which would be similar in quality to distilled water (City of San Diego, 2013a). The purified water would then become part of the raw water supply, treated again at a drinking water treatment plant, and distributed through the existing potable water system. The health and safety of the drinking water is ensured by having multiple treatment barriers between recycled water and drinking water. The State Board is responsible for regulating potable reuse projects through its Division of Drinking Water (DDW), which regulates drinking water supplies, and its nine Regional Water Quality Control Boards, which regulate surface water and groundwater discharges. Potable reuse may either be indirect or direct; each will be subject to different regulations. Indirect potable reuse (IPR) involves discharging advanced treated water into an environmental buffer, such as a large reservoir or groundwater basin, where it must have a minimum of a six-month residence time before extraction for treatment at a drinking water treatment plan.

Direct potable reuse (DPR) eliminates the environmental buffer requirement, though advanced treated water is still incorporated into the raw water supply and treated again at a drinking water treatment plant. Draft regulations for DPR are still in development by DDW[1], and such systems cannot yet be permitted. Several local agencies are actively pursuing potable reuse.

Six of the Region's water supply agencies are currently completing studies and pilot programs pertaining to potable reuse via groundwater recharge or reservoir augmentation:



City of San Diego's Pure Water Project

1. The **City of San Diego** has been exploring potable reuse for over a decade as a way to supplement local supplies and offload wastewater flows to the Point Loma WWTP, whose location makes it challenging to expand as the region grows. Pure Water San Diego is the City of San Diego's phased, multi-year program to use proven water purification technology to clean recycled water to produce purified water that meets state and federal drinking water standards. The project's long-term goal is to produce 83 mgd (93,013 AFY), or one-third of San Diego's future drinking water supply, by 2035. Phase 1 of the Pure Water Program will produce 30 mgd starting in 2021 and utilize surface water augmentation, with Miramar Reservoir serving as the environmental buffer. While originally conceived to utilize San Vicente Reservoir, Miramar Reservoir provides cost saving by reducing conveyance pipelines

[1] See State Board DDW's website on potable reuse regulations: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RW_SWA_DPRexpertpanel.html

from 28 miles to 8 miles, has fewer environmental impacts, and can use renewable energy to satisfy pumping demands (City of San Diego, 2017).

2. The **City of Oceanside** completed the investigative phase of their Pure Water Oceanside, which involves recharging of the Mission Groundwater Basin using water advanced treated at the San Luis Rey Water Reclamation Facility (SLRWRF). The project will be implemented in two phases, with a final capacity of 4.5 mgd, which will provide an ultimate yield of 3,300 AFY of groundwater recharge. This project will be operational in 2020.
3. **Padre Dam MWD** received IRWM funding under Proposition 84 Round 4 Implementation Grant for their East County Advanced Water Purification Program (East County AWP). The project will expand the Ray Stoyer WRF by 4 mgd to deliver recycled water for irrigation and to deliver tertiary effluent to the Advanced Water Purification Facility, allowing for potable reuse. This project is the first step in the East County AWP, which is projected to begin delivering 3,920 AFY potable reuse supplies in 2020, with an ultimate goal of delivering 11,536 AFY potable reuse by 2025. Padre Dam MWD is also considering later expansion by an additional 5,824 AFY, though this third phase is still conceptual only (Water Authority, 2016a).
4. **Rincon Del Diablo MWD** is exploring potable reuse opportunities, with a goal of 1,000 AFY potable reuse by 2030 (Water Authority, 2016a). After exploring potable reuse using a groundwater basin as the environmental buffer, Rincon Del Diablo MWD found that option to be infeasible, and is currently considering partnering with the City of Escondido for possible surface water augmentation or even direct potable reuse via a scalping plant from the Hale Avenue Resource Recovery Facility's (HARRF's) outfall once the State issues final guidance for DPR and Rincon Del Diablo MWD is approved as a sewer agency by the San Diego Local Agency Formation Commission (LAFCO) (Rincon Del Diablo, 2016)
5. The **City of Escondido** is considering implementing potable reuse at HAARF, though it's still in the conceptual phase. Should the City move forward with this project, it anticipates ultimate delivery of 5,000 AFY potable reuse water.
6. **Olivenhain MWD** is also considering potable reuse, with a goal of 560 AFY potable reuse through groundwater recharge with advanced treated wastewater from San Elijo JPA (Water Authority, 2016a).

Potable reuse can provide multiple water management benefits to the Region. It would further diversify the Region's water supplies and achieve environmental objectives by reducing wastewater discharges to the ocean. Investing in potable reuse would be a more efficient investment than solely focusing on upgrades to wastewater systems because it helps toward two goals – water supply and wastewater management (refer to the comment letter from the Metro JPA Technical Advisory Committee in Appendix 6-D). Savings from offloading wastewater systems could reduce water supply costs to consumers by $1000 per AF (City of San Diego, 2013a). Potable reuse would also reduce the cost of higher salinity to utilities and consumers through water quality improvements associated with advanced water treatment. Because purified water has TDS levels much lower than the existing imported water (about 15 mg/L compared to 500 mg/L), blending of the two supplies will reduce overall salinity. Operations and maintenance costs associated with corrosion would be substantially reduced in the potable water system for consumers. The savings from reduced TDS has been estimated at $100 per AF (City of San Diego, 2012). Additionally, potable reuse allows the same drop of water to be reused multiple times, versus non-potable reuse, because it reenters the wastewater treatment stream after use, whereas non-potable reuse is discharged to the environment and has limited opportunities for capture and reuse.

The IRWM Program has funded several projects to conduct important research that will advance the opportunities to reuse our water. This will lead to the opportunity to further integrate the Region's water supply and wastewater management efforts and achieve multiple benefits.

The City of San Diego is Testing the Feasibility of Potable Reuse at its Advanced Water Purification Demonstration Facility

Photo credit: Goldy Herbon, City of San Diego

The City of San Diego has been studying potable reuse using reservoir augmentation since the 1990s, recently with the Water Purification Demonstration Project. The Water Purification Demonstration Project, which began in 2007 and was completed in 2012, consisted of installation and operation of a 1 mgd demonstration-scale Advanced Water Purification Facility, studies of San Vicente Reservoir, education and outreach, and assessments of regulations, energy use, and costs; all with oversight by an Independent Advisory Committee. The results of the Water Purification Demonstration Project allowed CDPH to issue a letter of conceptual regulatory approval for the City's proposed 15 mgd potable reuse project using San Vicente Reservoir. Similarly, in a 2012 resolution the San Diego Water Board expressed support of the City's proposed potable reuse projects, and in 2013 the San Diego Water Board issued a letter validating the proposed regulatory pathway for a project at San Vicente Reservoir (City of San Diego, 2013a).

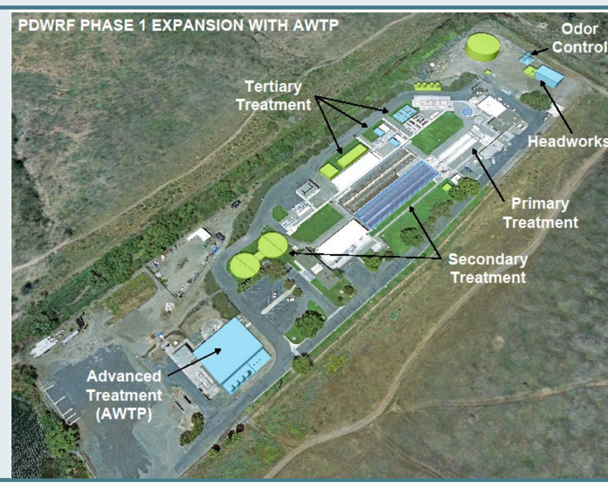
The City of San Diego's proposals to augment drinking water supplies through potable reuse has support of residents: in a 2012 poll of City residents, 73% of respondents strongly favored or somewhat favored using advanced treated recycled water as an addition to the Region's drinking water supply (City of San Diego, 2013a).

The City of San Diego is also investigating options for Direct Potable Reuse (DPR). The City has teamed with the WateReuse Foundation to conduct additional research at the Advanced Water Purification Facility to test treatment and monitory technologies. The City's Advanced Water Purification Facility is ideal for this research because it uses full-scale components, and the water produced can be returned to the purple pipe system. DPR is an emerging concept – there is currently no regulatory framework for DPR projects in California. The results of these on-going projects will support establishing regulatory guidelines for DPR. Continuing tours and education at the facility will further public understanding of the health and safety aspects of potable reuse.

The City's potable reuse initiatives are supported by grant funding from the San Diego IRWM Program.

Padre Dam Municipal Water District, Padre Dam Advanced Water Treatment – Phase IA Expansion

Padre Dam Municipal Water District will expand the Ray Stoyer Water Reclamation Facility by 4 mgd to deliver recycled water for irrigation, and to deliver tertiary effluent to the Advanced Water Purification Facility, to allow for future potable reuse. This project helps to move Padre Dam MWD and Helix Water District towards potable reuse, supporting the Region's goal of supply reliability and sustainability.



3.5.6 Groundwater Resources

The San Diego IRWM Region contains 22 separate groundwater basins, as defined by the California Department of Water Resources (DWR) Bulletin 118 (DWR, 2003 and 2016). These groundwater basins are:

- San Mateo Valley
- San Onofre Valley
- Santa Margarita Valley
- San Luis Rey Valley
- Warner Valley
- Escondido Valley
- San Pasqual Valley
- Santa Maria Valley
- San Dieguito Creek
- Poway Valley
- Mission Valley
- San Diego River Valley
- El Cajon Valley
- San Diego Formation
- Batiquitos Lagoon Valley
- San Elijo Valley
- Pamo Valley
- Ranchita Town Area
- Cottonwood Valley
- Campo Valley
- Potrero Valley
- San Marcos Area

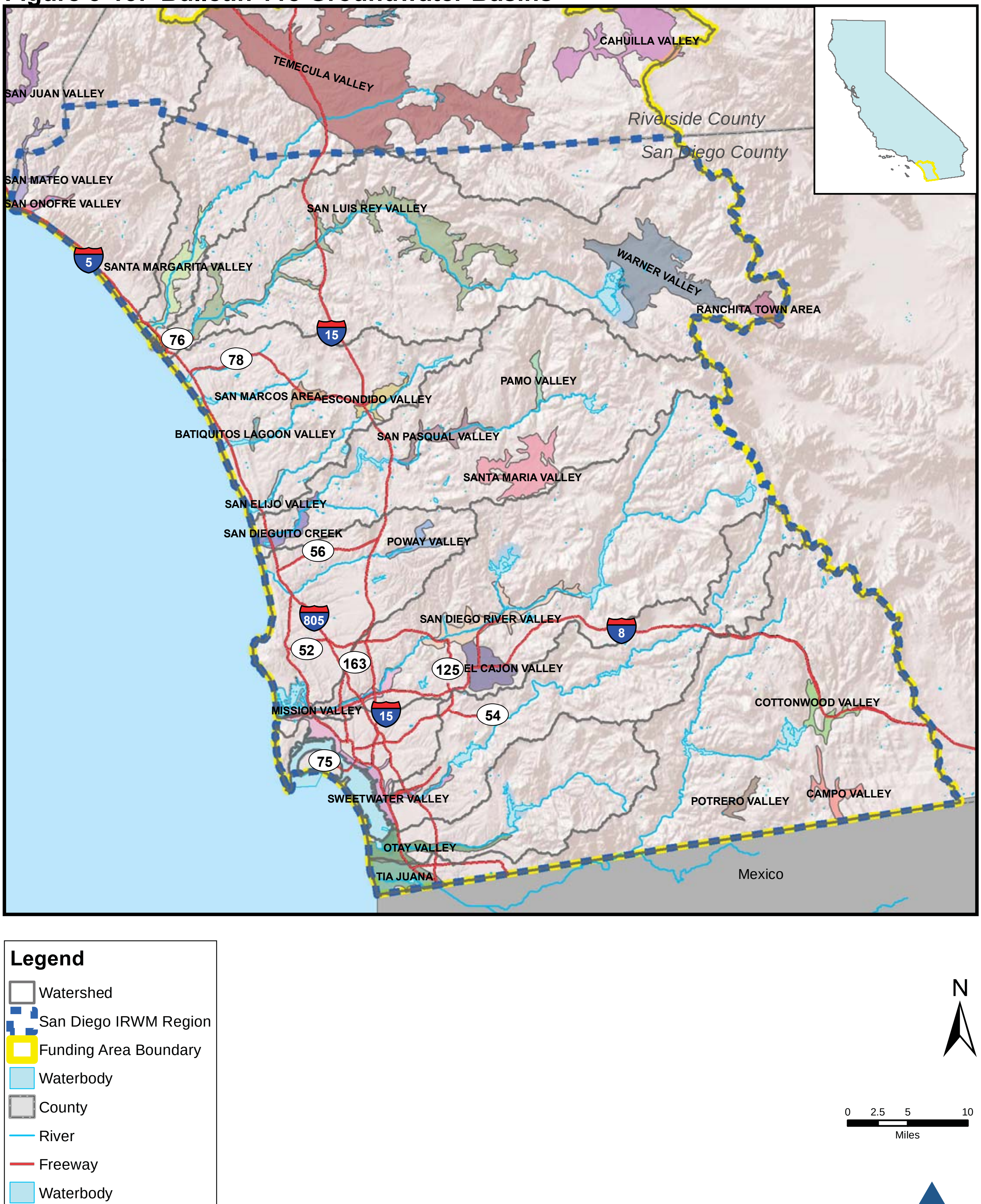
Although this IRWM Plan uses the groundwater basins defined by Bulletin 118, other local or regional plans may define basins slightly differently. For example, the *Salinity and Nutrient Management Planning Guidelines*, produced by the Water Authority and the Southern California Salinity Coalition, defines the San Luis Rey Valley groundwater basin as five basins: Oceanside/Mission, Bonsall, Moosa, Pala, and Pauma. Some basins that are recognized by a management agency may not be recognized in Bulletin 118, such as the Middle Sweetwater aquifer. The San Diego Water Board has begun to use the basins as named and defined in the *Salinity and Nutrient Management Planning Guidelines* when referring to Salt and Nutrient Management Plans in the Region.

For the most part, groundwater within the Region occurs in alluvial aquifers, residuum (crystalline bedrock that has weathered in place), aquifers comprised of semi-consolidated or consolidated sediments, and fractured crystalline rock. Other water-bearing formations in the Region include the Poway Group, San Mateo Formation, La Jolla Group, Santiago Peak Volcanics and Otay Formation. Figure 3-13 presents the locations of groundwater basins (as defined in Bulletin 118) in the Region. Groundwater yields from fractured rock and residuum can be sufficient to provide water supply for individual homes, but these aquifer types are typically not sufficiently productive to warrant supply development by water supply agencies (Water Authority, 1997). Table 3-22 summarizes characteristics of key groundwater aquifers within the Region.

Aside from the Warner, San Luis Rey Valley, and Sweetwater Valley Basins, none of the Region's alluvial aquifers exceed a storage capacity of 100,000 AF. A total of ten alluvial aquifers, however, are estimated to exceed a 50,000 AF capacity. Aquifers comprised of alluvial deposits (alluvium) provide much of the current groundwater production capacity within the region. Yields from the Region's larger aquifers are typically on the order of several thousand acre-feet per year (Water Authority, 1997; DWR, 2003).

Sources of groundwater recharge in the Region include creeks, precipitation, discharges from treatment plants, underflow from dams, and return flow. The imported water that is applied to the land as irrigation water (for agriculture and domestic irrigation) contributes to the groundwater supply in the form of return flows and may also be a resource for agencies that have usable aquifers.

Figure 3-13: Bulletin 118 Groundwater Basins



Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-11_GW Basins 060713.mxd

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Table 3-22: Summary of the Region's Principal Groundwater Aquifers[1]

Groundwater Basin	Basin Number	Water-Bearing Formations	Surface Area (sq. miles)	Estimated Storage Capacity (AF)	Estimated Potential Yield[2,4] (AFY)	Aquifer Depth (Feet)	
						Maximum	Average
San Mateo Valley	9-2	Alluvium, San Mateo	4.7[4]	14,000[4]	3,180[3]	100[4]	60[4]
San Onofre Valley	9-3	Alluvium, San Mateo	2.0[4]	6,500[4]	1,420[3]	55[4]	25[4]
Santa Margarita Valley	9-4	Alluvium, Residuum, Fractured Rock	12.4[4]	61,600[4]	5,400 to 16,700[6]	200[4]	175[4]
San Luis Rey Valley[5]	9-7	Alluvium, La Jolla	46.0[4,5]	240,000[4,5]	22,400 to 23,400[5,6,7]	1,650[4,8]	200[4,9]
Warner Valley	9-8	Alluvium, Residuum	37.5[4]	550,000[4]	12,000[6]	900[4,10]	900[4,10]
Escondido Valley	9-9	Alluvium, Residuum, Fractured Rock	4.5[4]	24,000[4]	NA[11]	NA[11]	NA[11]
San Pasqual Valley	9-10	Alluvium, Residuum	7.1[4]	63,000[4]	5,800[6]	200[4]	120[4]
Santa Maria Valley	9-11	Alluvium, Residuum	19.2[4]	77,000[4]	>2,500[6]	225[4]	40[4]
San Dieguito Creek	9-12	Alluvium, La Jolla, Santiago Peak Volcanics	5.6[4]	52,000[4]	<2,500[6]	180[4]	125[4]
Poway Valley	9-13	Alluvium, Residuum, Poway	3.8[4]	2,330[4]	NA	75[4]	40[4]
Mission Valley	9-14	Alluvium, San Diego	11.5[4]	42,000[4]	2,000 to 4,000[6]	200[4]	80[4]
San Diego River Valley[12]	9-15	Alluvium	15.4[4,12]	97,000[4,12]	5,000 to 8,000[6,12,13]	200[4]	70[4]
El Cajon Valley	9-16	Alluvium, Fractured Rock	11.2[4]	32,500[4]	NA[11]	350[64]	NA[11]
San Diego Formation[20]	9-33	Alluvium, San Diego, Otay	31.9[4]	270,000 to 360,000[19]	10,000[19]	2,000[4,18]	300[4,18]
Batiquitos Lagoon Valley	9-22	Alluvium, La Jolla	1.2[4]	NA[11]	NA[11]	100[4]	NA[11]
San Elijo Valley	9-23	Alluvium, La Jolla, Santiago Peak Volcanics	1.4[4]	8,500[4]	NA[11]	1,650[4]	50[4]
Pamo Valley	9-24	Alluvium, Residuum	2.3[4]	NA[11]	NA[11]	NA[11]	NA[11]
Ranchita Town Area	9-25	Alluvium, Residuum	4.9[4]	NA[11]	NA[11]	130[4]	NA[11]
Cottonwood Valley	9-27	Alluvium, Residuum	6.0[4]	NA[11]	NA[11]	100[4]	NA[11]
Campo Valley	9-28	Alluvium, Residuum	5.5[4]	63,450[4]	NA[11]	100[4]	55[4]
Potrero Valley	9-29	Alluvium, Residuum	3.2[4]	NA[11]	NA[11]	NA[11]	NA[11]
San Marcos Area	9-32	Alluvium, Residuum	3.3[4]	NA[11]	NA[11]	175[4]	NA[11]

1 Groundwater Basin names and numerical designations per California Department of Water Resources *California's Groundwater* (Bulletin 118).

2 Total existing long-term yield that could be realized on an annual basis without causing long-term overdraft. Does not consider yield restrictions that may be necessary to prevent impacts to groundwater-dependent vegetation or yield

Table 3-22: Summary of the Region's Principal Groundwater Aquifers[1]

Groundwater Basin	Basin Number	Water-Bearing Formations	Surface Area (sq. miles)	Estimated Storage Capacity (AF)	Estimated Potential Yield[2,4] (AFY)	Aquifer Depth (Feet)	
						Maximum	Average

restrictions necessary to protect or improve existing groundwater quality. In many coastal basins, the available groundwater yield may not be of a quality that meets potable or irrigation use standards.
3 Value reported by U.S. Marine Corps Base Camp Pendleton within Metropolitan Water District of Southern California *Groundwater Assessment Study*, Chapter IV, Groundwater Basin Reports (Metropolitan Water District of Southern California, 2007).
4 Value or estimate presented within California Department of Water Resources *California's Groundwater* (Bulletin 118) (DWR, 2003). Total surface area of Sweetwater Valley Basin, Otay Valley Basin, and Tijuana Basin. Average aquifer depth calculated by averaging the average aquifer depth of Sweetwater Valley Basin, Otay Valley Basin, and Tijuana Basin.
5 Includes Oceanside Mission Basin, Bonsall Basin, Moosa Basin, and Pala/Pauma Basin.
6 Value reported within Metropolitan Water District of Southern California *Groundwater Assessment Study*, Chapter IV, Groundwater Basin Reports (Metropolitan Water District of Southern California, 2007).
7 Estimated yield for Mission Basin (7,000-10,000 AFY), Bonsall Basin (5,400 AFY), and Pala/Pauma Basin (8,000 AFY).
8 Maximum depth of La Jolla Formation within the San Luis Rey Valley groundwater basin.
9 Average depth of alluvium within the San Luis Rey Valley groundwater basin.
10 Depth for Temecula Arkose formation which underlies the Warner Basin.
11 Value currently unknown, as reported within DWR Bulletin 118 (DWR, 2003).
12 Includes the Mission Valley Basin and Santee-El Monte Basin.
13 Estimated yield includes 2,000-3,000 AFY from the Mission Valley Basin and 3,000-4,000 AFY from the Santee-El Monte Basin.
14 Capacity includes capacity of underlying San Diego Formation. DWR (2003) estimates the storage capacity of alluvium within the Sweetwater Valley Groundwater basin at 17,00o to 20,000 acre-feet.
15 Estimated yield includes 2,400 AF from the lower Sweetwater River Valley alluvium, 3,000 AF from the middle Sweetwater River Valley alluvium, and 3,000-5,000 AFY from the San Diego Formation.
16 Listed thickness for the San Diego Formation within the Sweetwater River Valley.
17 Yield is for the San Diego Formation within the Lower Tijuana Basin.
18 Depth of San Diego Formation extends to 1700 feet. Maximum depth of alluvium is 150 feet.
19 San Diego Formation Basin Fact Sheet. City of San Diego (2009)
20 Sweetwater Valley Basin, Otay Valley Basin, and Tijuana Basin were consolidated into one San Diego Formation Basin (Bulletin 118 Interim Update 2016).

The Water Authority (2016) reports that existing groundwater production for municipal supply purposes exceeds 23,000 AFY within the region, and includes:

- more than 6,400 AFY of production within the Santa Margarita, Las Flores, San Mateo, and San Onofre Basins within USMC Base Camp Pendleton,
- 3,300 AFY of production by the City of Oceanside from the Mission Basin (lower San Luis Rey River Valley Basin),
- Approximately 7,000 AFY of production by mutual water company wells within the Yuima Water District boundaries in the Pauma Basin (upper San Luis Rey River Valley Basin),
- more than 700 AFY of production within the Santee Basin by the Lakeside Water District,
- 93 AFY of production within the El Monte Basin by the Helix Water District,
- approximately 500 AFY of production within the Santee/El Monte Basin by the City of San Diego, and
- 5,700 AFY of production within the San Diego Formation by Sweetwater Authority.

In 1954, the Vista Irrigation District began pumping groundwater from the Warner Valley groundwater basin to supplement raw water supplies in Lake Henshaw (VID, 2016). Although VID groundwater pumping from the Warner Valley groundwater basin varies, VID estimates that since 1960 the median annual groundwater production has been 7,728 AFY (VID, 2016). This pumping is not included within the Water Authority's estimates of groundwater use.

Significant groundwater resources have been found to exist in deeper aquifers comprised of semi-consolidated or consolidated sediments. Recent field investigations indicate that one such deep aquifer, the San Diego Formation, has significant unused water storage and groundwater production potential.

While significant understanding occurs for larger alluvial aquifers that have supported ongoing groundwater development projects, additional study and evaluation is required to better understand aquifer characteristics and water supply development potential within the Region's deeper and less utilized aquifers. To address this need, the USGS, in partnership with local water agencies, has initiated a comprehensive geologic and hydrologic study of the Region's aquifers. Key objectives of the San Diego Hydrology Project include:

1. Develop an integrated, comprehensive understanding of the geology and hydrology of the San Diego area, focusing on the San Diego Formation and the overlying alluvial deposits.
2. Use this understanding to evaluate expanded use of the alluvial deposits and the San Diego Formation for recharge and extraction.

To develop data in support of these objectives, the USGS study has completed 12 multiple-depth test wells in and around the San Diego Formation, along with an additional well in the Santa Ysabel area. Four additional deep test wells are planned as part of this effort.

Groundwater Demineralization

Public water agencies currently utilize groundwater resources to develop municipal water supply within the following watersheds: San Juan (901), Santa Margarita River (902), San Luis Rey River (903), San Dieguito River (905), San Diego (907), and Sweetwater (909). Demineralization treatment of groundwater is utilized in three of these groundwater basins and has increasing appeal to local agencies. In 2017, Sweetwater Authority, in partnership with the City of San Diego, completed construction of an expansion to the Richard A. Reynolds Desalination Facility that doubled its production capacity. Other agencies, particularly in northern San Diego County, are also considering constructing or expanding their groundwater desalination facilities in the future. Olivenhain Municipal Water District is currently studying the feasibility of developing its own demineralization treatment facility. Table 3-23 summarizes groundwater demineralization treatment facilities within the Region.

Reynolds Desalination Facility

Photo Credit: Sally Johnson, Woodard & Curran

Table 3-23: Groundwater Demineralization Facilities

HU[1]	Watershed	Groundwater Demineralization Facility	Operating Agency	Treatment Capacity[2] (mgd)	Source of Groundwater
902	Santa Margarita River	Haybarn Canyon	USMC Camp Pendleton	6.9	Santa Margarita Basin
903	San Luis Rey River	Mission Basin	City of Oceanside	6.37	Mission Basin
909	Sweetwater River	Reynolds	Sweetwater Authority	10.0[3]	Lower Sweetwater Basin

1 Numerical watershed (hydrologic unit) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
2 Potable water production capacity. Influent treatment plant capacity is larger as part of the flow is lost as waste brine. mgd = million gallons per day
3 From *2015 Urban Water Management Plan* (Sweetwater Authority, 2016).

3.5.7 Conservation

Water conservation is a fundamental component of the Region's water supply diversification effort. The Water Authority and its member agencies have been aggressively implementing water conservation since 1990. Under SB 606 and AB 1668, the Long-Term Water Conservation Regulations, mandatory indoor and outdoor water budgets will be established statewide, with regular reporting to the state for accountability. Conservation efforts in the region will help local agencies meet these requirements. The State's Model Water Efficient Landscape Ordinance (MWELO) was updated in 2015 in response to the recent drought, and further increased water efficiency standards. As a result, local and regional ordinances were also updated to require increased irrigation efficiency and reduce irrigation demands.

There are two types of water conservation in the Region, both of which contribute to Regional water supplies: 1) water conserved through reduced loss from both the Water Authority and other agencies' systems, and 2) water conserved through reduced user demand. Water conservation through loss reduction has been achieved through projects that line canals that bring imported water to the Region and other infrastructure improvements. Potable water demand reduction can take place in a traditional water conservation setting whereby water users use less water on a per capita basis. In addition to traditional water conservation, implementation of onsite systems that use alternative water sources such as graywater systems, rainwater harvesting systems or on-site industrial reuse can reduce potable water demands.

The Sustainable Landscapes Program was funded under Proposition 84 Round 1
Photo credit: Kyrsten Burr-Rosenthal, Water Authority

Water Use Reduction Programs

Significant Water Authority and member agency funding has been directed toward implementing comprehensive water conservation best management practices (BMPs) (see inset below) to reduce water use for residential, commercial, and agricultural irrigation, and to reduce water use in homes, businesses, industries, and institutions. Annual water audits are submitted by water agencies to understand and report where water loss is occurring in their systems, which helps to identify opportunities for reducing water loss.

The comprehensive water conservation program implemented by the Water Authority and its member agencies was accelerated during the 2012-2016 drought and is anticipated to continue to grow conservation benefits into the future. The Water Authority's 2015 UWMP estimates that conservation will grow from approximately 74,000 AFY in 2020 to over 128,000 AFY by 2040 (Water Authority, 2016). Conservation estimates were developed using the Alliance for Water Efficiency Water Conservation Tracking Tool, which accounts for existing and future passive and active water savings. Within the San Diego IRWM region, passive conservation is anticipated to increase as appliance standards and code changes increase water use efficiency and as existing landscape converts to water wise landscaping. Active conservation is anticipated to increase as the 2015 Model Water Efficient Landscape Ordinance (MWELO) continues to be implemented in new development and as Water Authority member agencies continue to move towards compliance with SBx7-7 water use targets. Regional water-use efficiency programs include the Regional WaterSmart Turf Replacement Program, the SoCal Water$mart Commercial, Industrial, and Institutional Program, Water Savings Incentive Program, the On-site Recycled Water Conversions Program, and the Sustainable Landscapes Program. Additionally, the Water Authority and its member agencies are undertaking measures to comply with Senate Bill 7-7 (SBx7-7), which require retail urban water agencies to achieve a 20% reduction in per capita water use by 2020. In the 2015 UWMPs, all of the Water Authority member agencies reported that they were on target to meet their SBx7-7 use reduction goals.

California Urban Water Conservation Council
Water Conservation Best Management Practices (BMPs)

The Water Authority and its member agencies comply with all 13 water conservation BMPs developed by the California Urban Water Conservation Council, including:

Operation Practices

- Conservation coordinator
- Water waste prevention
- Wholesale agency assistance programs

Public Outreach

- Public information programs
- School education programs

Residential

- Residential assistance program
- Landscape water survey
- High-efficiency clothes washers
- WaterSense Specification toilets
- WaterSense Specifications for residential development

Commercial, Industrial, and Institutional

- Commercial, industrial, and institutional savings

Landscape

- Savings for dedicated landscape irrigation accounts
- Savings from CII accounts within meters or mixed use meters

Source: CUWCC Resource Center: http://www.cuwcc.org/bmps.aspx

While many regional efforts have been implemented to increase conservation, especially with regards to outdoor water use for landscape irrigation, regional stakeholders have indicated that there are impediments to conservation. The public's attitude about what are acceptable landscaping options given the Region's warm and dry Mediterranean climate, need to change to match the current climate. There are a wide range of options available for landscapes which use a minimal amount of water and still look beautiful. Contrary to State law, homeowners associations are still trying to enforce outdated rules that restrict the use of certain plants, and therefore provide an impediment to landscaping with low water use plants. Public education and a conservation ethic is critical to achieving outdoor conservation.

Graywater

Graywater is defined as wastewater that is generated from domestic activities such as laundry and bathing. To protect human and environmental health, graywater systems reuse untreated wastewater that has not been contaminated by food or human waste for non-potable purposes, primarily irrigation.

Although the potential for graywater reuse to reduce potable water demand has long been recognized, potential public health issues related to the use of graywater required additional time to develop permitting processes and regulations. As the use of graywater becomes more attractive to consumers, permitting and regulations are becoming more streamlined, helping to reduce barriers to widespread implementation of graywater systems in the Region. In 2009 DWR released an emergency order that eased the permitting process for graywater systems in California. Per State Plumbing Code Chapter 16A, graywater systems supplied by washing machines generally do not require a permit, though more complex systems or ones that utilize other graywater supply sources typically do. General requirements for graywater systems include the ability to direct graywater to both irrigation and sewer systems, a physical barrier or air gap to prevent backflow and cross-contamination, subsurface irrigation systems, and design that prevents ponding or runoff. Additionally, graywater cannot make direct contact with edible portions of food crops. Cities, counties, and other jurisdictions may place additional regulations on graywater systems and uses (HCD, 2010). Within the Region, local cities and the County of San Diego (Department of Environmental Health) regulate graywater through adoption of the plumbing code.

Conservation Home Makeover in the Chollas Creek Watershed
Groundwork San Diego

Photo credit: Leslie Reynolds, Groundwork San Diego

Groundwork San Diego has partnered with the U.S. Green Building Council, San Diego Sustainable Living Institute, San Diego Unified School District, and Encanto Community Planning Group to implement the "Conservation Home Makeover". The project engages low income families within the Encanto neighborhood of San Diego to conserve water through water capture and greywater reuse for food production and landscaping. This project addresses DAC needs for water conservation, water supply, and food security and supports the Region's goals of water supply sustainability, protection of natural resources, and promotion of sustainable resource management.

Challenges to widespread implementation of graywater systems include the expense of installation and restrictions on use, both of which place limits on graywater system installation (City of San Diego, 2002). The City of San Diego has estimated that graywater could potentially provide 2,575 AFY of irrigation water by 2035 (City of San Diego, 2013b). If this amount of graywater were to be used in the City, it would represent just over 1% of the City's 2035 water demands (City of San Diego, 2016).

Rainwater Capture

Rainwater capture is another tool for water conservation in the Region. As its name implies, rainwater capture involves diverting, capturing, and storing rainwater runoff before it enters the storm sewer system. Captured rainwater can be used for non-potable purposes, such as irrigation, or may be allowed to recharge into groundwater basins. Capturing and reusing rainwater can reduce water demands for irrigation or groundwater recharge, benefit water quality through reduced stormwater runoff, reduce the load on regional stormwater infrastructure, and help mitigate high runoff flows from impervious surfaces that cause hydromodification of streams and rivers. While rainwater capture can minimize peak flows and retain pollution onsite, it can reduce flows to local watersheds. Rainwater capture through groundwater recharge is limited in the San Diego region due to the small size of the local groundwater basin and the presence of expansive clay soils.

City of San Diego's
Rain Barrel Rebate Pilot Program

The City of San Diego initiated its Rain Barrel Rebate Pilot Program in 2012 which offers single-family residential customers the opportunity to receive a rebate when connecting a newly installed rain barrel to a rain gutter downspout in that collects precipitation from the rooftop. This rebate is available periodically as funds allow and is next expected to reopen in July 2018. The amount of rain water that can be collected depends on several variables, including dimensions of the rooftop, storage capacity of the rain barrel(s), as well as the amount and timing of rainfall. A general rule of thumb follows that 1,000 square feet of rooftop surface captures 625 gallons of water when an inch of rainwater falls. Since the start of the City's program, over 300 rain barrel rebates have been issued with water savings projected at 1,113,250 gallons (3.4 AF) per year.

Common methods of rainwater capture include installation of rain barrels to collect water from rooftops, cisterns to capture water from roofs and parking lots, and rain gardens designed to collect rainwater and allow the water to irrigate onsite plants. Though the Region encourages the use of rain barrels, cisterns, and rain gardens, it is important to properly design rainwater capture systems for the appropriate volume of water expected to be captured and to accommodate individual site characteristics, such as soil type or slope. The City of San Diego has produced a *Rainwater Harvesting Guide* (City of San Diego, 2012) that details how to design a rainwater harvesting system. This guide encourages customers to select plants for a proposed rain garden that have a corresponding water need to the expected volume of rainwater that can be captured by the system. For example, if the site only receives a few inches of rain per year, a rain garden of tropical plants would require additional irrigation, as its water needs would not be met by the captured rainfall. Instead, landowners in areas with low rainfall should select less-water intensive plants, such as native plants or succulents.

Low Impact Development

In addition to rainwater capture that involves capturing water and storing the water for irrigation purposes, landscapes can be modified to increase local infiltration potential, which will help to ensure that water that falls on the ground is infiltrated rather than running off the surface as stormwater. Increasing infiltration through Low Impact Development (LID) is a long-term rainwater capture strategy that helps to restore soil moisture and improve ecosystem health by restoring sub-surface water flows.

There is a diversity of LID designs and functions, with varying degrees of natural and engineered components. LID systems are effective because they mimic natural systems and can reduce infrastructure and maintenance costs over time. LID can include bioretention facilities or rain gardens, grass swales and channels, vegetated rooftops, rain barrels, cisterns, vegetated filter strips, and permeable pavements. Some LIDs are designed to filter out contaminants before directing flows to storm drains. The 2013 MS4 permit mandates that no additional runoff may occur from new developments in the MS4 permit area. This requirement will encourage implementation of rainwater capture-friendly LID measures (County of San Diego, 2007).

> ***Regional Stormwater Green Streets***
>
> The Region is implementing a series of green street projects to implement stormwater management and LID. These include the Mapleview Street Project, Woodside Avenue Project, Sweetwater River Park Bioretention Project, LID Urban Runoff Control Projects for the Tijuana Estuary, and the South Santa Fe Green Street Project.
>
> The County's Mapleview Street Project will treat runoff from 64 acres of primarily residential development, and will include biofiltatration basins, permeable pavements and vegetated swales, while also installing sidewalks and bike lanes to encourage alternative transportation. The County's Woodside Avenue Project is similar in nature, and will treat wet weather flows from a 93-acre area. Together, the County's projects are expected to retain between 120,000 and 160,000 cubic feet of stormwater per year (2.75 – 3.7 AFY), remove 93,000 lbs of GHGs per year, provide trash from entering waterways, help address flooding, and remove metals and nutrients from stormwater.

Reducing stormwater runoff improves water quality by increasing natural filtration of pollutants from runoff flowing slowly through vegetation and percolation through permeable surfaces, reducing the amount of pollutants washing into local waterways over time, and reducing habitat changes that may have a negative impact on water quality. Pollutants found on exterior surfaces are conveyed through runoff into waterways. Although reduced runoff can contribute to improved water quality, these pollutants are still present, and will enter waters during the "first flush" event – the first major storm event following the dry season. However, the first flush event tends to move pollutants to the ocean more quickly and at greater dilution than when carried by smaller rainfall events that would produce runoff without rainfall capture efforts in place.

3.5.8 Stormwater Management

Stormwater is managed under the Region's MS4 Permit, as described here and in *Section 3.6.4*. Stormwater in the Region is diverted to each agency's municipal separate storm sewer system (MS4). An MS4 is legally defined as a system through which stormwater and non-stormwater are discharged to waters of the United States (San Diego Water Board, 2013a). In the San Diego Region, MS4 systems fall into one or more of the following categories:

1. A medium or large MS4 that services a population of greater than 100,000 or 250,000 respectively
2. A small MS4 that is "interrelated" to a medium or large MS4
3. An MS4 which contributes to a violation of a water quality standard
4. An MS4 which is a significant contributor of pollutants to waters of the United States

> ***Water Terminology***
>
> **Urban Runoff:** used here to describe water that travels through and across urbanized areas; includes natural precipitation that falls in urban areas as well as water released into the urban environment as a result of other uses (e.g., over-irrigation of lawns, washing cars in driveways, leaking pipes, etc.). Typically of concern due to the potential to transport pollutants.
>
> **Stormwater:** any water that falls during a precipitation event as well as any water that enters an MS4 in the Region.
>
> **Non-Stormwater:** water released into the environment from non-precipitation events, such as improper irrigation practices, regardless of whether it occurs in urbanized areas.

An MS4 comprises the ditches, storm pipes, retention ponds and other facilities constructed to store runoff or carry it to receiving waters such as streams, lakes, bays, or the ocean. Other constructed features in such a system include LID features that collect runoff and direct it to storm drains and ditches. Most MS4s are designed to handle specified storm flows, such as the amount of water expected during a 10-year storm. Larger storms may cause overload and result in backed-up storm drains and ditches and produce shallow flooding (FEMA, 2007).

An MS4 is designed to prevent or reduce flooding in developed areas. Because MS4s usually do not provide treatment prior to discharging collected stormwater, they can present a water quality challenge, as stormwater can have high levels of pollutants collected during runoff. The MS4s in the Region also collect urban runoff which can carry pesticides, fertilizers, and anything that is dumped into storm drains, such as oil or trash, to the receiving waters. As the Region continues to grow, addressing pollution from stormwater and the MS4 is imperative. In general, stormwater programs governed by the MS4 permit include:

- Urban runoff and receiving water monitoring during wet and dry weather,
- Assessment of water quality trends, potential sources, and impacts,
- Standards to manage runoff discharge rates and durations from all new development, and
- Programs to prevent, control, and treat sources of pollutants such as BMPs, water conservation, public education and outreach, maintenance of streets and storm water infrastructure, inspections of pollutant generating activities.

Stormwater is managed by the jurisdictions that own and operate the MS4 system, and is regulated by an MS4 Permit granted by the San Diego Water Board.

Since 2001, the MS4 Permit for the San Diego Copermittees has shifted to include a variety of new stormwater management plans and requirements for stormwater mitigation and oversight. Additionally, the current MS4 Permit (Order No. R9-2015-0001 and Order No. R9-2015-0100) includes the portions of south Orange County and south Riverside County that are within the San Diego Water Board area (and align with the South Orange County and Upper Santa Margarita Watershed IRWM Regions, respectively). New to this 2015 permit was the development of WQIPs for each watershed management area. WQIPs define priority water quality conditions, establish water quality improvement goals and strategies, and incorporate integrated monitoring and assessment plans to help guide runoff management programs in improving water quality in MS4 discharges and receiving waters (San Diego Water Board, 2013a). The permit also includes more rigorous development and redevelopment requirements that include an offsite mitigation option for development projects where onsite retention and treatment are not technically feasible, or where applicants can demonstrate a greater overall benefit to water quality by mitigating offsite. The permit also includes adopted TMDL waste load allocations as numeric water quality-based effluent limits that must be achieved by specified timelines. Finally, the permit requires Copermittees to implement expanded programs to pro-actively address urban runoff discharges from residential areas, including a stronger emphasis on eliminating or reducing over-irrigation flows.

Improved stormwater quality is a central component to multiple IRWM Plan

Water Quality Improvement Plans (WQIPs) for the San Diego IRWM Region

A key feature of the 2013 MS4 Permit is that it provides an "adaptive management pathway" for Copermittees to select and address the highest priority water quality issues, rather than all pollutants. The WQIPs, which are developed via a collaborative process between the Copermittees, watershed stakeholders, and Regional Board staff, specify the highest priority pollutants in each watershed and lay out a strategy and schedule for addressing those pollutants.

The WQIPs are available on the Regional Board's website:

https://www.waterboards.ca.gov/sandiego/water_issues/programs/stormwater/wqip.html objectives. Specifically, activities that contribute to Objective G and Objective H frequently manifest themselves as stormwater or stormwater quality control. The IRWM Program includes numerous projects that reduce impervious surfaces, increase infiltration, and reduce runoff. Changes in landscaping practices, such as using water-wise plants instead of turf or improving irrigation practices, also help to reduce the pollutants in stormwater and runoff. Restoration projects also frequently increase the ability of an area to act as natural filters for runoff, providing benefits to water quality and hydromodification issues downstream. Carbon sequestration represents another ecosystem service that may be provided through restoration. By helping to meet the Plan objectives, these types of projects are more likely to be prioritized or selected for inclusion in IRWM funding packages and help to improve stormwater management region-wide. Projects designed to improve the scientific basis of water quality regulations are consistent with the IRWM regulatory strategies outlined in *Chapter 7, Regional Coordination*.

Challenges to managing stormwater in the Region frequently stem from the expense of BMP installation, variability and uncertainty of BMP success, jurisdictional boundaries that are not aligned with watersheds or drainage areas, differences in land use and priorities, debate over appropriate water quality standards that are protective of beneficial uses, uncertainty over the ability to comply with the terms of the Region's MS4 Permit, and the high variability in annual rainfall experienced by the Region. There has also been some debate over the water quality standards established by the San Diego Water Board, and the future may see a shift from some of the current concentration-based standards to biological criteria, such as those considered in the nutrient numeric endpoint (NNE) based standards. This shift may affect which management strategies are necessary or appropriate, and may make management easier or more challenging, depending on if or how changes to standards are implemented.

Determining Appropriate Water Quality Objectives: Santa Margarita River

Nitrogen and phosphorous loading from the Santa Margarita River Watershed can result in low dissolved oxygen (DO) and increased algal blooms in the estuary and stream segments, several of which have been 303(d)-listed for nitrogen, phosphorus, or eutrophication. Total Maximum Daily Loads (TMDLs) are not currently in place in most of the Santa Margarita River Watershed segments which are listed for nutrient impairment. At this time, there is little scientific knowledge about the appropriate level of nutrients that the Santa Margarita River can sustainably assimilate.

The Santa Margarita River Nutrient Study – funded through Proposition 84, Round 1 – aims to establish the science and seek stakeholder consensus to develop seasonal nutrient water quality objectives (WQOs) that are protective of beneficial uses. Stakeholders believe that since the estuary through which the Santa Margarita River flows is open to the ocean during the winter (the wet season), nutrients in the river only have a short residence time before they enter the ocean. Development and adoption of seasonal WQOs would significantly decrease stormwater treatment costs during a timeframe in which there are no real impacts to riverine species or habitats. The project conducted 33 sampling events over seven sites from January to September 2015 and then again from April to July 2016. Water quality data collected included nutrient loads, dissolved oxygen (DO), pH, temperature, and conductivity. The next phase of work – funded under Proposition 84, Round 2 – will use data collected during this project to develop the nutrient water quality goals.

Nutrient water quality data collection will help the Region better understand how to manage the Santa Margarita River.

Photo credit: JoAnn Weber, County of San Diego

Another challenge to stormwater maintenance involves balancing multiple and sometimes conflicting interests. For example, the City of San Diego's Municipal Waterways Maintenance Plan identifies channels within the City's jurisdiction that have deposits of sediment and overgrowth of vegetation that require maintenance to restore stormwater and flood control capacity. This program was challenged by local organizations for its potential habitat fragmentation and biological impacts, and a Settlement Agreement was reached that incorporated additional water quality measures and biological mitigation requirements into the program. This program, and others across the Region, must balance flood control safety and stormwater maintenance requirements with natural resources protection.

As the State continues to grapple with drought conditions, a greater emphasis has been placed on using stormwater as a resource. The Region is studying how to leverage stormwater as a supply source, but must also consider the significant water quality issues associated with stormwater reuse. The 2018 Stormwater Capture and Use Feasibility Study (County, 2018), which expanded on the findings of the 2017 Stormwater Water Resource Plan (County, 2017), created a methodology for identifying the potential for stormwater capture at a given site, to assist with improving the Region's ability to utilize stormwater as a resource.

3.5.9 Flood Management

Although precipitation in the Region is highly variable, flooding remains a high risk in many communities. Flooding in the Region occurs during periods of heavy rainfall (San Diego County, 2010).

The Floodplain Management Plan for the County of San Diego (FEMA, 2007) reports that from 1770 until 1952, 29 floods were recorded in the County of San Diego. Between 1950 and 2006, flooding prompted 12 Proclaimed States of Emergency in the County of San Diego. Several very large floods have caused significant damage in the County. The Hatfield Flood of 1916 destroyed the Sweetwater and Lower Otay Dams, and caused 22 deaths and $4.5 million in damages. The most recent serious floods affecting the County occurred during tropical storms Kathleen (1977) and Doreen (1978) and during winter storms in 1980, 1987, 1993, 1998, 2005, and 2017. In the 1980 flood, approximately 16-20 inches of rain accumulated over a six-week period. This slow-moving storm, which was the most severe since the Hatfield Flood of 1916, lead to wide-spread small stream flooding and evacuations of residents in Mission Valley. The San Diego River at Mission Valley peaked at 27,000 CFS and caused $120 million in damage (FEMA, 2007). Flooding during the 2004-2005 wet season caused $7.7 million in damages, and flash flooding since 1993 has caused upwards of $16 billion in damages, countywide (San Diego County, 2011a).

Within the Region there are two categories of flooding: precipitation-induced and non-precipitation-induced. Precipitation-induced flooding includes flash floods, debris flows, and alluvial fan floods. The central and eastern portions of San Diego County are most susceptible to flash floods where mountain canyons, dry creek beds, and high deserts are the prevailing terrain (FEMA, 2007). Additional risks from precipitation-induced flooding stems from the association of wildfires with flooding. As fires remove vegetation, runoff is not taken up by vegetation and soils are destabilized. This leads to an increase in runoff entering streams, increasing flooding risks, and to an increase in debris flow risks. Because the Region is prone to wildfires, and this risk is expected to increase as an impact of climate change, the risk of flooding that is exacerbated by wildfires needs to be managed (San Diego County, 2011a). An additional flood risk that can be exacerbated by wildfires is non-native invasive vegetation species. Land that has been cleared by wildfire is more susceptible to regrowth of non-native invasive vegetation species. Invasive species, such as giant reed (*Arundo donax*), can outcompete native species and dominate riparian areas. Once established, Arundo in particular can change diverse native riparian areas into monotypic non-native riparian areas. Arundo provides very little habitat value to native wildlife and dead and dry stands can become a fire hazard themselves. The root system of Arundo along with its typical dense growth structure can cause increased sedimentation and narrowing of channels. This can increase flood risk on adjacent lands.

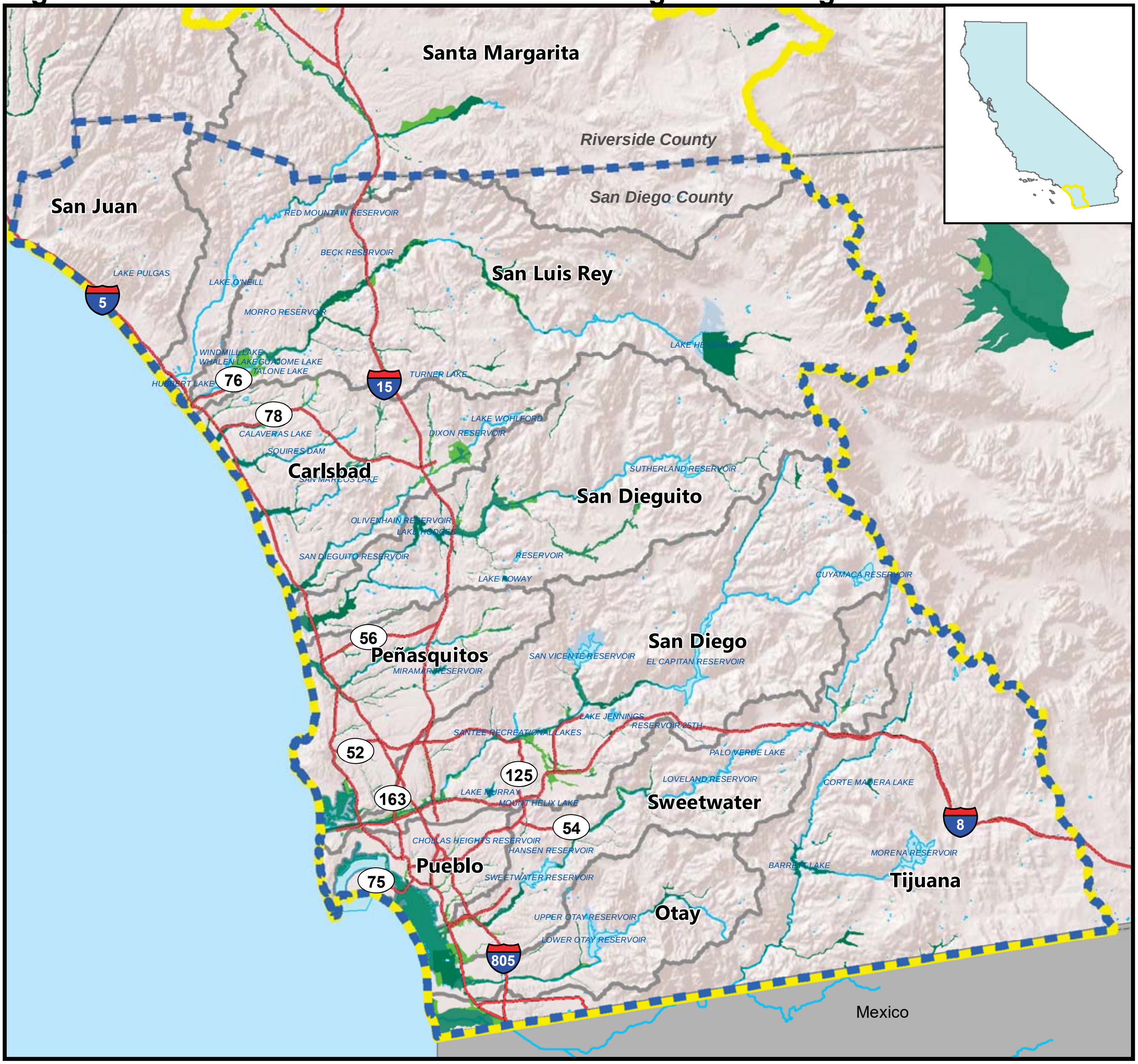
Non-precipitation-induced flooding is caused by urbanization, landform modification, faulty drainage facilities, dam failures, tsunamis, seiches (standing waves in an enclosed or partially enclosed body of water), and high surf during storm events. Of these, the Region is most at risk from flooding caused by urbanization and faulty drainage facilities. Urbanization increases impervious surfaces, and therefore increases runoff. This runoff enters streams more quickly, in higher volumes, and at greater speeds. Each of these contributes to an increase in flood risk if the channels or streams are not able to accommodate the increased runoff. These problems can be made worse by faulty drainage facilities, which may fail or overflow if not adequately sized or maintained (San Diego County, 2011a). Sea level rise is anticipated to increase the risk of non-precipitation-induced flooding.

Federal Emergency Management Agency (FEMA) flood zones represent the areas susceptible to the 1% annual chance flood (often referred to as the “100-year flood”), and the 0.2% annual chance flood (“500-year flood”). The 1% annual chance flood, also known as the “base flood,” has at least a 1% chance of occurring in any given year. FEMA designates this area as the Special Flood Hazard Area (SFHA) and requires flood insurance for properties in this area as a condition of a mortgage backed by federal funds. Designated high-risk areas are those within the 100-year floodplain, while areas within the 500-year floodplain are considered low-risk. Areas within the Region at highest risk for flooding are typically downstream areas along rivers, and concentrated around the coast at bays, coastal inlets, and estuaries. Properties that are included in the SFHA may be contested, and those interested in changing a property’s floodplain designation may submit a request for a Letter of Map Change (LOMC) to FEMA. If FEMA approves a LOMC, the FEMA Flood Insurance Rate Map will be officially revised or amended by FEMA; such an amendment will likely reduce insurance requirements and can reduce development restrictions. The Region’s FEMA flood zones are shown in Figure 3-14.

Within the Region, over 101,000 people are exposed to high-risk from flooding. The potential losses due to damages to buildings in high-risk areas are over $17 billion, with $2.2 billion of critical facilities (e.g., hospitals, infrastructure) at high-risk from flooding (San Diego County, 2010). Locally identified “hot spot” flood areas are listed in Table 3-24 below.

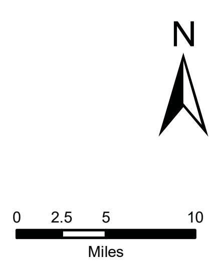
In order to address these risks, a Multi-Hazard Mitigation Plan was developed for San Diego County (San Diego County, 2010). This Mitigation Plan included participation from the Water Authority, California Emergency Management Agency, FEMA, local and regional officials, the Rancho Santa Fe Fire Protection District, and stakeholder input. The Mitigation Plan includes specific goals, objectives, and actions for each jurisdiction to help address or mitigate the identified risks. Common actions related to mitigation of flood risks include maintaining current flood maps, discouraging growth in flood-risk areas, improving or maintaining stormwater systems, incorporation of natural flood control measures into design and development, continuing to monitor and assess drainage, and developing comprehensive flood management and response plans (San Diego County, 2010).

Figure 3-14: FEMA Flood Zones in the San Diego IRWM Region



Legend

- San Diego IRWM Region
- Funding Area Boundary
- Watershed
- County
- FEMA 100-year Flood Zone
- FEMA 500-year Flood Zone
- River
- Freeway



Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-1_Overview of Regions Watersheds_060713.mxd

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Table 3-24: Local "Hot Spot" Flood Areas[1]

HU	Watershed	Flooding Source	Location and/or Description
902	Santa Margarita River	Santa Margarita River	Sandia Creek Drive and Rock Mountain Drive affecting Fallbrook and De Luz
903	San Luis Rey	Upper San Luis Rey River	Between Lake Henshaw and La Jolla Indian Reservation; Cole Grade Road; and Shearer Crossing (San Luis Rey River at I-15); Pauma Valley Drive: Wiskon Way; Valley Center Road (Rincon Casino)
904	Carlsbad	Escondido Creek	El Camino Del Norte near Rancho Santa Fe and Olivenhain
		Escondido Creek	At Country Club Road; Elfin Forest
		Twin Oaks Creek	At Sycamore Road/Walnut Grove
		San Marcos Creek	From Discovery Street to East of SR-78
905	San Dieguito River	San Dieguito River	Downstream from Hodges Reservoir to Del Mar
		Hatfield Creek	Magnolia Avenue in Ramona
		Santa Maria Creek	In Ramona; Rangeland Road
907	San Diego River	San Diego River	Mission Valley and Fashion Valley Mall; Fashion Valley Road; Avenida del Rio; Camino del Este
		San Vicente Creek	Below San Vicente Reservoir, Moreno Valley
		Lemon Crest (Lakeside)	Local flooding problem
		Dulene Drive (Lakeside)	Local flooding problem
		Adlai Drive (East Lakeview)	Local flooding problem
909	Sweetwater River	Spring Valley Creek	Quarry Road at Spring Valley Creek
		Sweetwater River	Singing Hills Country Club
		Wildoats Lane off Central Avenue	Yearly flooding problem identified by Flood Control staff
911	Tijuana River	Tijuana River Valley	Tijuana River Regional Park; Hollister Street; Dairy Mart Road
		Cottonwood Creek	Trailer Park at Barrett Junction
		Campo Creek	Campo Valley flash flooding

1 From *Floodplain Management Plan* (FEMA, 2007).

Flood Warning Program

The San Diego County Flood Control District (FCD) has the responsibility to provide flood warning services for the County of San Diego. This program encompasses three components: the ALERT Flood Warning System, the Webcam Program, and the Flood Forecast System.

ALERT Flood Warning System

The ALERT Flood Warning System was developed in 1982 to address the need to obtain real-time rain and stream level data in order to detect flood-producing events early enough to respond in a timely manner. The system started out with 14 stations and has since expanded to over 120 stations. Data collected by the individual field stations are relayed in real-time to nearby data repeaters, which in turn, relay the data to the flood warning base station in Kearny Mesa. Incoming data is received by the flood warning computer, examined for quality control, examined for meeting any alarm criteria, then is placed into the database. Displays are updated, and if the data meet alarm criteria, a warning is issued on the computer, and a text message is assembled and sent to designated emergency personnel via email or smart phone. Emergency staff responds to the alarm and contact the pertinent emergency agencies with information and recommendations. The ALERT flood warning system forms the core of the County Flood Warning Program and is used to provide input to flood forecast programs and provide real-time warning to emergency managers.

FCD Webcam Program

The County of San Diego has several low water crossings over creeks and rivers. These crossings are either built directly on the river bottom or have small culverts to carry low flows under the road. Several times per year, heavy rainfall in the region is sufficient to cause enough runoff to flood several low water crossings in the County. The County has recently begun a program of placing internet webcams at key low water crossings with a history of flooding and flooding-related accidents. By accessing an in-house County website, these webcams can be controlled by emergency managers to check the magnitude of flooding at a crossing, check the quality of the road conditions during and immediately after flooding, identify vehicles that may have gotten trapped in the flood waters, and enable the public to examine the condition of the road during storms to determine whether they should use the crossing. Current webcams are located at Country Club Drive at Escondido Creek, Quarry Road at Spring Valley Creek, and Sandia Creek Road at Santa Margarita River. There is one candidate for a future webcam at Cole Grade Road on the San Luis Rey River. The public can view, but not control, the webcams at http://sdcfcd.org/.

San Diego County Flood Forecast Program

Occasionally, the magnitude of the periodic flooding in San Diego County river systems is high enough to cause significant damage and injury. Recently, the FCD contracted with DHI Water and Environment to develop a comprehensive flood forecast model to cover the entire San Luis Rey Watershed and its primary tributaries. At regular timed intervals, the model retrieves rainfall and streamflow data from the ALERT Flood Warning system, and forecast rainfall from the National Weather Service website (http://www.weather.gov/). This information is run through the model to create a forecast of the expected flow conditions at several points along the San Luis Rey River and its primary tributaries. Analysis results are uploaded to a public website and a private emergency managers' website. The websites display the ALERT flood warning data from the stations within and near the watershed, point forecasts at nearly 100 bridges and low water crossings in the watershed, floodplain forecasts at five sensitive floodplains within the watershed, and a "state of the watershed" map showing the current water conditions at the forecast points. Emergency managers have access to detailed point forecasts, and animated floodplain maps that enable the user to drill right down to the street level to determined expected areas of flooding.

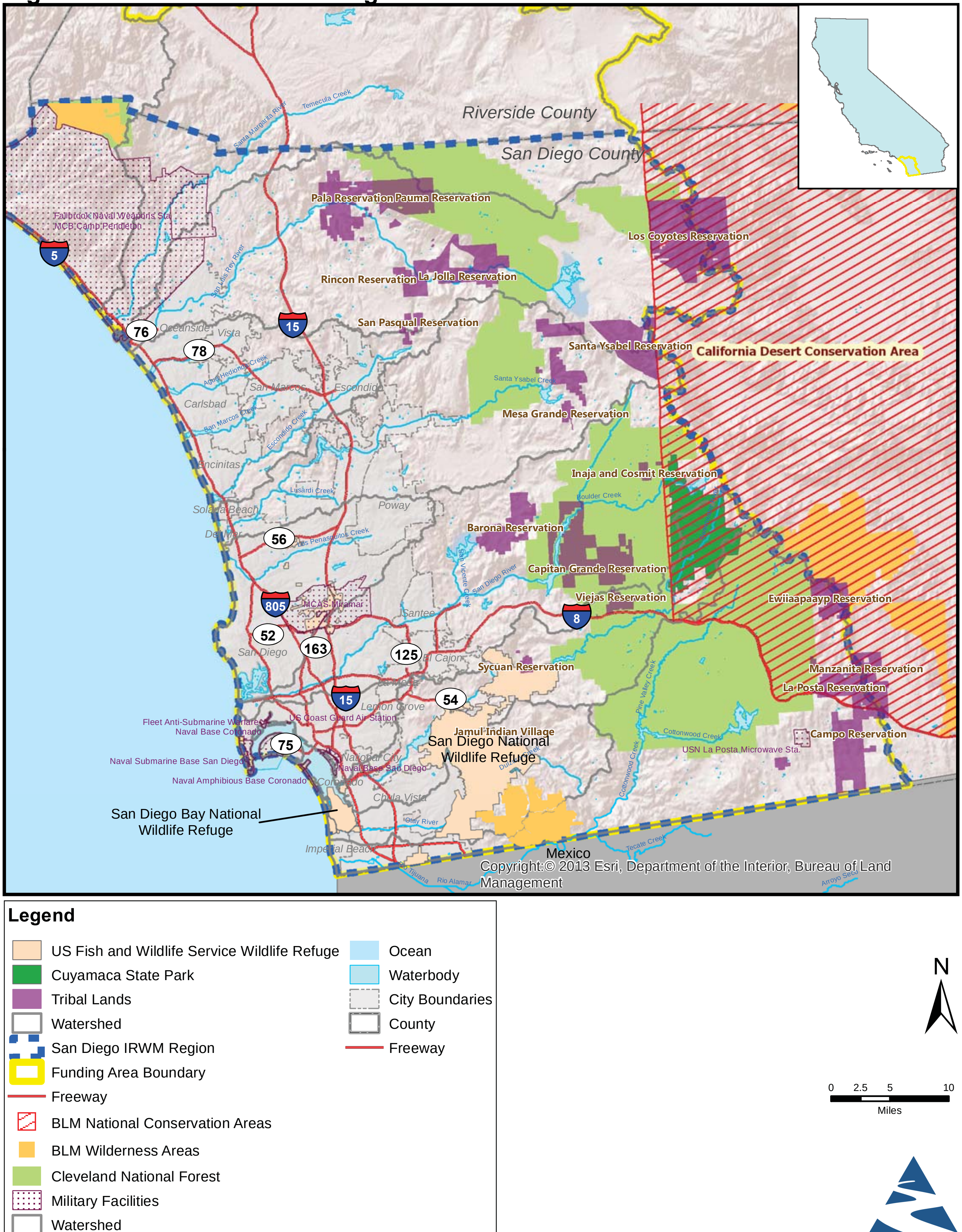
As funds allow, the model will be extended over time to cover the major watersheds of the San Diego River, Sweetwater River, San Dieguito River, and possibly the Tijuana River.

3.6 Internal Boundaries

3.6.1 Land Use Jurisdictions

Figure 3-15 identifies agencies responsible for land use and land planning within the region. The County, the 18 incorporated cities, and their associated planning districts support community planning, maintain comprehensive plans as required by statute, and administer and enforce land use codes and ordinances.

Figure 3-15: Land Use Planning



Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse, Department of Interior and Bureau of Land Management.
N:\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-13_Land Use Planning 060813.mxd

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The USMC Base Camp Pendleton covers over 125,000 acres in the north portion of the Region. More than a dozen other military facilities exist within the Region. Additional federal land managers within the Region, in part, include the USFS, BLM, National Oceanic and Atmospheric Administration (NOAA), and the United States Fish and Wildlife Service (USFWS). USFS manages the Cleveland National Forest, which comprises the eastern portions of several of the Region's larger watersheds. BLM manages lands designated as Wilderness Areas, BLM National Monuments, BLM Public Lands, and BLM Wilderness Study Areas. USFWS manages the National Wildlife Refuge in the southwestern part of the County. NOAA co-manages the Tijuana River National Estuarine Research Reserve (TRNERR), located along the coast near the border, with California State Parks and USFWS.

State land managers include the California Department of Fish and Wildlife (CDFW), which manages land to implement CDFW's Natural Community Conservation Plan (California Fish and Game Code Sections 2088-2805), and the California State Parks, which manages parklands such as Cuyamaca State Park. CDFW's Natural Community Conservation Plan seeks to conserve natural communities at the ecosystem scale while accommodating compatible land use.

Tribal lands are significant in the Region: there are more Tribal Reservations within the County than in any other county in the United States (University of San Diego, 2006). These Reservation lands, which are governed by Tribal Nations, total 127,000 acres (approximately 200 square miles). The Region's tribal lands are described in detail in *Chapter 4, Tribal Nations of San Diego County*.

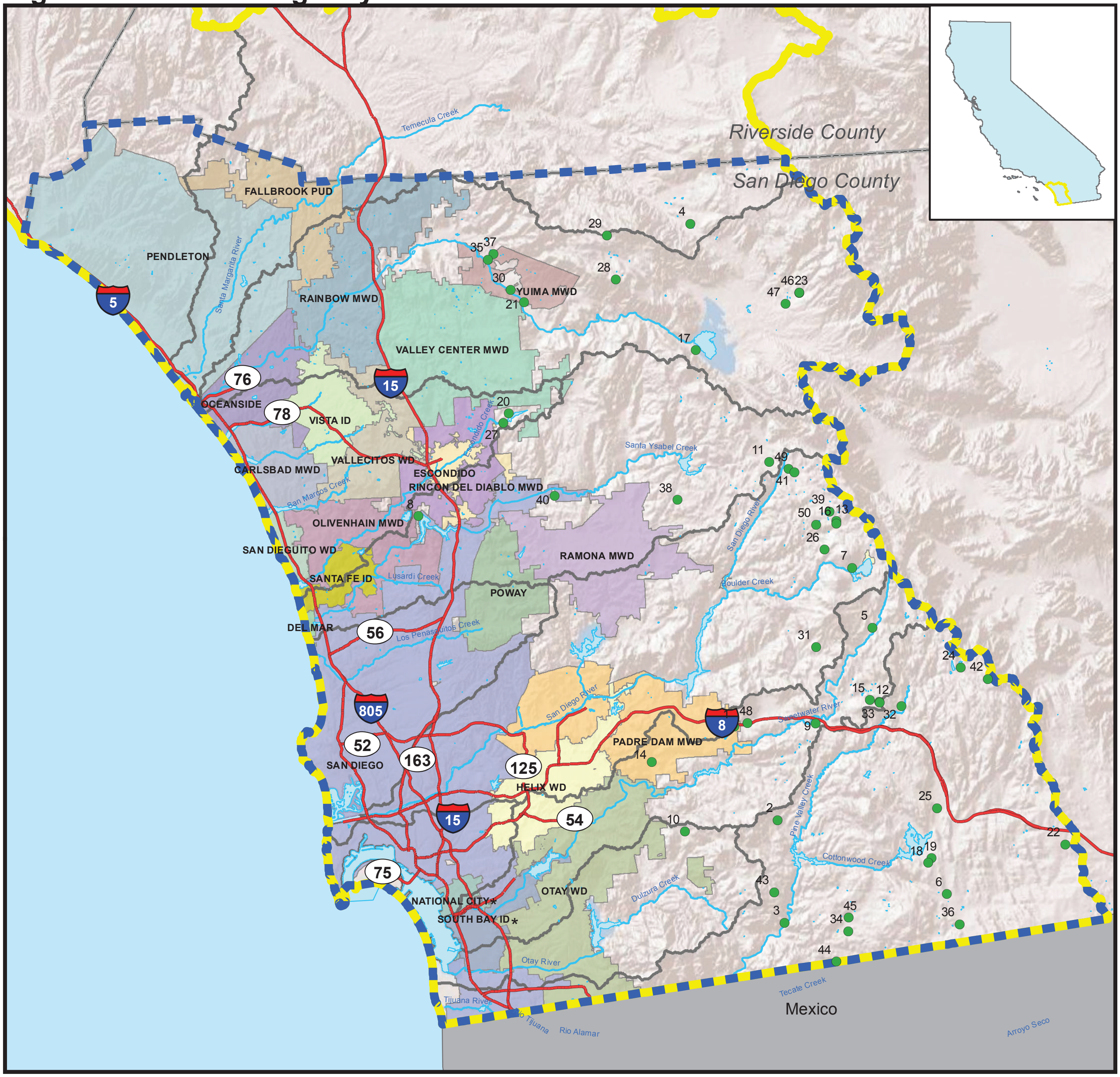
3.6.2 Water Supply Agencies

Water supply within the Region is predominantly imported water provided by the Water Authority, which is the sole imported water wholesale agency within the region. All major retail water agencies within the Region are members of the Water Authority. Figure 3-16 presents boundaries of Water Authority member agencies. *Section 3.5* provides a general description of the Region's water management systems, including supply sources.

In addition to serving as the Region's provider of imported water, the Water Authority serves as a regional water planning agency to coordinate regional water issues. In this role, the Water Authority assists its member agencies (through financial, coordination, or planning support) in implementing local water planning and project development, and provides a forum for member agencies to discuss and address regional water issues. Most Water Authority member agencies maintain interagency agreements with adjoining member agencies to maximize conveyance flexibility and emergency response.

The rural eastern portion of the Region is outside the Water Authority's service area. Water service within this eastern area is provided by either onsite private wells or by small community water systems or private water companies.

Figure 3-16: Water Agency Boundaries



Legend

- Small Water Systems
- San Diego IRWM Region
- Prop 84 Funding Area Boundary
- Mexico
- Waterbody
- Freeway
- River

Map ID	Small Water System	Map ID	Small Water System
1	ALPINE OAKS ESTATES	26	NORTH PEAK MUTUAL WATER CO.
2	BARRETT HONOR CAMP	27	OAKVALE PARK
3	BARRETT LAKE MOBILEHOME PARK	28	PALOMAR MOUNTAIN MW CO.
4	BUTTERFIELD OAKS MH PARK	29	PALOMAR OBSERVATORY
5	CAMP CUYAMACA	30	PAUMA VALLEY MUTUAL WATER CO.
6	CAMPO ELEMENTARY SCHOOL	31	PHOENIX HOUSE
7	CUYAMACA WATER DISTRICT	32	PINE VALLEY BIBLE CONF. CENTER
8	DEL DIOS MUTUAL WATER CO.	33	PINE VALLEY TRAILER PARK
9	DESCANSO DETENTION FACILITY	34	POTRERO ELEMENTARY SCHOOL
10	DIAMOND JACK'S RV RANCH	35	RANCHO CORRIDO RV RESORT
11	DUDLEY'S BAKERY	36	RANCHO DEL CAMPO WATER SYSTEM
12	GUATAY MUTUAL BENEFIT CORP.	37	RANCHO ESTATES MUTUAL WATER CO
13	H & J WATER CO.	38	RANCHO SANTA TERESA MW CO.
14	HARBISON CANYON ESTATES	39	RICHARDSON BEARDSLEY PARK INC.
15	HEAVENLY OAKS	40	SAN PASQUAL ACADEMY
16	JULIAN YOUTH ACADEMY	41	SPENCER VALLEY SCHOOL
17	LAKE HENSHAW WATER CO.	42	STUART WATER CO.
18	LAKE MORENA TRAILER RESORT	43	SUNRISE ESTATES MW CO.
19	LAKE MORENA VIEWS MW CO.	44	TECATE VISTA MUTUAL WATER CO.
20	LAKE WOHLFORD RESORT	45	TWIN LAKES RESORT
21	LAZY H MUTUAL WATER CO.	46	WARNER SPRINGS RANCH
22	LIVE OAK SPRINGS WATER COMPANY	47	WARNER UNIFIED SCHOOL DIST.
23	LOS TULES MUTUAL WATER CO.	48	WILLOWSIDE TERRACE WATER ASSOC
24	MOUNT LAGUNA IMPROVEMENT ASSN.	49	WYNOLA WATER DISTRICT
25	MOUNTAIN EMPIRE HIGH SCHOOL	50	YMCA CAMP MARSTON/RAINTREE

N

0 2.5 5 10
Miles

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County of San Diego, Department of Environmental Health, Small Water Systems dataset, San Diego County Water Authority Member Agencies, Available: http://www.sangis.org/Download_GIS_Data.htm
** The City of National City and South Bay Irrigation District have formed a joint powers authority, the Sweetwater Authority, to provide water supply within their jurisdictions.*
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-14_Water Agency Boundaries 060713.mxd

Table 3-25 presents a list of water systems within the Region that are supported by special districts or the County. In addition to the community water systems operated or supported by the County or special districts, nearly 200 mutual water companies provide water service (derived from local groundwater supply) to small communities within the Region. Table 3-26 presents mutual water companies within the Region that serve more than 200 service connections.

Tribal Nations within the Region are generally located on lands east of the Water Authority's service area and are dependent on local sources of water (primarily groundwater). The Rincon Band of Indians receives deliveries from Lake Henshaw, which stores both natural runoff and groundwater pumped from the Warner Basin. Their share of deliveries from Lake Henshaw is dependent on hydrologic conditions, as the groundwater is reserved for Vista Irrigation District and the City of Escondido.

Table 3-25: District-Operated Water Systems outside the Water Authority Service Area with More Than 200 Connections

HU[1]	Watershed	District	Community	Number of Connections[2]	Water Source
903	San Luis Rey River	Mootamai Municipal Water District	Pala-Pauma	0[3]	Local groundwater
		Pauma Municipal Water District	Pala-Pauma	0[4]	Local groundwater
		San Luis Rey Municipal Water District	Fallbrook Valley Center Pala-Pauma	0[5]	Local groundwater
905	San Dieguito River	Questhaven Municipal Water District	San Dieguito	18	Local groundwater
907	San Diego River	Cuyamaca Water District	Cuyamaca	125	Local groundwater
		Julian Community Service District	Julian	188	Local groundwater
		Majestic Pines Community Service District[6]	Julian	695[6]	Local groundwater
		Wynola Water District	Julian/Wynola	63	Local groundwater
909	Sweetwater	Descanso Community Service District	Descanso	315	Local groundwater
911	Tijuana River	County of San Diego (Campo Water and Sewer Maintenance District)	Campo	45	Local groundwater

1 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
2 Estimated number of connections as of 2011, per San Diego Local Agency Formation Commission (2011).
3 The Mootami Municipal Water District does not directly provide water. The district's operations are limited to protection of groundwater and riparian water sources. Water users within the district are served by privately-owned Pauma Valley Water Company or private wells.
4 The Pauma Municipal Water District does not directly provide water. The district manages water rights protection efforts and coordinates engineering activities related to water supply. All water within the district is obtained from private wells.
5 The San Luis Rey Municipal Water District is not authorized to provide water. The district funds activities to protect water and water storage rights of private owners.
6 A portion of the Majestic Pines Community Service District is within the Colorado River Basin, and is located outside the IRWM Plan region. Data are not available on the number of these customers that are inside the Region's boundaries.

Table 3-26: Mutual Water Company Systems outside the Water Authority Service Area[1]

HU[2]	Watershed	Water Company	Community	Number of Connections	Water Source
903	San Luis Rey River	Rancho Pauma Mutual Water Company	Pala-Pauma	396[3]	Local groundwater
907	San Diego River	Pine Hills Mutual Water Company	Julian/Pine Hills	465[4]	Local groundwater
		Pine Valley Mutual Water Company	Pine Valley	691[5]	Local groundwater
911	Tijuana	Lake Morena Oak Shores Mutual Water Company	Lake Morena	205[6]	Local groundwater

1 Mutual water companies with more than 200 service connections servicing areas outside the Water Authority service area. Water systems with more than 200 service connections are regulated by the California Department of Public Health.
2 Numerical watershed (hydrologic unit) designation per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
3 Pauma Valley Community Services District. Available: http://www.paumavalleycsd.com/waterdist.php. Accessed 14 May 2013.
4 Number of people served. Total number of connections not available. New York Times.16 May 2012. Available: http://projects.nytimes.com/toxic-waters/contaminants/ca/san-diego/ca3700905-pine-hills-mututal-water-company. Accessed 14 May 2013.
5 Pine Valley Mutual Water Company. Available: http://www.pinevalleywater.org/company-history.html. Accessed 14 May 2013
6 *2007 San Diego IRWM Plan.* Available: http://sdirwmp.org/2007-irwm-plan

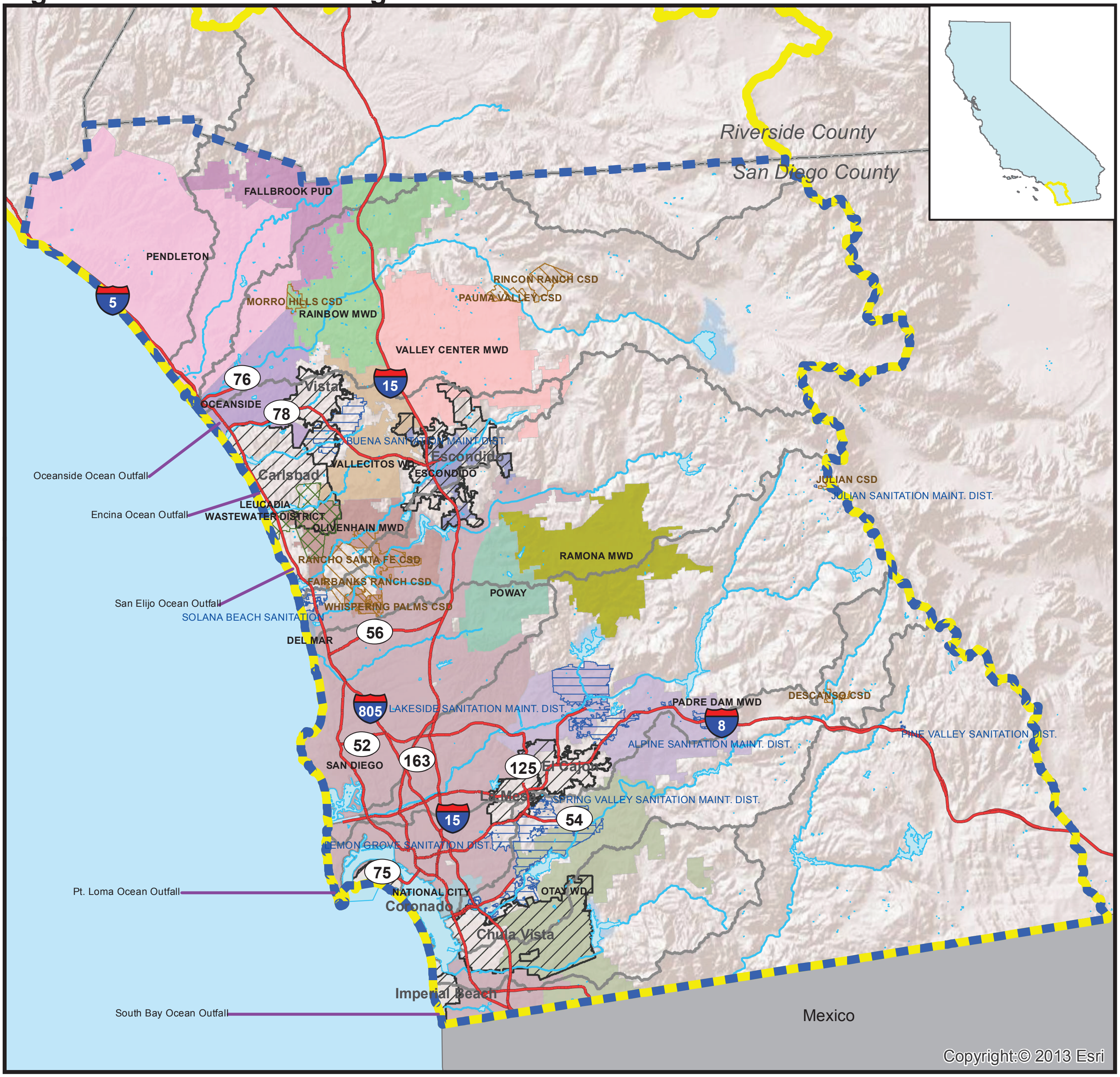
3.6.3 Wastewater Agencies

Municipalities and special districts provide wastewater service within the urbanized portion of the Region. Figure 3-17 presents wastewater agencies within the Region.

Section 3.5.4 presents a general description of the Region's wastewater infrastructure. The Region's urban wastewater agencies have organized (both through the formation of joint powers authorities and through interagency contracts) into five multi-jurisdictional wastewater systems based around the Region's five deep-water ocean outfalls. These include:

1. *Oceanside Ocean Outfall*. Fallbrook Public Utility District and USMC Base Camp Pendleton (southern portion of the base) have connected to the City of Oceanside system (via contract) to form an interconnected regional wastewater system in North San Diego County.
2. *Encina Ocean Outfall*. North County agencies that comprise the Encina Wastewater Authority (a joint powers authority [JPA]) include the Buena Sanitation District, City of Carlsbad, City of Encinitas, Leucadia County Water District, Vallecitos Water District, and City of Vista.
3. *San Elijo Ocean Outfall***.** The City of Escondido and San Elijo JPA jointly own the San Elijo Ocean Outfall. The San Elijo JPA is comprised of the City of Solana Beach, Cardiff Sanitation District, Olivenhain Municipal Water District, and Rancho Santa Fe Community Services District.
4. *Point Loma Ocean Outfall*. The Metropolitan Wastewater Sewer is operated by the City of San Diego on behalf of the Cities of Chula Vista, Coronado, Del Mar, El Cajon, Imperial Beach, La Mesa, National City, Poway, and San Diego, San Diego County, the Otay and Padre Dam Water Districts, and the East Otay, Lemon Grove, Alpine, Lakeside, Spring Valley, and Winter Gardens Sanitation Districts. *Note*: the City of Chula Vista is not a member of the JPA but receives wastewater service through the Metropolitan Wastewater System.
5. *South Bay Ocean Outfall*. The City of San Diego and the U.S. Government jointly own the South Bay Ocean Outfall.

Figure 3-17: Wastewater Agencies



Legend

- San Diego IRWM Region
- Prop 84 Funding Area Boundary
- Community Service Districts
- Cities
- Sanitation Districts
- Waterbody
- Freeway
- River

N

0 2.5 5 10
Miles

San Diego County Water Authority Member Agencies, Community Service Districts & Sanitation Districts, Available: http://www.sangis.org/Download_GIS_Data.htm
Note: City utility districts are based on their municipal boundaries. Data to show their actual sanitation district boundaries do no currently exist, so there may be some overlap.
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-15_Wastewater Agency Boundaries.mxd

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In addition to the integrated wastewater systems listed above, a number of the Region's wastewater and recycled water agencies have entered into agreements to construct and operate joint facilities, share use of facilities owned by one or more entities, purvey recycled water to one another, address wastewater and recycled water service areas and responsibilities, share or assign industrial waste pretreatment responsibilities, conduct required monitoring, and mutually share resources during emergencies.

Special service districts provide wastewater service in less urbanized areas of the Region, including the communities of Whispering Palms, Valley Center, Fairbanks Ranch, Ramona, Rancho Santa Fe, and Pauma Valley. Sanitation districts operated by the County provide wastewater service to such inland communities as Julian, Pine Valley, and Campo. Local Tribes provide wastewater service within their respective reservation boundaries. Wastewater service outside of these districts is provided by onsite wastewater (septic) systems.

3.6.4 Stormwater Agencies

As noted previously, the MS4 Permit (Order No. R9-2013-0001) regulates stormwater, non-stormwater, and urban runoff within the Region. The current MS4 Permit (adopted in May 2013 and amended in 2015) shifts the emphasis of stormwater management more to watersheds. Copermittees implement stormwater programs on a watershed basis following the boundaries of the Watershed Management Areas (WMAs). Each Copermittee is responsible for operating its own stormwater/urban runoff management program, consistent with the approved WQIPs, within its respective jurisdiction.

The 21 Copermittees from the San Diego IRWM Region named in the MS4 Permit include:

- City of Carlsbad
- City of Chula Vista
- City of Coronado
- City of Del Mar
- City of El Cajon
- City of Encinitas
- City of Escondido
- City of Imperial Beach
- City of La Mesa
- City of Lemon Grove
- City of National City
- City of Oceanside
- City of Poway
- City of San Diego
- City of San Marcos
- City of Santee
- City of Solana Beach
- City of Vista
- County of San Diego
- San Diego Unified Port District
- San Diego County Regional Airport Authority

In 2004, the County formed Project Clean Water (www.projectcleanwater.org) to address region-wide watershed issues through participation of a broad range of governmental agencies, non-governmental agencies, and regulators. As part of Project Clean Water, the Technical Advisory Committee (TAC) was formed in 2004 to discuss and coordinate a range of watershed planning and implementation issues. The TAC is also providing substantial input on the 2018 Stormwater Capture and Use Feasibility Study, currently under development by the County. Interim deliverables for the Stormwater Capture and Use Feasibility Study are hosted on the Project Clean Water website (http://www.projectcleanwater.org/stormwater-capture-and-use-feasibility-study/).

Previous versions of the MS4 permit listed the County as Principal Permittee. In this role, the County coordinated with the County's 18 municipalities, the Unified Port District, and the Regional Airport Authority in the development and implementation of stormwater monitoring programs and plans. Starting with the 2013 MS4 permit, the role of Principal Permittee was eliminated, and subsequent amendments to the permit incorporated all 39 agencies in Regional Water Quality Control Board Region 9 (this includes Copermittees from San Diego County, south Riverside County, and south

Orange County) into the same permit. Copermittees are required to organize on a watershed scale for coordination and planning of stormwater programs via WQIPs developed for each watershed. However, given the nature of water management and jurisdictions in the Region and the fact that regional coordination on stormwater management will continue to be critical, the County continues to play a central role in facilitating coordination of stormwater management.

3.6.5 Flood Control Agencies

The San Diego County Flood Control District (FCD) is the key flood control agency in the County. The FCD (which is governed by the elected Supervisors of the County) establishes flood policies, maintains flood control facilities, operates a regional flood warning system, and is charged with protection of watercourses, watershed management, and protection of water quality.

The different agencies responsible for floodplain management within the region include:

- County of San Diego
- City of Carlsbad
- City of Chula Vista
- City of Coronado
- City of Del Mar
- City of El Cajon
- City of Encinitas
- City of Escondido
- City of Imperial Beach
- City of La Mesa
- City of Lemon Grove
- City of National City
- City of Oceanside
- City of Poway
- City of San Diego
- City of San Marcos
- City of Santee
- City of Solana Beach
- City of Vista

The FCD's role is to provide for the control of the flood and storm waters of the District, and of the flood and storm waters that flow into the District. The FCD's role also includes preserving such waters for beneficial use such as water supply, groundwater percolation, recreation, and environment, and to protect the land, properties, facilities, and people within the District from damage caused by storm and flood waters. The FCD has an adopted Floodplain Management Plan for the County unincorporated area which assesses the flood hazards, summarizes the current flood management program, describes mitigation strategies, and provides a future action plan (FCD, 2007).

North end of El Capitan Reservoir, showing flooded trees.
Photo credit: Jeff Pasek, City of San Diego

As listed above, the eighteen cities within the Region also have floodplain management responsibilities, which are similar to those of the FCD, but are only applied within that city's jurisdictional boundaries. Although the FCD spans the entire unincorporated portion of the County, no single entity within the Region currently coordinates floodplain management between the different floodplain managers.

3.6.6 Groundwater Management Agencies

Under the Sustainable Groundwater Management Act of 2014 (SGMA), water supply agencies that use a medium or high priority groundwater basin are required to form Groundwater Sustainability Agencies (GSAs) to develop comprehensive Groundwater Sustainability Plans (GSPs). Within the San

Diego IRWM Region, are four medium priority groundwater basins and three GSAs. All other groundwater basins in the Region are designated as "Very Low" priority and are not currently organized under SGMA. Table 3-27 identifies the groundwater basins for which a GSA has formed, as well as which entities are members of the GSA. *Section 3.5.6* contains additional detail on the groundwater basins located within the Region.

Table 3-27: Groundwater Sustainability Agencies in the San Diego IRWM Region

Groundwater Basin	CASGEM Priority	Designated Monitoring Entity	GSA Name	GSA Members
Santa Margarita Valley	Medium[1]	USMCB Camp Pendleton	-	-
San Luis Rey Valley[2]	Medium	County of San Diego	Pauma Valley GSA	County of San Diego, Pauma Valley Community Services District, Yuima Municipal Water District, and Upper San Luis Rey Resource Conservation District
San Pasqual Valley	Medium	City of San Diego	San Pasqual Valley GSA	County of San Diego and City of San Diego
San Diego River Valley	Medium[1]	City of San Diego	San Diego River Valley GSA	County of San Diego, City of San Diego, Lakeside Water District, and Padre Dam Municipal Water District

1 Draft Prioritization List released by DWR in May 2018 reclassified these basins as Very Low priority.
2 At the time of this writing, July 2018, Senate Bill AB 1994 was being considered by the California State Legislature. AB 1994 would divide the San Luis Rey Valley Groundwater Basin into an upper and lower subbasin, each of which would be designated as medium priority under CASGEM.

3.6.7 Environmental Organizations

In addition to the above-noted federal land managers, many private foundations and conservancies have been established within the Region to preserve lands and to provide environmental management of conserved lands. Foundations or conservancies that provide environmental management of lagoons include: Batiquitos Lagoon Foundation, Buena Vista Lagoon Foundation, Agua Hedionda Lagoon Foundation, San Elijo Lagoon Conservancy, Los Peñasquitos Lagoon Foundation, and San Dieguito River Valley Land Conservancy.

Additional conservancy groups involved in conservation, research, resource conservation, and/or environmental management, in part, include: CoastKeeper, Southern California Coastal Water Research Project (SCCWRP) San Diego Task Force, The Nature Conservancy, Trust for Public Land, Escondido Creek Conservancy, Cottonwood Creek Conservancy, Fallbrook Land Conservancy, Bonsall Conservancy, Preserve Calaveras, Iron Mountain Conservancy, Back Country Land Trust, San Diego River Park Foundation, San Diego River Conservancy, Lakeside River Park Conservancy, Groundwork San Diego-Chollas Creek, Living Coast Discovery Center, San Diego Habitat Conservancy, and Resource Conservation District of Greater San Diego County. The San Diego Conservation Resources Network is a network that assists in coordinating efforts among the Region's conservancy groups.

Finally, as climate change science has evolved, the San Diego IRWM Program has connected with climate change organizations, including the Climate Science Alliance and San Diego Regional Climate Collaborative, which work to build a network of scientists, leaders, educators, artists, and others to expand understanding of the effects of climate change on the Region. The San Diego IRWM Program has recently begun participating in dialogues about adaptation and mitigation strategies to address these impacts, specifically as they affect water resources.

3.7 Water Quality

The following sections focus on water quality for the Region's various water resources. Water quality management and regulations pertaining to stormwater are described above in *Section 3.5.8*. Per Assembly Bill (AB) 1249, nitrate, arsenic, perchlorate, and hexavalent chromium are considered priority contaminants. Of the four constituents called out in AB 1249, nitrate is identified as an issue in the Carlsbad Watershed for surface water and the San Juan, San Luis Rey River, and San Dieguito River Watersheds for groundwater. Perchlorate was identified as an issue in the Tijuana River Watershed surface water.

3.7.1 Imported Water Quality

Imported water provided to the Water Authority by Metropolitan is a blend of water from the SWP and Colorado River. The quality of imported supply provided at any time is a function of hydrologic conditions in Northern California and the Colorado River basin, and the blend of water between the two sources.

Total Dissolved Solids (TDS) concentrations in the Colorado River supply have varied significantly during the past 30 years depending on hydrologic conditions. Peak TDS concentrations in the Colorado River supply have exceeded 900 milligrams per liter (mg/L) during sustained years of below-normal runoff within the basin, while TDS concentrations approaching 525 mg/L have occurred after sustained years of above-normal runoff. Colorado River TDS concentrations have averaged approximately 650 mg/L under normal water years (Water Authority 2016a). During the recent drought, however, TDS levels at Lake Havasu on the Colorado River reached 626 mg/L (June 2015), and imported water purchased from Metropolitan exceeded its salinity objective of 500 mg/L from 2013-2015 (Metropolitan, 2016).

SWP supplies typically comprise a smaller percentage of the imported supply provided to the Water Authority, but TDS concentrations in the SWP supply are typically lower than those of Colorado River supplies, historically ranging from more than 425 mg/L to less than 300 mg/L.

While SWP supplies have lower TDS concentrations than Colorado River supplies, concentrations of nutrients (nitrogen and phosphorus) are higher in SWP supplies than in Colorado River supplies. Total nitrogen concentrations in the imported water provided by the Water Authority have ranged from 0.05 mg/L to 1.1 mg/L (as N), with the low values occurring during times when Colorado River supplies comprise a significant portion of the Region's imported supply (Flow Science, 2012). Total phosphorus concentrations in the imported supply have ranged from less than 0.005 mg/L to 0.08 mg/L (Flow Science, 2012).

Of the priority contaminants identified in AB1249, only arsenic is detected in imported water with any consistency. Arsenic in Colorado River supplies range from not detected to 3.5 mg/L, which can be further reduced during treatment. SWP supplies have detected slightly higher levels of arsenic, from not detected to 4.0 mg/L. The greatest source of arsenic in imported water is suspected to be from the use of groundwater storage, as arsenic can be naturally occurring in some water-bearing formations. Elevated arsenic associated with groundwater can be managed through treatment before delivery to customers, as well as blending with supplies lower in arsenic. Perchlorate levels in imported supplies are generally low, with levels not detected in Colorado River supplies since 2012. Chromium-6 is monitored by Metropolitan but has not been detected at levels high enough to require reporting in its Colorado River supplies (Water Authority, 2016a).

3.7.2 Surface Water Quality

Designated Beneficial Uses

The Basin Plan designates beneficial uses for streamflow and surface waters, coastal waters, and reservoir and lake resources within the Region's eleven watersheds. Appendix 3-A presents these beneficial use designations as documented in the Basin Plan for each watershed. The Basin Plan also designates wildlife habitat, water contact recreation, and non-contact recreation of surface waters as beneficial uses within each of the watersheds. Additionally, portions of each of the eleven watersheds have been designated as warm-water or cold-water aquatic habitats. Municipal, agricultural, and industrial supplies are designated as beneficial uses of surface waters within ten of the eleven watersheds.

Surface Water Quality Standards

The Basin Plan (San Diego Water Board, 1994) establishes numeric and narrative water quality objectives to protect designated beneficial uses of inland surface waters and coastal waters. Appendix 3-B presents Basin Plan numerical water quality objectives for the Region. The Basin Plan establishes numeric water quality objectives for TDS, mineral constituents, and turbidity on a watershed-by-watershed basis within the Region. The Water Quality Objective for TDS for surface waters is set at 500 mg/L (the state and federal secondary drinking water standard) in most watersheds, but TDS objectives range from as low as 300 mg/L in the upper reaches of the San Diego River Watershed to as high as 2,100 mg/L in the downstream reach of the Tijuana River Watershed.

Basin Plan Surface Water Nutrient Standards

The San Diego Regional Board is the only one of the nine California Regional Boards to interpret narrative Basin Plan Objectives as numerical concentration standards for nitrogen and phosphorus in surface waters. The San Diego Basin Plan standard for phosphorus is 0.025 mg/L for standing bodies of water and 0.05 mg/L for flowing waters. The original 1976 San Diego Region Basin Plan cited historic nutrient-related biostimulation impacts to San Diego County's coastal lagoons as part of the justification for establishing the numerical phosphorus and nitrogen standards. The 1976 nutrient standards have been maintained in the current (1994) version of the Basin Plan. However, the San Diego Regional Board has indicated that they may consider narrative interpretation of nutrient objectives in the future.

As shown in Appendix 3-B, water quality objectives that apply to the entire region are established for total and fecal coliform bacteria, nutrients (total nitrogen and total phosphorus), pH, dissolved oxygen, and unionized ammonia. The Basin Plan establishes a region-wide phosphorus standard of 0.025 mg/L for standing bodies of water, and a phosphorus standard of 0.05 mg/L for flowing waters.

A narrative objective for biostimulatory substances defines total nitrogen standards at a 10:1 ratio to the total phosphorus limits; however, as indicated above, the San Diego Water Board currently interprets these narrative objectives as numerical concentration standards. As a result of the 2014 Basin Plan Triennial Review, the San Diego Water Board is working to incorporate watershed-wide narrative biological objectives for water bodies, in addition to numeric measures to interpret the narrative objective based on water body type.

Water quality objectives for toxic organic and toxic inorganic constituents are established at the corresponding state and federal drinking water standards for waters designated as municipal supply. The San Diego Water Board also implements the Water Quality Criteria for Priority Toxic Pollutants for California Inland Surface Waters, Enclosed Bays and Estuaries, also known as the California Toxics Rule (CTR), established by the U.S. Environmental Protection Agency in Title 40 §141.38 of the Code of Federal Regulations. The CTR establishes numeric criteria for cyanide, metals, and toxic organic constituents (EPA, 2002).

The State Board established water quality objectives for ocean waters in the *Water Quality Control*

Plan for Ocean Waters of California (Ocean Plan). The Ocean Plan establishes receiving water standards for total coliform, fecal coliform, toxic inorganic constituents, and toxic organic constituents.

In addition to complying with statewide regulations, the Region has recognized the need to improve surface water quality, especially within the Region's reservoirs given the important role that those reservoirs play in regional water supply reliability. Due to its concern for the water quality of its reservoirs, the City of San Diego prepared the *Source Water Protection Guidelines for New Developments* (Guidelines) in 2004. The Guidelines were prepared to assist municipal agencies, designers, land planners, developers, and laypersons in conducting site design planning and select best management practices (BMPs) that protect or improve the quality of runoff draining into the reservoirs. The Guidelines provide a stepwise, simplified BMP selection process to ensure that preferred source water protection BMPs are considered when designing new developments. Although the use of the Guidelines is voluntary, the guidance is consistent with state and local stormwater permit requirements, as well as local planning protocols.

Section 303(d) Listed Waters

Per Section 303(d) of the Clean Water Act, the San Diego Water Board and State Board are required to identify waters that do not meet applicable water quality objectives. Waters not attaining applicable water quality objectives are deemed to be "impaired" water bodies. Appendix 3-C presents 303(d) impaired water body listings for the Region's streams and rivers (Table C-1), lakes and reservoirs (Table C-2), and coastal/marine waters (Table C-3 and Table C-4). Figure 3-18 shows the location of impaired water bodies within the region.

Table 3-28 summarizes 303(d) listings for inland surface waters of the Region. As shown in this table, 72 inland surface water bodies are currently designated as not attaining applicable water quality objectives (State Board, 2014). 303(d)-listed impaired inland surface waters are found in each of the Region's eleven watersheds. Two watersheds have waters impaired by one of the priority constituents identified by AB1240: Carlsbad Watershed for nitrate and Tijuana River Watershed for perchlorate. Refer to Appendix 3-C for a complete listing of impaired waters.

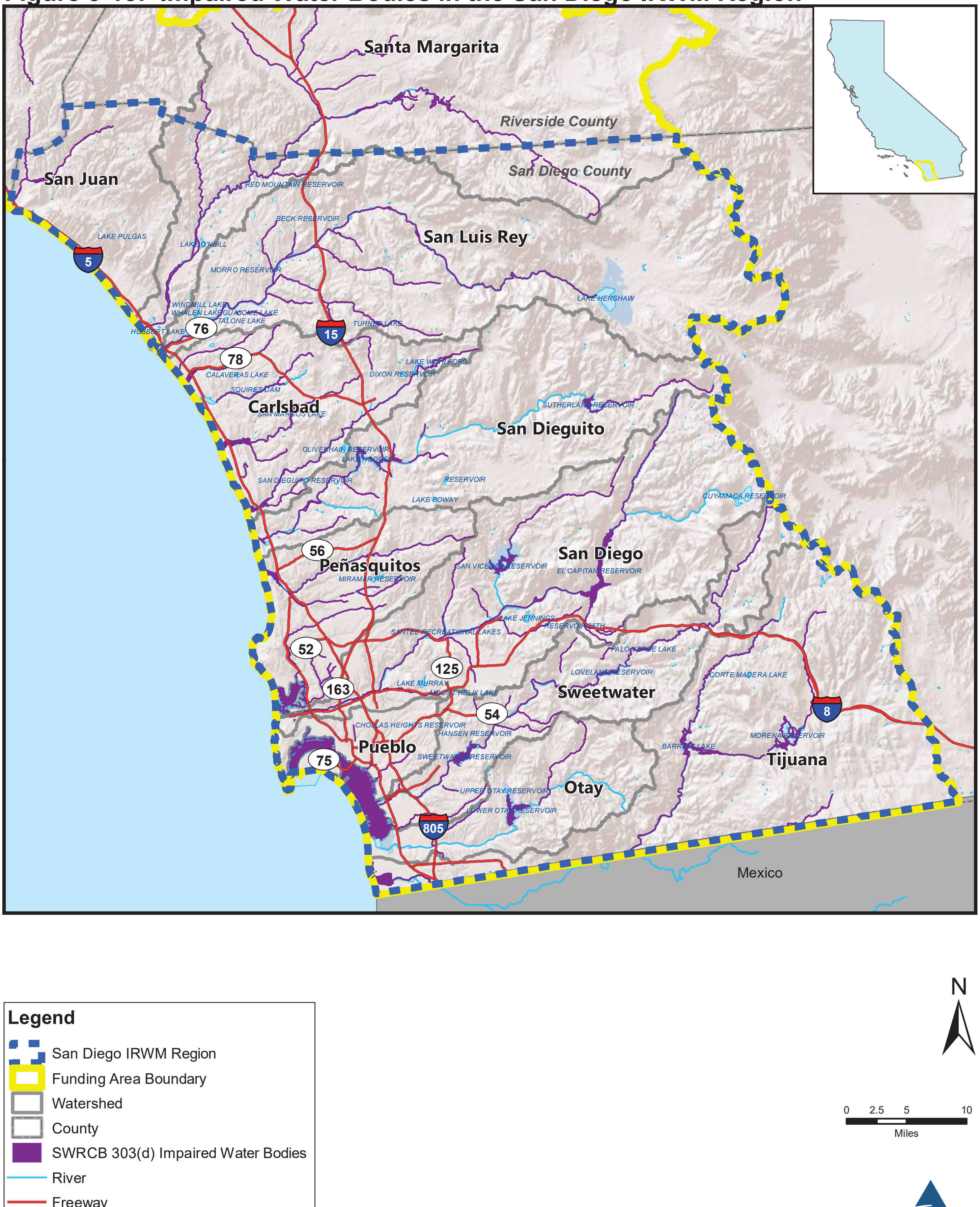
303(d) Impairment and Imported Water Reservoirs

A number of the Region's reservoirs are predominantly used for imported water storage, including Miramar, San Vicente, Murray, Jennings, and Sweetwater, and Otay Reservoirs. The Regional Board has listed several of the imported water storage reservoirs (see Appendix 3-C) as being on the State's 303(d) list of impaired water bodies for exceedance of water quality objectives that are based on drinking water secondary standards (MCLs); specifically for color, manganese, pH, iron, sulfate, and chloride. These listings require that TMDLs be developed to assure attainment of drinking water secondary standards in the reservoirs themselves. These goals cannot be achieved as many of these exceedances are the result of natural conditions.

While local water suppliers agree that water at the tap should be regulated and treated so that it complies with the secondary standards at the point of use, enforcing drinking water secondary standards in the environment does not enhance beneficial uses within these water bodies nor does it improve the quality of municipal water supply at the tap. Maintaining water quality in these reservoirs at levels which occur naturally would balance costs (both economic and environmental) with benefits to beneficial uses.

Lower Otay Reservoir
Photo Credit: Jeff Pasek, City of San Diego

Figure 3-18: Impaired Water Bodies in the San Diego IRWM Region



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Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
\\rmcsd\RMCSD\Projects GIS\0188-003 SDIRWM Plan Update\AdminDraftMaps\060713_JD\Fig3-1_Overview of Regions Watersheds_060713.mxd

Table 3-28: Summary of 303(d) Listings for Inland Surface Waters[1]

HU	Watershed	# of Listed Streams & Rivers[1,2]	# of Listed Reservoirs & Lakes[1,3]	Impaired Water Parameters within Listed Streams, Rivers, Lakes or Reservoirs[1,4]		
901	San Juan	10	0	• Benzo(b)fluoranthene • Cadmium • Chloride • DDE • Diazinon • Dieldrin	• Indicator bacteria • Nickel • Nitrogen • Phosphorus • Sediment toxicity	• Selenium • Sulfates • Total dissolved solids • Toxicity • Turbidity
902	Santa Margarita River	11	0	• Chlorpyrifos • Copper • Diazinon • E. Coli • Enterococcus	• Fecal coliform • Iron • Manganese • Nitrogen	• Phosphorus • Sulfates • Total dissolved solids • Toxicity
903	San Luis Rey River	3	1	• Chloride • Enterococcus • Eutrophic	• Fecal coliform • Nitrogen • Phosphorus	• Selenium • Total dissolved solids • Toxicity
904	Carlsbad	8	1	• Ammonia • DDE • DDT • Enterococcus • Fecal coliform • Manganese	• Nitrate and nitrite • Nitrogen • Nutrients • Phosphate • Phosphorus	• Sediment toxicity • Selenium • Sulfates • Total dissolved solids • Toxicity
905	San Dieguito River	6	2	• Aluminum • Chloride • Color • Enterococcus • Fecal coliform • Iron	• Manganese • Mercury • Total Nitrogen as N • Pentachlorophenol • pH	• Phosphorus • Sulfates • Total dissolved solids • Toxicity • Turbidity
906	Peñasquitos	5	1	• Cadmium • Copper • Enterococcus • Fecal coliform • Indicator bacteria	• Lead • Nitrogen • Phosphorus • Sediment toxicity • Selenium	• Total dissolved solids • Toxicity • Turbidity • Zinc
907	San Diego River	5	3	• Ammonia • Benthic community effects • Chloride • Color • Dissolved oxygen	• Enterococcus • Fecal coliform • Manganese • Total Nitrogen as N • pH	• Phosphorus • Selenium • Sulfates • Total dissolved solids • Toxicity
908	Pueblo	3	0	• Copper • Diazinon • Indicator bacteria	• Lead • Phosphorus • Nitrogen	• Trash • Zinc
909	Sweetwater River	3	2	• Aluminum • Dissolved oxygen • Enterococcus • Fecal coliform	• Manganese • Nitrogen • pH • Phosphorus	• Selenium • Total dissolved solids • Toxicity
910	Otay	2	1	• Ammonia • Color • Iron	• Manganese • Nitrogen	• pH • Toxicity
911	Tijuana River	4	2	• Ammonia • Color • Dissolved oxygen • Eutrophic • Indicator bacteria • Manganese • Nitrogen	• Perchlorate • Pesticides • pH • Phosphorus • Sediments • Selenium • Solids	• Surfactants • Synthetic organics • Toxicity • Trace elements • Trash • Turbidity

1 SWRCB *2014 and 2016 California Integrated Report, Clean Water Act Section 303(d) List and 305(b) Report* (2017), approved by USEPA April 2018.
2 See Appendix C-3 (Table C-1) for rivers and streams listed as 303(d) impaired within the Region.
3 See Appendix C-3 (Table C-2) for reservoirs and lakes listed as 303(d) impaired within the Region.
4 Impaired water parameters listed for at least one receiving water within the watershed. See Appendix C-3.

Appendix 3-C also presents impaired water body listings for coastal and marine waters. Each of the Region's eleven watersheds contains at least one coastal water or beach segment that is currently listed as impaired within the Region. None of these coastal waters or beaches are listed for arsenic, nitrate, perchlorate, or hexavalent chromium.

As part of the 303(d) impaired water designations, the San Diego Water Board establishes priorities for conducting TMDL evaluations to identify and implement required actions to bring the water bodies into compliance with applicable standards. Table 3-29 summarizes TMDLs that have been adopted by the San Diego Water Board to date. Table 3-30 summarizes TMDLs that are in progress.

Table 3-29: Adopted TMDLs

HU	Watershed	Receiving Water	Constituent	San Diego Water Board Resolution (Date of Adoption)	Effective Date[1]
901	San Juan	Baby Beach Dana Point	Indicator bacteria	R9-2008-0027 (June 11, 2008)	September 15, 2009
902	Santa Margarita River	Rainbow Creek	Nitrogen & phosphorus	R9-2005-0036 (February 9, 2005)	February 1, 2006
904	Carlsbad	Loma Alta Slough	Phosphorus	R9-2014-0020 (June 26, 2014)	Approval pending[3]
906	Peñasquitos	Los Peñasquitos Lagoon	Sediment	R9-2012-0022 (June 13, 2012)	January 21, 2014
908	Pueblo	Shelter Island	Dissolved copper	R9-2005-0019 (February 9, 2005)	December 2, 2005
		Shelter Island Shoreline Park	Indicator bacteria	R9-2008-0027 (June 11, 2008)	September 15, 2009
		Chollas Creek	Diazanon	R9-2002-0123 (August 14, 2002)	September 11, 2003
		Chollas Creek	Copper, lead, zinc	R9-2007-0043 (June 13, 2007)	October 22, 2008
Various		Project I beaches & creeks[2]	Indicator bacteria	R9-2010-0001 (February 10, 2010)	April 4, 2011

1 After San Diego Water Board approval, the TMDL is approved by the State Water Resources Control Board, State of California Office of Administrative Law), and U.S. EPA. After EPA approval, the effective date of the TMDL becomes the date the TMDL was approved by the California Office of Administrative Law.

2 Includes Pacific Ocean shorelines in the San Joaquin Hills Hydrologic Subarea (901.11), Laguna Beach Hydrologic Subarea (902.12), Aliso Hydrologic Subarea (901.13), and Dana Point Hydrologic Subarea (901.14); Aliso Creek and mouth of Aliso Creek Estuary (901.13); San Juan Creek and mouth of San Juan Creek Estuary (901.27); Pacific Ocean shorelines at the Lower San Juan Hydrologic Subarea (901.27), San Clemente Hydrologic Area (901.3), San Luis Rey Watershed (903.0), San Marcos Hydrologic Area (904.5), San Dieguito Watershed (905.0), and Miramar Reservoir Hydrologic Area (906.1), and Scripps Hydrologic Area (906.3); Tecolote Creek (906.5), Forrester Creek (907.12), Lower San Diego River (907.11/907.12), Pacific Ocean shoreline in the San Diego Watershed (907.0), and Chollas Creek (908.22).

3 Loma Alta Slough is subject to an "alternative" TMDL, in which the MS4 permit is being used to achieve water quality objectives.

Table 3-30: Summary of TMDLs in Progress[1]

HU	Watershed	Receiving Water	Pollutants to be Addressed in TMDLs
902	Santa Margarita River	Santa Margarita River Lagoon	• Nutrients
904	Carlsbad	Loma Alta Slough	• Bacteria • Nutrients
		Pacific Ocean shoreline at Loma Alta Creek	• Bacteria
		Buena Vista Lagoon	• Bacteria • Nutrients • Sediments
		Pacific Ocean shoreline at Buena Vista Creek	• Bacteria
		Lower Agua Hedionda Creek	• Bacteria
		San Elijo Lagoon	• Bacteria • Nutrients • Sediments
		Pacific Ocean at San Elijo Lagoon Outlet	• Bacteria
		San Marcos Creek/Lake San Marcos (Voluntary Agreement)	• Nutrients
906	Peñasquitos	Los Peñasquitos Lagoon	• Sedimentation/ Siltation
907	San Diego River	Famosa Slough and channel	• Nutrients/ Eutrophication
908	Pueblo	Downtown anchorage	• Chlordane • PAH • PCB
		B Street/Broadway Pier	• PAH • PCB • Zinc
		Mouth of Chollas Creek	• Chlordane • PAH • PCB
		Mouth of Paleta Creek	• Chlordane • PAH • PCB
		Mouth of Switzer Creek	• Chlordane • PAH • PCB
911	Tijuana River	Tijuana River and Estuary	• Sedimentation • Trash

1 TMDLs in progress (as of April 2018), as documented on the San Diego Water Board TMDL website located at: https://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/tmdlprogress.html.

Additional Constituents of Concern

The MS4 Copermittees coordinate in the development and implementation of a regional watershed-based receiving water monitoring program. Table 3-31 summarizes highest priority water quality conditions identified in the in the 2017 Stormwater Resources Plan (SWRP). The 2017 SWRP incorporated the water quality priorities identified in the WQIPs for each of the watersheds in the San Diego region. These WQIPs reflect the priorities of the watershed as identified by stakeholders, based on understanding of water quality conditions, regulatory priorities, and stakeholder concerns.

Table 3-31: Highest Priority Water Quality Conditions[1]

HU	Watershed Management Area	Water Body	Dry Weather Priority Constituents	Wet Weather Priority Constituents
902	Santa Margarita River[2]	Santa Margarita River Estuary, Warm Springs, Redhawk Channel	• Eutrophication (elevated algal biomass)	• NA
		Rainbow Creek	• Nutrient loading to TMDL waterbody	• Nutrient loading to TMDL waterbody
		Upper and lower Santa Margarita River subareas except Vail Lake, Fallbrook Creek, and Sandia Creek	• Nutrient loading	• NA
903	San Luis Rey River	San Luis Rey River Mouth	• Bacteria	• Bacteria
		Lower San Luis Rey River	• Bacteria	• Bacteria
904	Carlsbad[4]	Loma Alta Slough	• Eutrophic (nutrients)[3]	• NA
		Agua Hedionda Creek	• Riparian Habitat Degradation • Hydromodification Impacts	• Riparian Habitat Degradation • Hydromodification Impacts
		Lower San Marcos Creek - Pacific Ocean Shoreline at Moonlight Beach	• Bacteria	• Bacteria
		Upper San Marcos Creek	• Nutrients	• Nutrients
905	San Dieguito	Pacific Ocean Shoreline at San Dieguito Lagoon Mouth	• Indicator bacteria at San Dieguito River above Lake Hodges	• Indicator bacteria at San Dieguito River above Lake Hodges • Indicator bacteria at San Dieguito River below Lake Hodges
906	Los Peñasquitos	Los Peñasquitos Lagoon	• Freshwater discharges	• Hydromodification, siltation, and sedimentation
		Pacific Ocean Shoreline at Torrey Pines State Beach at Del Mar	• Indicator bacteria (total coliform, fecal coliform, *Enterococcus*)	• Indicator bacteria (total coliform, fecal coliform, *Enterococcus*)
906	Mission Bay	Tecolote Creek Subwatershed	• Indicator Bacteria	• Indicator Bacteria
		Scripps Subwatershed	• Indicator Bacteria	• Indicator Bacteria • Sediment
907	San Diego River	Forester Creek	• Indicator Bacteria	• Indicator Bacteria
		Lower San Diego River	• *Enterococcus* • Fecal coliform	• *Enterococcus* • Fecal coliform
		Pacific Ocean Shoreline, at the San Diego River outlet, at Dog Beach	• *Enterococcus* • Total coliform	• *Enterococcus* • Total coliform
908 909 910	San Diego Bay	Chollas Creek	• Metals (dissolved copper, lead and zinc) • Bacteria	• Metals (dissolved copper, lead and zinc) • Bacteria
911	Tijuana River	Tijuana River	• NA	• Sedimentation/Siltation • Turbidity
		Tijuana Estuary	• NA	• Turbidity

1 Highest priority water quality constituents identified in the San Diego Region Storm Water Resource Plan (County of San Diego, 2017).
2 Highest Priority Water Quality constituents identified in the Santa Margarita Water Quality Improvement Plan currently pending approval by Regional Water Quality Control Board.
3 Temporal extent between May and October
4 Highest Priority Water Quality constituents identified in Carlsbad Watershed Management Area Water Quality Improvement Plan (Mikhail Ogawa Engineering, 2016)

On the basis of the 303(d) listings and region-wide monitoring programs, Table 3-32 summarizes region-wide water quality issues and constituents of concern for inland surface waters and coastal waters of the Region's eleven watersheds. Key water quality issues of interest in the Region include:

> ***Do TMDLs Address Critical Needs?***
>
> In 2010, the San Diego Regional Board adopted a TMDL for indicator bacteria at 20 beaches and creeks in the San Diego County Region (Resolution No. R9-2010-0001). The TMDL was adopted to address routine exceedances of water quality objectives for Enterococcus, fecal, and total coliform bacteria, which are indicators intended to protect primary contact recreation (REC-1) activities like swimming. Although Enterococcus and coliform bacteria are a commonly-used indicator of human pathogens, and can cause illness in recreational users, the presence of indicator bacteria in some of the TMDL's designated water bodies does not present the most critical water quality problem facing beneficial uses. In these cases, the adopted bacteria TMDL has established a de-facto priority for resource allocation within local stormwater programs. Many affected stakeholders have indicated that the implementation actions needed to comply with the TMDL during wet weather events drive costs and resources, diverting attention from other important issues. Use of alternative compliance methods rather than TMDLs would help to resolve resource allocation issues so that implementation actions truly address the most critical water quality and public health issues.

- *Indicator Bacteria*. Elevated concentrations of total or fecal coliform bacteria indicate the potential for elevated concentrations of pathogens. High concentrations of coliform bacteria resulted in beach advisories along each of the Region's watersheds. Table 3-33 summarizes beach advisories and closures during 2011-2013. Observed elevated coliform bacteria concentrations have occurred as a result of stormwater runoff, urban runoff, and sewer spills.
- *Sediment and Turbidity*. Discharges of sediment can adversely impact water clarity, wildlife habitat, and aquatic habitat. Additionally, sediment can adversely affect the hydraulics of lagoons and estuaries, decrease tidal flushing, and contribute to the transport of bacteria. Turbidity can adversely affect aquatic habitats by limiting light penetration and overall aesthetics.
- *Nutrients*. Elevated concentrations of nitrogen and phosphorus can result in algal blooms and impacts associated with emergent and submergent vegetation. Nutrients are of particular concern in watersheds that discharge to coastal lagoons and estuaries, as summer temperatures and lagoon hydraulics that limit tidal flushing may lead to algal blooms and fish kills due to decreased dissolved oxygen levels. Nutrients are also a concern in inland creek and reservoir systems for the same algal bloom concerns, which may occur due to water stagnancy. Nutrients are a concern in potable water reservoirs, as eutrophication reduces reservoir dissolved oxygen, the treatability of supplies, and taste and odor.

> ***Nutrients in Hodges Reservoir***
>
> Hodges Reservoir, a highly eutrophic reservoir, regularly experiences anoxic conditions, which causes the flux of nutrients from the sediment into the water column and reduces overall water quality. Currently, water quality at Hodges Reservoir does not meet the water quality standards to move this local surface water supply into the regional aqueduct system.

- *Salinity*. Concentrations of TDS and dissolved mineral constituents can adversely impact aquatic and wildlife habitat and the usability of waters for municipal and irrigation supply. TDS concentrations in Region surface waters vary significantly, with TDS concentrations being lower during periods of extreme flow and higher during periods of lower flow.
- *Toxic Inorganic Compounds*. Toxic inorganic compounds (e.g., metals, nitrates, cyanide, and unionized ammonia) can adversely impact aquatic habitat, wildlife habitat, and water supply

uses. As no inland point-source discharges of toxic inorganic pollutants exist within the Region, toxic inorganic compounds in the Region's surface waters can be presumed to originate from non-point sources.

- *Toxic Organic Compounds*. Toxic organic compounds (e.g., pesticides and other EPA-designated priority pollutants) can adversely impact aquatic habitat, wildlife habitat, and water supply uses. Since no inland point-source discharges of toxic organic pollutants exist within the Region, toxic organic compounds in the Region's waters can be presumed to originate from non-point sources. Toxic organic compounds that have resulted in 303(d) impairment listings within the Region include benzo(b)fluoranthene, diazanon, dieldrin, DDT, pentachlorophenol, and perchlorate.

Table 3-32: Summary of Water Quality Issues for Surface Waters

HU[1]	Water-shed	WMA	Water Quality Issues/Constituents of Concern[1]										
			Trash & Debris	Fecal Indicator Bacteria	Nutrients	Eutrophication / Dissolved Oxygen	Turbidity	Sediment	Toxic Organics / Toxicity	Metals	TDS	Index of Biotic Integrity	Pesticides
901	San Juan	San Juan		✓	✓		✓		✓	✓	✓		
902	Santa Margarita River	Santa Margarita River		✓	✓						✓		
903	San Luis Rey River	San Luis Rey River		✓	✓	✓			✓			✓	
904	Carlsbad	Carlsbad	✓	✓	✓	✓		✓	✓		✓	✓	
905	San Dieguito River	San Dieguito		✓	✓	✓			✓	✓	✓		
906	Peñasquitos	Los Peñasquitos; Mission Bay		✓	✓	✓	✓	✓	✓	✓	✓		
907	San Diego River	San Diego River		✓	✓	✓					✓	✓	
908	Pueblo[2]	San Diego Bay	✓	✓	✓			✓		✓			✓
909	Sweetwater[2]	San Diego Bay	✓	✓	✓			✓					
910	Otay[2]	San Diego Bay			✓			✓					
911	Tijuana River	Tijuana River	✓	✓	✓	✓	✓	✓			✓		✓

1 Constituent category is either listed as 303(d) impaired within the watershed (see Table 3-28 and Appendix C), or is identified as a high priority wet-weather or dry-weather constituent (see Table 3-31) as part of the 2017 San Diego Region Storm Water Resource Plan (County of San Diego, 2017).
2 Pueblo, Sweetwater, and Otay are monitored and assessed separately, but are all a part of the San Diego Bay Watershed Management Area.

Table 3-33: Summary of Beach Advisory and Closures, 2009-2013[1]

Parameter	Year				
	2013	2012	2011	2010	2009
Total number of samples	3,868	3,501	3,523	3,493	3,905
Number of beach monitoring stations	79	76	90	87	95
Closures					
Tijuana River beach closure days[2]	11	15	218	266	112
Sanitary sewer overflow (SSO) closure days[3]	2	7	67	61	23
Total closure days	13	22	285	327	135
Advisory Days					
Rain advisory days[4]	8	10	70	70	30
Bacterial exceedance advisories[5]	61	27	117	163	254
Precautionary advisory days[6]	12	5	30	40	24
Total advisory days	81	42	217	273	308

1 From San Diego County Department of Environmental Health Annual Beach Monitoring Summaries, 2009-2013.
2 Closure due to Tijuana River flow that may impact or threaten to impact beach water quality.
3 Closure due to reported sewage spill that may impact or threaten to impact beach water quality.
4 Advisory to refrain from water contact within 72 hours of precipitation runoff.
5 Advisory due to exceedance of body contact recreation (REC-1) bacteriological standards.
6 Advisory due to lagoon outlet excavations or localized runoff/discharges that may impact or threaten to impact beach water quality.

3.7.3 Wastewater Quality

Wastewater from municipal agencies within the Region in excess of recycled water demands is treated via secondary treatment and discharged through regional ocean outfalls. Secondary treatment standards require treatment to achieve a monthly average TSS and BOD concentrations of 30 mg/L, but most of the Region's wastewater plants produce secondary effluent that contains concentrations significantly below these limits.

The City of San Diego currently has a Clean Water Act Section 301(h) waiver from secondary treatment requirements for its Point Loma WWTP. Advanced primary treatment at Point Loma WWTP achieves an average TSS concentration of approximately 35 mg/L, slightly above the mandated federal limit. The Metropolitan Sewer System, however, is required to implement additional pretreatment to ensure that concentrations of toxic organic and inorganic pollutants in the Point Loma WWTP discharge are equivalent to secondary treatment.

The Region's ocean outfalls are described in *Section 3.6.3*. All of the Region's ocean outfall discharges comply with California Ocean Plan receiving water standards for toxic constituents. The City of San Diego's Ocean Monitoring Program monitors 120 square miles of ocean for the effects of ocean outfall discharges on marine health and identifies potential threats to public health.

3.7.4 Water Reuse Quality

Non-Potable Reuse

Non-potable reuse water (tertiary-treated recycled water) produced within the Region conforms to the State Board's Division of Drinking Water (DDW) Title 22 requirements for disinfected tertiary recycled water, which requires disinfection and filtration to achieve:

- a 99.999% removal of indicator poliovirus (or provide equivalent disinfectant dose/contact time to achieve the same),
- median total coliform concentrations of less than 2.2 organisms per 100 milliliters,
- no more than 23 total coliform organisms per 100 ml in more than one sample during any 30 day period, and
- no sample exceeding a total coliform concentration of 240 organisms per 100 ml.

Concentrations of dissolved minerals in the Region's recycled water supplies vary depending on the quality of the source supply. Recycled water TDS concentrations are typically about 250 to 350 mg/L higher than the source water supply, though this difference can be less. For example, recycled water produced in northern San Diego averages TDS levels of 847 mg/L compared to potable water from the Water Authority, which has a TDS between 615 and 650 mg/L.

Table 3-34 summarizes water quality requirements for dissolved minerals that are established by the San Diego Water Board for the Region's recycled water facilities. Recycled water TDS effluent limits typically range from 1000-1200 mg/L. To prevent salinity-related impacts to landscape and agricultural vegetation, most recycled water producers target recycled water TDS concentrations of 1000 mg/L or less. Several of the Region's coastal recycled water facilities include demineralization treatment that can be used during times of high TDS supply water to ensure conformance with recycled water TDS limits, including the Carlsbad WRF, San Elijo WRF, and City of San Diego NCWRP.

Potable Reuse

The water resulting from indirect potable reuse (discussed in detail in *Section 3.5.5*), which is referred to as purified water, is of similar quality to distilled water, containing 15 mg/L of TDS. During the demonstration and pilot study stages of the City of San Diego's Pure Water San Diego, this purified water is discharged to the recycled water system, helping to improve recycled water quality (City of San Diego, 2013a).

Pure Water San Diego

TDS concentrations in advanced treated water from the demonstration phase of Pure Water San Diego averaged approximately 15 mg/L. The one-year demonstration project has led to the advancement of Pure Water San Diego, which was approved by City council in 2014. Pure Water San Diego will be implemented in phases, with the final phase to be completed by 2035. Pure Water San Diego will involve the diversion of wastewater from the Point Loma WWTP to advanced water purification facilities at NCWRP, a future central area facility. Advanced treated water will be conveyed to Miramar Reservoir for surface water augmentation. This diversion of flows to the advanced treated system will reduce flows to the ocean outfall at Point Loma WWTP. The first phase is scheduled to produce up to 15 mgd of water by 2025, with a long-term goal of 83 mgd of water by 2035, providing approximately one-third of San Diego's future drinking water supply.

The City of San Diego Advanced Water Purification Facility is conducting pilot testing for indirect potable reuse.

Photo credit: City of San Diego

Table 3-34: Recycled Water Quality

HU	Recycled Water Agency	Recycled Water Facility (Permit Number)	Permitted Recycled Water Concentration[1] (mg/l) (Average annual value unless noted)				
			TDS	Chloride	Boron	Iron	Manganese
902	Camp Pendleton	Southern Regional (Order R9-2013-0112)	1200[2]	325[3]	0.6[3]	0.3[3]	0.05[3]
		Northern Regional (Order R9-2014-0006)	500	250	0.75	0.3	0.05
903	City of Oceanside	San Luis Rey (Order No. R9-2014-0108)	1200[2]	350[2]	0.5[2]	0.3[2]	0.15[2]
	Fallbrook Public Utility District	Plant No. 1 (Order No. 91-39)	See note[5]	See note[6]	0.5[3]	0.85[3]	0.15[3]
	Valley Center Municipal Water District	Woods Valley Ranch (Order No. 98-09)	1100[2]	300[2]	0.75[2]	0.3[2]	0.05[2]
904	Buena Sanitation District/City of Vista	Shadowridge[7]	1200[4]	300[2]	0.5[2]	0.3[2]	0.07[2]
	Carlsbad Municipal Water District	Carlsbad (Order R9-2016-0183)	1100[2]	350[3]	0.75[2]	0.3[2]	0.1[2]
	Leucadia Wastewater District	Gafner (Order No. 93-41)	1500[4]	500[4]	0.5[2]	0.3[2]	0.05[2]
	Vallecitos Water District	Meadowlark (Order No. 93-23)	1500[4]	500[4]	0.5[3]	0.3[3]	0.05[3]
	City of Escondido	Hale Avenue (Order R9-2015-0026)	1000[2]	300[2]	1.1[2]	0.3[2]	0.1[2]
	County of San Diego/Rincon Del Diablo Municipal Water District	Harmony Grove (Order R9-2012-0054)	1000	300	0.75	0.3	0.05
	San Elijo Joint Powers Authority	San Elijo (Order No. 2000-10)	1200[2]	400[2]	0.75[2]	0.3[2]	0.15[2]
905	Olivenhain Municipal Water District	4-S Ranch (Order R9-2003-0007)	1200[4]	350 daily	0.75[3]	0.85[3]	0.15[3]
	Ramona Municipal Water District	Santa Maria (Order No. R9-2016-01540154)	1000[2]	250[2]	0.5[2]	0.3[2]	0.05[2]
	Rancho Santa Fe Community Services District	Santa Fe Valley (Order No. 92-04)	1500[4]	500[4]	0.5[3]	0.85[3]	0.15[3]
906	City of San Diego	North City (Order No. 97-03)	1200[2]	300[2]	0.7[2]	0.3[2]	0.1[2]
907	Padre Dam Municipal Water District	Padre Dam (Order No. R9-2016-0099)	1000[2]	400[2]	0.6[2]	0.3[2]	0.05[2]
	Ramona Municipal Water District	San Vicente (Order No. R9-2009-0005)	550[2]	145[2]	0.7[2]	0.3[2]	0.06[2]

HU	Recycled Water Agency	Recycled Water Facility (Permit Number)	Permitted Recycled Water Concentration[1] (mg/l) (Average annual value unless noted)				
			TDS	Chloride	Boron	Iron	Manganese
910	Otay Water District	R.W. Chapman (Order No. R9-2007-0038)	1376[3]	440[3]	0.7[3]	0.2[3]	0.03[3]
911	City of San Diego	South Bay (Order No. R9-2017-0023)	1200[3]	260[3]	0.75[3]	0.3[3]	0.05[3]

1 Recycled water effluent quality limit established within the listed San Diego Water Board recycled water permit or waste discharge requirements.

2 Effluent Limit expressed as an annual (12-month) average.

3 Effluent limit expressed as a monthly (30-day) average.

4 Effluent limit expressed as a daily maximum.

5 Recycled water TDS concentration not to exceed potable supply concentration by 450 mg/l.

6 Recycled water chloride concentration not to exceed potable supply concentration by more than 150 mg/l.

7 Shadowridge plant currently not in operation but San Diego Water Board permit remains active.

3.7.5 Groundwater Quality

Under SGMA, the various GSAs in the Region are developing GSPs to sustainably manage the medium priority groundwater basins in the Region. These GSPs will replace the Groundwater Management Plans that were previously developed under AB3030 and require a coordinated approach to groundwater management. Basin prioritization under CASGEM was developed by the State using consideration of basin use, yield, groundwater levels, overdraft status, and quality. Groundwater basins that form a substantial supply source and have water quality issues were given a higher priority than similar basins that did not contribute substantially to supply. While progress is under way on developing GSPs, they are not scheduled for adoption until 2020 and 2021. In addition to a coordinated effort between basin users, the GSP development process requires stakeholder input, generally solicited at a series of public meetings and workshops.

Designated Beneficial Uses

The Basin Plan designates beneficial uses for groundwater within each hydrologic area of the Region's eleven watersheds. Appendix 3-A presents beneficial uses for groundwater designated in the Basin Plan.

The Basin Plan designates municipal supply, agricultural supply, and industrial service supply as beneficial uses within a significant majority of the Region's hydrologic areas. Industrial process supply and fresh water replenishment (maintaining surface flows) are listed as beneficial uses within several of the Region's hydrologic areas. The Basin Plan does not designate wildlife habitat as a beneficial use of groundwater, but significant areas of riparian habitat and groundwater-dependent vegetation exist within each of the eleven watersheds.

Groundwater Quality Objectives

The Basin Plan establishes numerical groundwater quality objectives on a watershed-by-watershed basis for color, turbidity, detergent (methylene blue active substances, or MBAS), TDS, and mineral constituents. Additionally, the Basin Plan imposes state and federal drinking water standards for toxic inorganic and toxic organic constituents on groundwaters designated for domestic use.

Appendix 3-B presents Basin Plan numerical groundwater quality objectives within the Region. Groundwater quality objectives for TDS and mineral constituents are established as lower concentrations in the upstream portions of the watersheds and at higher concentrations in downstream portions of the watersheds.

Regional Constituents of Concern

While alluvial groundwater aquifers can be quickly recharged by stormwater or urban runoff, the porous nature of the aquifers render them susceptible to contamination by activities on the ground surface, contaminated stormwater infiltration, abandoned well heads, and from underground storage tanks.

Table 3-35 summarizes key groundwater quality issues within the Region. Constituents of concern within Region's groundwater aquifers include TDS, nitrate, iron and manganese, and toxic organic pollutants.

- *Total Dissolved Solids (TDS)*. TDS can affect both the usability of groundwater as a domestic water source and as an irrigation water source. Groundwater TDS concentrations within coastal groundwater basins vary significantly but have generally exhibited a trend of deteriorating water quality in recent decades as a result of seawater intrusion and salt load imbalances associated with imported water use (Water Authority, 1997). Coastal alluvial groundwater aquifers in the region that have experienced significant degradation from elevated TDS concentrations include the Lower Santa Margarita River Basin, Mission Basin (lower San Luis Rey Basin), Lower San Dieguito River Valley, Mission Valley (lower San Diego River Basin), Lower Sweetwater River Valley, and Lower Tijuana River Valley. Groundwater TDS concentrations in these coastal alluvial aquifers currently range from approximately 750 mg/l to more than 2000 mg/l. Among the principal alluvial groundwater aquifers within the Region, only the Pala/Pauma Basin, Warner Basin, and the upstream portions of the San Pasqual, El Monte, and Middle Sweetwater Basins contain groundwater TDS concentrations below the 500 mg/L state and federal secondary (non-enforceable) drinking water limits for TDS. Water quality in the San Diego Formation (a deep consolidated sediments aquifer that underlies a central portion of the City of San Diego) is highly variable. Groundwater TDS concentrations in this aquifer may range from below 500 mg/L to more than 12,000 mg/L. Groundwater TDS concentrations within inland fractured rock aquifers are variable, but most wells produce groundwater that contains TDS concentrations that are suitable for potable water uses (Water Authority, 1997).
- *Nitrate.* State and federal primary (enforceable) drinking water MCLs for nitrate are established at 10 mg/L (as nitrogen). The Basin Plan establishes more stringent nitrate objectives (as low as 2.2 mg/L as nitrogen) for many of the Region's groundwater basins. Alluvial aquifers are susceptible to nitrate contamination from fertilizer application, animal confinement, wastewater percolation, and septic tank discharges. Exceedance of the Basin Plan nitrate objectives has

High TDS and other constituents in groundwater can impact large scale irrigation operations (Torrey Pines Golf Course shown above).

Photo credit: Jeff Pasek, City of San Diego

been documented in portions of the San Luis Rey River and San Dieguito River Watersheds (Water Authority, 1997).

- *Iron and Manganese.* Iron and manganese occur naturally in Region's alluvial groundwaters. Groundwater from the Region's coastal aquifers periodically exceeds recommended state and federal secondary (non-enforceable) drinking water standards (0.3 mg/L for iron and 0.05 mg/L for manganese). Aquifers that have exhibited iron and manganese compliance problems include portions of the Santa Margarita River, San Luis Rey River, San Dieguito River, and San Diego River Watersheds (Water Authority, 1997).
- *Toxic Organic Compounds.* Several toxic organic compounds have been detected in groundwater within several of the Region's aquifers. Underground fuel tanks are a common source of groundwater contamination that may result in noncompliance with state and federal drinking water limits for benzene, methyl-tertiary-butyl ether (MTBE), and other volatile organic compounds. MTBE, in particular, is a key contaminant due to its low State of California primary MCL of 5 micrograms per liter (µg/L) and its ability to be rapidly dispersed by diffusion and advection throughout an aquifer. The State Board's Geotracker database system lists more than 100 sites of documented leaking underground fuel tanks within the Region's eleven watersheds. Although contamination effects from most of these sites are localized, a mile-long plume of petroleum derivatives from the Mission Valley Terminal (a fuel storage facility) contaminates portions of the Mission Valley aquifer in the San Diego River Watershed. The Mission Valley Terminal is under a San Diego Water Board Order to reduce concentrations of dissolved phase petroleum hydrocarbon constituents to attain background water quality conditions by January 31, 2024 (San Diego Water Board, 2016).

In addition to the above constituents, the State has identified arsenic, perchlorate, and hexavalent chromium as priority constituents.

- *Arsenic*. Arsenic is naturally occurring in some groundwater basins and comes from the surrounding rocks and soils. The federal MCL for arsenic is 10 µg/L, with Colorado River supplies having concentrations of between not detected and 3.5 µg/L, and SWP supplies having between not detected and 4.0 µg/L. Groundwater storage and pumping poses the greatest risk of arsenic contamination. Arsenic exposure can lead to cancers, hyperkeratosis, and changes in skin pigmentation (Water Authority, 2016). Although monitored closely, arsenic concentrations in the region's supplies are generally low.
- *Perchlorate.* Perchlorate compounds are found in solid rocket propellant, munition, and fireworks, and is highly mobile in groundwater. The primary health concern of perchlorate is that it causes hypothyroidism. In 2015, the public health goal (PHG) for perchlorate was set at 1 µg/L, which led to a DDW review of the MCL based on the current PHG. A federal MCL is currently being developed. However, perchlorate is not generally a constituent of concern in the Region's groundwater basins.
- *Hexavalent chromium*. Hexavalent chromium is a naturally occurring element found in rocks, soils, plants, and animals, and is also used in electroplating, stainless steel production, leather tanning, textiles manufacturing, and wood preservation. Hexavalent chromium has been shown to cause certain cancers. Effective July 1, 2014, DDW adopted an MCL of 10 µg/L for hexavalent chromium, but that has since been rescinded. The current federal MCL of 100 µg/L is being reevaluated. Similar to perchlorate, hexavalent chromium is not generally a constituent of concern in the Region's groundwater basins.

In February 2009, the State Board adopted Resolution No. 2009-011, which established a statewide Recycled Water Policy. The Recycled Water Policy, last amended in 2013, requires the State Board and the Regional Water Quality Control Boards to exercise their authority to the fullest extent possible to encourage the use of recycled water, consistent with state and federal water quality regulations. The Recycled Water Policy identifies stakeholder-driven salinity/nutrient management plans (SNMPs) as the appropriate means for identifying and managing salinity and nutrient loads associated with recycled water use. *Chapter 7, Regional Coordination* includes a detailed discussion of the Policy and SNMPs under development within the Region.

Table 3-35: Summary of Water Quality Issues for Principal Groundwater Aquifers[1]

HU[2]	Watershed	HA[2]	Name of Aquifer	TDS Concentration Range (mg/l)	Water Quality Constituents of Concern[3,4]			
					TDS	Nitrate	Iron & Manganese	Toxic Organics
901	San Juan	901.4	San Mateo	400 – 800	✓	✓		✓
		901.5	San Onofre	600 – 1,500	✓	✓		✓
902	Santa Margarita River	902.00	Lower Santa Margarita[4]	600 – 750	✓		✓	✓
903	San Luis Rey River	903.1	Mission	500 – 2,000	✓		✓	✓
			Bonsall	600 – 3,400	✓	✓		
			Moosa Canyon	200 – 900	✓	✓		
		903.2	Pala/Pauma	350 – 1,400	✓	✓		
		903.3	Warner	250 – 350				
905	San Dieguito River	905.1	Lower San Dieguito	1000 - 27,000	✓		✓	
		905.3	San Pasqual	320 – 2,500	✓	✓		
		905.4	Santa Maria	500 – 1,500	✓	✓		
907	San Diego River	907.1	Mission Valley	1000 – 3,000	✓		✓	✓
			Santee/El Monte	500 – 3,000	✓		✓	
909	Sweetwater	909.1	Lower Sweetwater	1700 – 3,100	✓			
		909.2	Middle Sweetwater	300 – 1,400	✓			
911	Tijuana River	911.1	Lower Tijuana	500 – 3,000	✓			
Vary	Pueblo Sweetwater Otay Tijuana River	908.00 909.00 910.00 911.00	San Diego Formation	340 – 12,000	✓			

1 From Water Authority *Groundwater Report* (1997).
2 Numerical watershed (hydrologic unit and hydrologic area) designations per Regional Water Quality Control Board (1994) and California Department of Water Resources *Hydrologic Data* (Bulletin 130).
3 Constituents that have exceeded state or federal drinking water primary or secondary standards in untreated groundwater (prior to treatment).
4 Hexavalent chromium, perchlorate, and arsenic were not identified as issues in any of the Region's groundwater aquifers.

3.7.6 Desalinated Water Quality

As described within *Section 3.5.1*, desalination supply from the 50 mgd capacity Carlsbad Desalination Plant is blended into the Water Authority's aqueduct system. Concentrations of dissolved minerals are low in desalinated product water. To prevent corrosive effects associated with these low concentrations of alkalinity and dissolved minerals, product water from the Carlsbad Desalination Plant is stabilized prior to blending into the Water Authority aqueducts. After product water stabilization, TDS concentrations in the desalination supply average approximately 350 mg/L. Table 3-36 summarizes projected quality of the desalination supply from the Carlsbad Desalination Plant.

Table 3-36: Quality of Seawater Desalination Supply

Parameter	Desalination Water Quality Carlsbad Desalination Plant		
	Central Tendency[1] (not to be exceeded more than 50% of the time)	Extreme Value[1] (not to be exceeded more than 10% of the time)	2016 Average Values[3]
Total dissolved solids	350 mg/l	400 mg/l	182 ppm
Boron	0.75 mg/l	1.0 mg/l	0.49 ppb
Bromide	0.5 mg/l	0.8 mg/l	-
Chloride	180 mg/l	210 mg/l	63.83 ppm
Turbidity	0.3 NTU[2]	0.5 NTU[2]	NA

1 Water quality terms incorporated into water purchase agreement between Poseidon Resources and the Water Authority.
2 Nephelometric Turbidity Units
3 Water Quality Report 2016 (CMWD, 2016).

The City of Oceanside's 6.37 mgd capacity Mission Basin Groundwater Purification Facility (MBGPF), Sweetwater Authority's 10 mgd capacity Richard A. Reynolds Groundwater Desalination Facility (Reynolds Facility), and Camp Pendleton's Haybarn Canyon Advanced Water Treatment Plan (AWTP) are the operating brackish groundwater recovery and treatment facilities within the Region.

- **MBGPF** – The MBGPF uses reverse osmosis (RO) to reduce TDS concentrations, granular activated carbon to remove 1,2, 3-trichloropropane (TCP), and a side-stream treatment system to reduce iron and manganese. Product water is blended with 20% share of water direct from the groundwater well field and subjected to additional post-blend treatment to meet drinking water standards (City of Oceanside, 2016).
- **Reynolds Facility** – High TDS concentrations in Sweetwater Authority's brackish water supply are removed through RO, which decreases the TDS concentration from an average 2,200 mg/L to 100 mg/L. The treated water is then blended with other water supplies to bring the TDS concentration back up to 400 to 500 mg/L to prevent corrosion in the distribution mains (Sweetwater Authority, 2016).
- **Haybarn Canyon AWTP** – Haybarn Canyon AWTP is located in the Santa Margarita Watershed. It has a permitted capacity of 3.6 mgd, and uses RO treatment and disinfection to reduce TDS levels to 325 mg/L.

3.8 Environmental Resources

The Region's water resources are closely linked to its environmental and habitat resources. Local water resources support a variety of important habitat and species, but are also affected, both positively and negatively, by the natural environment through which the Region's water resources pass. Environmental services provided by different vegetation communities, such as wetland habitat, can help to improve water quality, while the presence of invasive species can contribute to flooding or have greater water uptake than native species, preventing domestic uses of that water.

The Region's eleven watersheds support many habitat communities and contain more rare, threatened, and endangered plant and animal species than any comparable land area in the continental United States (Pulliam and Babbitt, 1997).

Multiple Habitat and Multiple Species Conservation Programs

The County Multiple Species Conservation Program (MSCP) and Multiple Habitat Conservation Program (MHCP) are being implemented by the County and local jurisdictions to protect these resources. Figure 3-19 presents the boundaries of the MSCP and MHCP areas.

In addition to the 900-square-mile area covered by the MSCP and 175-square-mile area covered by the MHCP, the County is in the process of developing a North County MSCP encompassing approximately 487 square miles in the northwestern portion of the county, and an East County MSCP that addresses habitat needs within a 2,420-square-mile area. Approximately 41% of the MSCP Plan area is developed or urbanized, and about 5% is used for agriculture.

Core biological resource areas and corridors within the City of San Diego portion of the MSCP area that are targeted for conservation include the Otay Lakes Cornerstone Lands, Marron Valley Cornerstone Lands, San Vicente Cornerstone Lands, and San Pasqual/Hodges Cornerstone Lands. Similar linkages and core biological resource conservation lands are addressed within the North and East County habitat protection programs.

While the MSCP and MHCP program are intended to protect habitat of value to the Region and its species, they are not without controversy. There is some disagreement about the effect of MSCP and MHCP programs that locate mitigation projects outside of the general area where an impact occurs. Because these programs establish formal mitigation areas, if the MSCP and MHCP areas are physically distant from the impact area, the mitigation site may be located at a distance from the physical biological impact. Mitigation implemented outside the area of impact or mitigation exportation has been noted as a concern by some IRWM stakeholders, specifically that certain watersheds that do not contain MSCP and MHCP lands may be continually degraded as a result of this practice.

Other IRWM stakeholders hold that, while individual watersheds may be affected, federal and state policies governing no-net-loss of wetlands ensure that regional wetland functions and services will not decrease. Most on-site compensatory mitigation projects yield widely scattered, small, and isolated or "patch" wetlands, which are not buffered by adjacent uses because they are created at an actual project site to compensate only for a particular project's wetland losses. Ultimately, "patch" wetlands probably will fail not only because of their location and size, but because their ecological potential is limited by their separation from broader wetlands ecosystems. Larger mitigation efforts, such as MSCP and MHCP, consolidate resources and create an economy of scale, yielding more efficient wetlands protection. These off-site wetlands systems are more ecologically valuable than the isolated, on-site "patch" wetlands created from individual mitigation efforts. The ecological benefits include: providing a habitat for a larger variety of wildlife; accommodating larger populations of the present species, which prevents inbreeding and promotes species stabilization; and allowing the wetlands to adapt to changes in the ecosystem.

Vegetation Communities

Table 3-37 describes the principal vegetation communities and characteristic species in the Region.

Table 3-37: Summary of Vegetation Communities[1]

Community	Range	Characteristic Vegetation Species
Coastal Sage Scrub	Extends from the coast to approximately a 1,500-foot elevation. Over 70% of the County's coastal sage scrub has been removed by urban development, but the habitat is found in portions of most of the Region's eleven watersheds.	• California sagebrush (*Artemisia californica*) • flat-top buckwheat (*Eriogonum fasciculatum*) • laurel sumac (*Malosmalaurina*) • white and black sage (*Salvia apiana* and *S. mellifera*)
Chaparral	Exists within an elevation range of 1,000 to 5,000 feet. Vegetation survives the prolonged summer drought season through deep root structure, leaves that minimize evaporation losses, and an ability to recover from wildfire.	• manzanita (*Arctostaphylos* spp.) • red shank (*Adenostoma sparsifolium*) • oaks (*Quercus* spp.) • chamise (*Adenostoma fasciculatum*) • California lilac (*Ceanothus* spp.)
Coastal Sage-Chaparral Scrub	Transition community containing species typical of both chaparral and coastal sage scrub	• (See Coastal Sage Scrub and Chaparral)
Grassland	Native and non-native grasslands occur throughout the Region's eleven watersheds. The largest mountain grassland in the County is at Lake Henshaw and Warner Ranch (San Luis Rey River watershed).	• purple needlegrass (*Nasella pulchra*) • wild barley (*Hordeum murinum*) • rip-gut (*Bromus diandrus*) • slender wild oat (*Avena barbata*) • foxtail (*Bromus madritensis*).
Riparian/Wetlands	Occurs along watercourses within each of the Region's eleven watersheds. Consists of tall, open, broadleafed riparian forests, woodlands, and dense, broadleafed riparian thickets. Herbaceous plants dominate the understory.	• willows (*Salix* spp.) • western cottonwood (*Populus fremontii*) • western sycamore (*Platanus racemosa*) • mule fat (*Baccharis salicifolia*) • Douglas mugwort (*Artemisia douglasiana*) • cattails (*Typha* spp.), bulrush (*Scirpus* spp.) • sedges (*Carex* spp.), primrose (*Oenothera* spp.)
Oak Woodlands	Consists of open or closed canopy woodlands dominated by oaks, including coast live oaks.	• coast live oaks (*Quercus agrifolia*) • Engelmann oaks (*Quercus en gelmannii*)
Coniferous Forest	Found at elevations above 3,500 feet in the northeastern portion of the Region, including Palomar State Park, and the Laguna recreation area in Cleveland National Forest.	• Jeffrey pine (*Pinus jeffreyi*) • Coulter pine (*Pinus coulteri*) • California Black Oak (*Quercus kelloggii*) • incense cedar (*Libocedrus decurrens*) • white fir (*Abies concolor*)
Beach/Foredunes	Found along the coast and bay shores, and characterized by stretches of loose, windswept, sandy dunes that vary in width from a few to several hundred feet.	• Beach sun cup (*Cammissionia cheirianthifolia)* • Beach bur (*Ambrosia bipinnatifida)* • Sea rockets (*Cakile maritima)*
Eucalyptus Woodland	Consists of open to dense stands of eucalyptus trees, which are an invasive, non-native species. The understory can include grasslands and chaparral habitats.	• Eucalyptus (*Eucalyptus* spp.)
Disturbed Habitat	Disturbed habitat consists of previously disturbed areas that are either devoid of vegetation (dirt roads/trails) or support scattered non-native species	• wild radish (*Raphanus sativus*) • tumbleweed (*Salsola tragus*) • tocalote (*Centaurea meletinsis*)
Shallow Bay	Includes Mission Bay and portions of San Diego Bay. Shallow bay areas may support some scattered emergent wetland vegetation.	• None - primarily open water

1 Adapted from USFWS and DFW (1998).

Wildlife and Endangered Species

The Region's vegetation communities support a wide array of wildlife species. San Diego County is home to approximately:

- 1,534 total native plant species
- 75 species of reptiles and amphibians
- 140 species of mammals, including 23 species of bats
- 20,000 species of insects
- 492 species of birds, of which about 70 breed within the County

Over 200 plant and animals species in the County are listed as endangered, threatened, rare, or are candidates for listing (USFWS and DFW, 1998). Over half of these species occur in the southwest portion of Region within the MSCP area. Appendix 3-D presents listed species covered under the MSCP and describes their associated habitats. Appendix 3-D also presents non-listed species that occur within the MSCP area that are considered sensitive. Appendix 3-D acknowledges that the federal listing for Southern California steelhead refers to a population ranging from Santa Maria River to San Mateo Creek; despite the federal listing of this population's range, the historical southern boundary of the species' range is the United States-Mexico border.

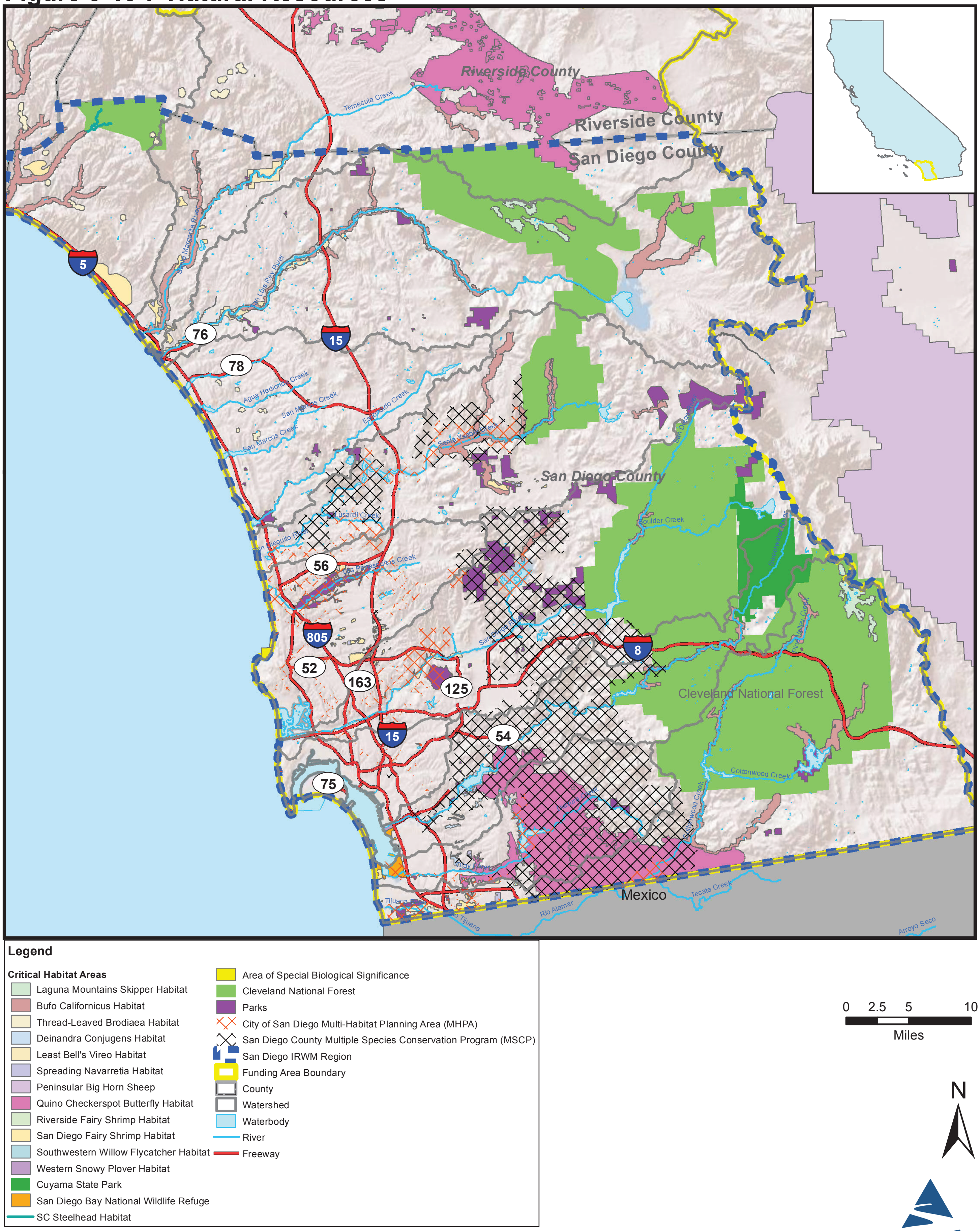
The San Diego River provides an important habitat corridors for native wildlife

Photo credit: Jeff Pasek, City of San Diego

Wildlife corridors and linkages are a key component of the Region's species protection plans. The conservation programs identify primary wildlife corridors/linkages that (1) connect core biological resource areas within the protection plan boundaries; and (2) provide connections to habitat outside the boundaries. As an example, identified linkages in the MSCP include:

- Otay Ranch to Sycuan
- Sweetwater Reservoir to McGinty Mountain
- Interstate-8 at Lakeside
- Dehesa to El Capitan Reservoir
- Boden Canyon

Figure 3-19 : Natural Resources



Critical Habitat, USFWS, Available: http://criticalhabitat.fws.gov/Areas of Special Biological Significance, SWRCB, Available: http://www.swrcb.ca.gov/water_issues/programs/ocean/asbs_areas.shtml
Parks, Cleveland Nat'l Forest, MCSP & MHPA, SANGIS, Available: http://www.sangis.org/Download_GIS_Data.htm
L:\Projects GIS\0188-003 SDIRWM Plan Update\MXD\Set 060713\Fig3-16ab_NatResources.mxd

Freshwater Habitat

In addition to the vegetation communities summarized in Table 3-37, vernal pools occur within the Santa Margarita River, Carlsbad, San Dieguito River, Peñasquitos, Otay River, and Tijuana River Watersheds. Vernal pool sites are characterized by fine textured soils underlain by cemented hardpan. Vernal pool vegetation typically consists of a low, herbaceous community dominated by annual herbs and grasses.

The Region's inland surface waters support both warm and cold freshwater aquatic habitats. Common channel flow regimes within the Region include alluvial reaches, with pools, bars, and shallow riffles. Upstream sections of the Region's major watercourses may contain cobble and bedrock reaches. In 1998, the San Diego Water Board implemented a four-year bioassessment program to expand ongoing efforts to assess the integrity of the Region's waters, develop indices of biological integrity, identify reference conditions, and develop baseline data. Assessment work completed to date indicates significant geographic and temporal variation in habitat integrity indices within the Region. The studies recommended designating the lower 25th percentile of reference site data as representing "poor" or "very poor" quality habitat. Monitoring sites with habitat indices in this lower 25th percentile were identified in portions of most of the Region's watersheds (DFW, 1999, 2001, 2002).

Coastal Habitats

Estuarine habitats within the Region include coastal lagoons, seagrass beds, southern coastal salt marsh, and brackish marsh. A wide range of intertidal marine habitats exist along the Region's coast, including: intertidal sandy beach, cobble beach, intertidal platform, intertidal boulder field, tidal pool, and rocky headland. Submerged marine habitats along the Region's coastline include: soft/sand bottom, rocky reef, seagrass beds, surfgrass, and kelp beds.

Many of the Region's estuarine habitats are located within coastal lagoons, which receive water from upstream creeks and rivers and also receive saline water from the Pacific Ocean. Due to their coastal nature, the inlets (openings) to the lagoons may become blocked by sand that is transported by tides, surf, and storm surges (San Elijo Lagoon Conservancy, 2013). In order to maintain connectivity with the ocean, several of the Region's coastal lagoons are dredged on a regular basis. Dredging activities often require excavation equipment to remove sediment and sand accumulations that block lagoon inlets, and can temporarily prevent recreational access to the Region's lagoons. Although impacts from dredging may occur, these activities are considered necessary to maintaining lagoon health and ensuring that the Region's lagoons do not become stagnant for long periods of time (San Elijo Lagoon Conservancy, 2013).

Invasive Species

Non-native invasive vegetation species have become established in portions of all of the Region's watersheds. The non-native invasive vegetation can alter fire frequencies, soil conditions, local hydrology, and reduce the reproductive ability of native vegetation. Once established, the non-native vegetation can displace the native vegetation community and dependent wildlife. Invasive species impacting the Region's riparian community include, but are not limited to, giant reed (*Arundo donax*) and salt cedar (*Tamarix* spp.). Through increased water uptake, these species can lower natural water tables, limit groundwater recharge, and reduce streamflow. In addition to hydrological changes, *Tamarix* leaf litter can sufficiently increase soil salinity such that areas can become unsuitable for native vegetation and dependent wildlife. *Arundo* and *Tamarix* support few insects, the main food supply for insectivorous birds, while limiting or eliminating native vegetation and their associated habitats.

Invasive species also negatively affect aesthetics and recreational access through overcrowding of waterways, excessive water uptake resulting in lower flows in waterbodies used for recreation, and overall decreased quality of native habitat for recreational enjoyment. Other key invasive species within the Region include: iceplant (*Carpobrotus edulis*) and pampas grass (*Cortaderia selloana*). Iceplant occupies significant areas of the Region, including coastal dunes, and can deprive native vegetation of moisture and nutrients. Pampas grass out-competes native vegetation through its aggressive root system. Invasive species eradication efforts are currently underway in many of the Region's watersheds.

Water quality monitoring and invasive removal, such as Arundo Donax, will improve the habitat quality of Chollas Creek.

Photo credit: Travis Prichard, San Diego CoastKeeper

The marine algae *Caulerpa taxifolia* is an invasive species of concern for the Region's coastal and marine waters. *Caulerpa taxifolia* grows as a dense blanket that covers and kills native aquatic vegetation. Once established, *Caulerpa taxifolia* results in the displacement of fish, invertebrates, marine mammals, and sea birds that are dependent on the displaced native marine vegetation (San Diego Water Board, 2006b). In 2000, *Caulerpa taxifolia* was found in Agua Hedionda Lagoon (Carlsbad Watershed). Eradication efforts including chemical treatment, tarping, surveillance, and public outreach efforts were conducted by the Southern California *Caulerpa* Action Team. As a result of these efforts, full eradication of *Caulerpa taxifolia* has been achieved.

The Quagga mussel is a recent invasive species of critical concern within the Region. The Quagga mussel is a small mollusk that can adversely impact the Region's water supply operations and facilities by clogging pumps, clogging water lines, creating taste and odor problems in treated water supplies, and adversely altering ecosystems within the Region's surface water reservoirs. In February 2007, Metropolitan launched a comprehensive program to detect and control an invasion of Quagga mussels within Metropolitan's imported water supply network. Quagga mussels were confirmed in several of the Region's imported water supply reservoirs in August 2007. In 2010, a Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) was formulated by the Water Authority, along with CDFW and others, to conserve and manage covered species under a comprehensive approach that contributes to the ongoing conservation and management efforts in San Diego County. The plan included a quagga and zebra mussel response and control action plan to control the spread of quagga and zebra mussels in San Diego County.

The gold spotted oak borer (*Agrilus auroguttatus*) as well as polyphagous shot hole borer (*Euwallacea* sp.) and its cousin the Kuroshio Shot Hole Borer, are present in the Region, and contribute to tree death through direct damage to plants as well as the spread of fungi and diseases. Since its introduction from Arizona, the gold spotted oak borer, which was first identified in San Diego County in 2004, had killed 21,500 trees in San Diego County by 2010. Oak death occurs due to damage to the nutrient and water conducting tissues in the trees (UC Cooperative Extension, 2011). The shot hole borers introduce fungi that cause Fusarium Dieback to a variety of host tree species, including willows and sycamores, both of which are riparian species. The loss of trees affects water quality, increases runoff, and changes habitat type and availability for native species.

Invasive species within San Diego Bay represents an additional concern within the Region. Biological surveys conducted by CDFW have confirmed the presence of over 50 non-native species within San Diego Bay (DFW, 2006).

3.9 Recreational Resources

The Region supports a wide array of recreational resources, with 70 miles of recreational beaches, which include:

- Nine California State Beaches: Cardiff, Carlsbad, Leucadia, Moonlight (operated by the City of Encinitas), San Elijo, San Onofre, Silver Strand, South Carlsbad, and Torrey Pines
- Municipal beaches in Oceanside, Encinitas, Solana Beach, Del Mar, San Diego, Coronado, La Jolla, Mission Bay, Mission Beach, Ocean Beach, Pacific Beach, Point Loma, and Imperial Beach

Important coastal preserves and recreational areas include State, county and local parks, beaches and ecological reserves. Table 3-38 presents the larger State and regional recreational areas and ecological reserves within the Region.

As noted, there are two ASBS sites in the region: the La Jolla ASBS and the San Diego-Scripps ASBS. Together, these areas are part of the San Diego-La Jolla Underwater Park. The 6,000-acre underwater park (established by the City of San Diego) stretches from La Jolla Cove in the south to the north end of Torrey Pines Reserve.

The County Department of Parks and Recreation maintains 90 parks and recreational facilities covering over 40,000 acres, including local and regional parks, fishing lakes, community centers, special-use facilities, ecological preserves, and open spaces. The County also operates the County Trails Program that includes (1) a Regional Trails Plan that addresses over 650 miles of existing and planned trails, and (2) a Community Trails Master Plan that addresses over 1,400 miles of new and existing trails.

The City of San Diego maintains a parks system that includes three regional parks, six open space parks, three golf courses and numerous community parks. The City also maintains a lakes recreation program that offers fishing and water contact sports to visitors at nine surface water reservoirs. Additionally, the Region's other 17 municipalities maintain numerous community parks, regional parks, and open space preserves.

Cleveland National Forest covers significant portions of the Region, including upstream areas of the San Luis Rey River, San Dieguito River, San Diego River, Sweetwater, and Tijuana River Watersheds. Mountain area state parks within the Region include Palomar Mountain State Park (San Luis Rey River Watershed) and Cuyamaca Rancho State Park (San Diego and Sweetwater River Watersheds).

Table 3-38: Summary of Regional Parks and Reserves

HU	Watershed	Regional Park or Reserve[1,2,3]
903	San Luis Rey	• Pilgrim Creek State Ecological Reserve • San Luis Rey River Park (land acquisition in progress)
904	Carlsbad	• Agua Hedionda Lagoon State Ecological Reserve • Batiquitos Lagoon State Marine Park • Buena Vista Creek State Ecological Reserve • Buena Vista Lagoon State Ecological Reserve • Carlsbad Highlands State Ecological Reserve • San Elijo Lagoon State Ecological Reserve • San Elijo State Marine Conservation Area • Swami's State Marine Conservation Area
905	San Dieguito	• Boden Canyon State Ecological Reserve • San Dieguito Lagoon State Marine Park and Ecological Reserve
906	Peñasquitos	• Blue Sky State Ecological Reserve • La Jolla State Marine Conservation Area • Matlahuayl State Marine Conservation Area • Meadowbrook State Ecological Reserve • San Diego Scripps State Marine Conservation Area • South La Jolla State Marine Reserve • Torrey Pines State Reserve
907	San Diego	• Famosa Slough State Marine Conservation Area • Mission Trails Regional Park • San Diego National Wildlife Refuge
908	Pueblo	• Cabrillo State Marine Reserve
909	Sweetwater	• Chula Vista Wildlife Reserve • Crestridge State Ecological Reserve • McGinty Mountain State Ecological Reserve • Rancho Jamul State Ecological Reserve • San Diego National Wildlife Refuge • Sweetwater Marsh National Wildlife Refuge • Sweetwater Regional Park • Sycuan Peak State Ecological Reserve
910	Otay	• Otay Mountain State Ecological Reserve • Otay Valley Regional Park • San Diego National Wildlife Refuge • South Bay County Biological Study Area
911	Tijuana	• Border Field State Park • Tijuana National Estuarine Sanctuary • Tijuana River Mouth State Marine Conservation Area • Tijuana River Valley Regional Park • Tijuana Slough National Wildlife Refuge • Walker Canyon State Ecological Reserve

1 List of County of San Diego parks from County of San Diego (2012).
2 List of City of San Diego parks from City of San Diego (2012).
3 List of marine protected areas and preserves adapted from DFW (2012).

3.10 Water Demand and Supply Diversification

Demand Forecasts

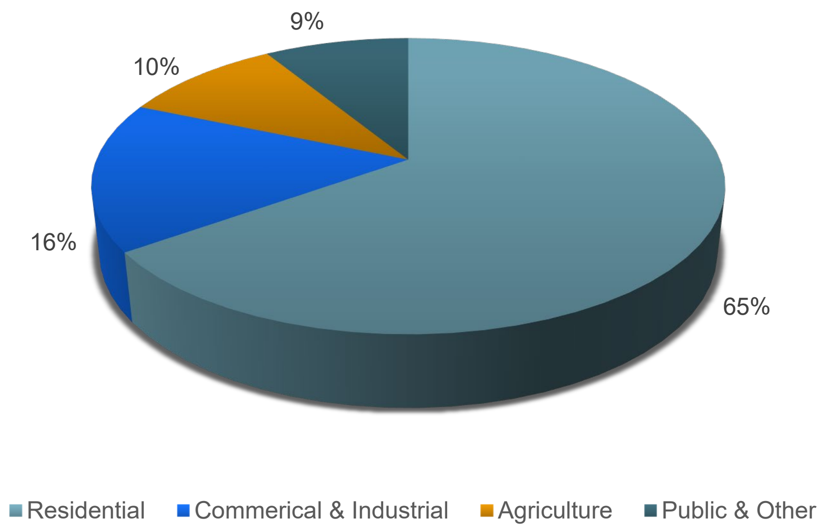
> ***Impact of Drought on Demand***
>
> As a result of the extreme multi-year drought during 2012-2016, water use restrictions and demand management strategies were implemented in the Region to reduce total water demand. With the support of regional water agencies, an average of 73,000 AFY of water was conserved from 2010-2015 when compared to the benchmark year of demand in 1991, when the population was 27% less. For water year 2017 (October 2016-September 2017), water production was approximately 85,000 AF less than in 2013 (SWRCB, 2017). In June 2015, the State Board adopted an emergency regulation that required water suppliers to reduce monthly water use. The regional average water use reduction target was 20%. From June 2015 to February 2016, when the State-mandated water use reductions were in effect, the Region exceeded the regional target with a water use reduction of 22%.
>
> In response to supply cutbacks from Metropolitan, allocation for agricultural program participants were imposed for fiscal year 2016 at 15%, and agricultural production decreased.

Demand for water in the Water Authority's service area includes municipal and industrial (M&I) demand and agricultural demand. M&I demand comprises 92% of regional water consumption and can be subdivided into residential demand and commercial/industrial demand (Water Authority, 2016).

Approximately 80% of the M&I demand is currently for residential use. Residential water consumption includes both indoor and outdoor uses. Indoor water use includes sanitation, bathing, laundry, cooking, and drinking, while most outdoor use is for landscape irrigation. Outdoor residential M&I demands for single family homes may comprise up to 60% of total residential use (Water Authority, 2016a). Industrial water consumption consists of a wide range of uses, including product processing, aggregate washing, concrete batching, dust control, cooling, air conditioning, sanitation, and landscape irrigation. Commercial water demand is typically for sanitation, landscape irrigation, and drinking. Excluding future conservation efforts, M&I demands are projected to increase by 30% between 2015 and 2040. However, per capita potable water use has decreased 39% since 1990 (Water Authority, 2016).

In recent years, agriculture demands have dropped significantly due to several factors, including water supply cutbacks, water rate increases, and economic downturn. Agricultural demand declined 58% between 2007 and 2015, from 98,000 AFY to 41,000 AFY. To comply with the mandatory supply allocations that resulted from drought conditions and judicial restrictions on SWP supply availability, growers implemented various actions that included tree stumping and plant stock reduction. Agricultural water demand now accounts for 8% of the Water Authority's total water demand. All but a small fraction of the agricultural demand is for irrigation. Primary crops within the Region include avocados, citrus, flowers, and nursery products. Agricultural water use within the Water Authority's service area is concentrated mainly in the northern portion of the Region within the Fallbrook Public Utility District, the City of Escondido, Rainbow, Valley Center, Ramona, and Yuima Municipal Water Districts (Water Authority, 2016a). Figure 3-20 shows FY 2016 water demand by customer sector.

Figure 3-20: FY 2016 Water Demand by Customer Sector Use



Source: Water Authority FY 2016 Annual Report (Water Authority, 2016a)

Because a significant portion of the overall regional water demand is for irrigation, weather and hydrologic conditions (precipitation, temperature, evaporation) have a significant effect on water demands within the Water Authority service area. Population, housing, and employment are also key factors in influencing the regional water demand. Over the last several decades a prosperous economy had stimulated local development and population growth, which in turn produced a relatively steady increase in water demand. However, since the 2000s, the combination of economic recession, drought messaging, implementation of member agency mandatory water use restrictions, water rate increases, and mild local weather culminated in a dramatic multi-year decrease in total water demand. Annual water demand in the Water Authority's service area went from 542,438 AF in fiscal year 2012 to 454,963 AF in fiscal year 2016, a roughly 16% decrease (Water Authority, 2016b).

To forecast future M&I water use, the Water Authority selected the IWR-MAIN (Institute for Water Resources – Municipal and Industrial Needs) computer model. Versions of this econometric model have evolved over a 20-year period and are being used by many U.S. cities and water agencies. The IWR-MAIN system is designed to utilize projections of local population, housing, and employment and other demographic data to forecast M&I water demand. The Water Authority's version of the IWR-MAIN model was modified to reflect the Region's unique parameters and is known as CWA-MAIN.

Per a 1992 Memorandum of Agreement (MOA) between SANDAG and the Water Authority, the Water Authority agreed to use SANDAG's most recent regional growth forecasts for planning purposes. Water demands presented in the Water Authority's *2015 Urban Water Management Plan* were developed using the CWA-MAIN model and the SANDAG *Series 13: 2050 Regional Growth Forecast* (Series 13 forecast). The Series 13 forecast was refined to include the 2010 Census counts and an economic outlook that factored in the "Great Recession." These refinements resulted in slower regional growth in the near term and lower water demands over the long-term planning horizon compared to SANDAG's previous forecast. The CWA-MAIN model was adjusted to incorporate:

- estimated demands for USMC Camp Pendleton that are based on historic trends, and
- a separate agricultural demand model that estimates demand based on projected agricultural acreage, and updated crop distribution and irrigation management data.

Using this modeling approach, Table 3-39 presents projected water demands through 2035 under "normal year" hydrologic conditions.

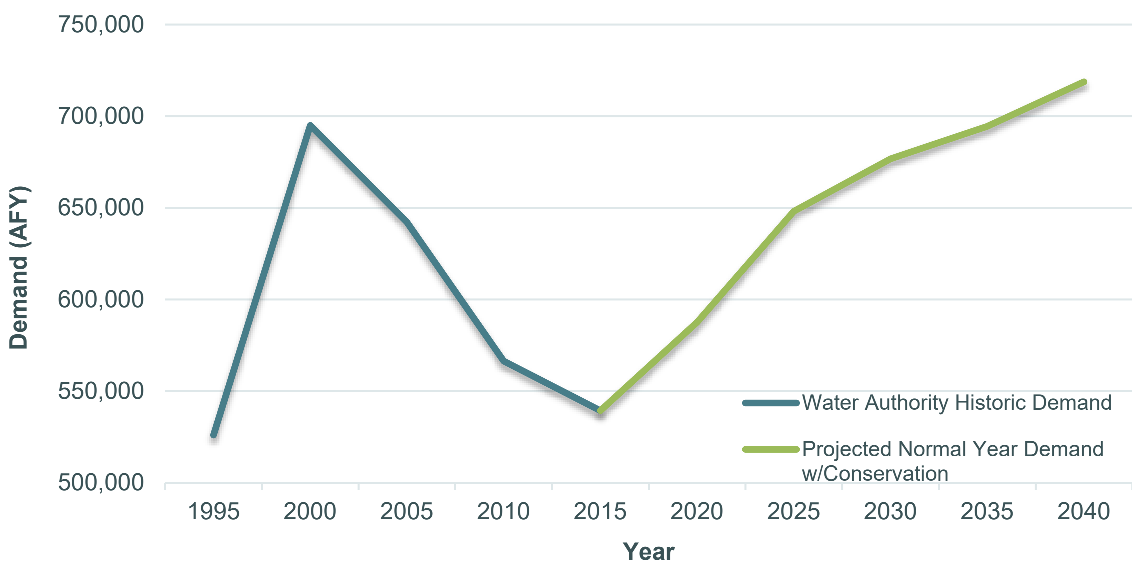
Table 3-39: Normal Year Water Demand Forecast – Water Authority Service Area[1]

Demand Parameter	Projected Water Demand (acre-feet per year)				
	2020	2025	2030	2035	2040
M&I Baseline Forecast[2]	602,100	673,886	715,690	744,370	781,433
Estimated Conservation Savings	74,141	89,110	102,834	114,599	128,222
M&I Forecast Reduced by Conservation	527,959	584,776	612,856	629,771	653,211
Agricultural Forecast	52,961	51,379	49,897	48,460	47,214
Total Projected Demand	580,920	636,155	662,753	678,231	700,425
Total Projected Demand with Pending Annexations and Additional Anticipated Growth	587,581	648,124	676,721	694,431	718,773

1 From *2015 Urban Water Management Plan* (Water Authority, 2016a). Water demand estimates for the portion of the Region outside the Water Authority service area are not available.
2 Includes M&I demands for Camp Pendleton area customers.

Figure 3-21 shows these projected demands alongside historic water demands. As described earlier, the decrease in water demand since 2000 is attributed to regulatory and conservation efforts, as well as the economy, water costs, and home foreclosures. Information presented in Table 3-39 and Figure 3-21 reflects current demand projections presented within the *2015 Urban Water Management Plan* (Water Authority, 2016a).

Figure 3-21: Historic Water Use and Projected Water Demands



Water Supply Diversification

The *California Water Plan Update 2013* (DWR, 2013) identifies short-term and long-term issues that may impact water supply availability and include (in part): population growth, drought, flood, earthquake, aging infrastructure, global climate change, and environmental restrictions. The *California Water Plan Update 2013* promotes diversification of regional water portfolios.

Recognizing that imported SWP and Colorado River supplies are subject to legal, environmental, drought, and other uncertainties, a key result area of the Water Authority's *Strategic Plan* is diversification of the Region's water portfolio. This diversification plan is based on:

- Retail member agency compliance with Senate Bill (SB) x7-7 water conservation targets, requiring 20% reduction in potable water use by 2020.
- The completed Carlsbad Desalination Plant.
- Increasing the amount of recycled water use and brackish groundwater demineralization facility yield implemented by member agencies.
- Full implementation of the IID water transfers.

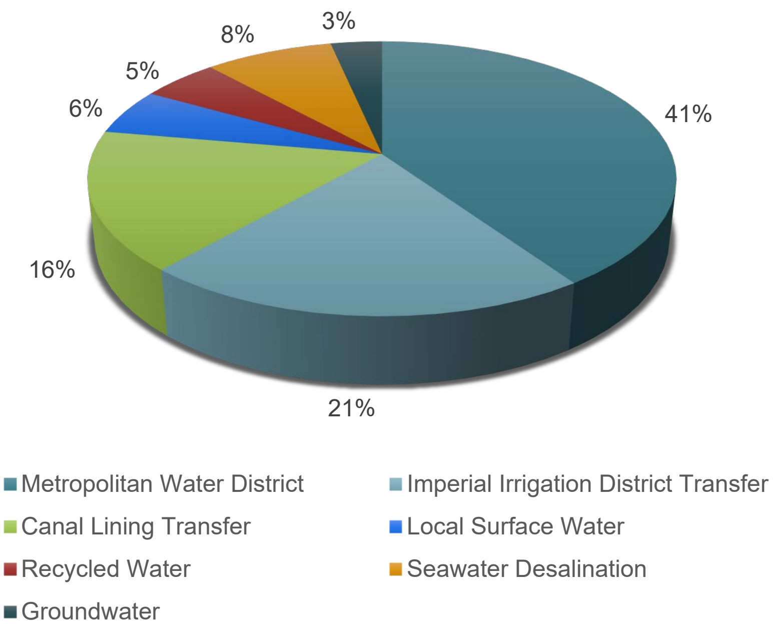
Many of these actions are complete or nearing completion. For example, the Water Authority member agencies are all on track to meeting their SBx7-7 goals, and deliveries of IID water transfers has continued to grow closer to full implementation. Additionally, multiple member agencies are expanding their recycled water systems, and those with groundwater desalination facilities have expanded or are considering expansion of their capacities.

Water conservation is a fundamental component of the Region's water diversification plan. The Water Authority and its member agencies have aggressively supported water conservation since 1990. Significant Water Authority and member agency funding has been directed toward implementing comprehensive conservation programs to reduce water use for residential, commercial, and agricultural irrigation, and to reduce water use in homes, businesses, industries, and institutions.

Water transfers that incorporate water conservation represent another key element of the Water Authority's water supply diversification effort. In 1998, the Water Authority executed an agreement with the IID for the conservation and transfer of agricultural water. Under the agreement, water conserved by Imperial County farmers who participate in a voluntary program would be transferred to the Water Authority. Water transferred to the Water Authority totaled 70,000 AF during 2010 and 100,000 AF in 2015. The quantities will increase annually to a maximum annual total of 200,000 AF in 2021 and remain fixed for the duration of the 75-year transfer agreement.

Additionally, in 2003, the Water Authority contracted rights to 77,700 AFY of water conserved through projects that lined 24 miles of the All-American Canal and 37 miles of the Coachella Canal in Imperial County. An additional amount up to 4,850 AFY is available to the Water Authority depending on environmental requirements associated with the Coachella Canal. For planning purposes, the Water Authority assumes that 2,500 AF of the 4,850 AF will be available each year for delivery, for a total of 80,200 AFY of this supply. Work on the Coachella Canal lining project was initiated in 2004 and was completed in 2006. Work on the All-American Canal began in 2005 and was completed in 2010. Deliveries of conserved water to the Region began in 2007. Figure 3-22 shows FY2017 water supply sources for the Region.

Figure 3-22: FY 2017 Water Supply Sources



Source: Water Authority Website Available: http://www.sdcwa.org/regional-water-supply-reliability

Conserved IID agricultural water and water conserved through the canal lining projects is credited to the Water Authority through a 2003 transfer agreement between the Water Authority and Metropolitan. Under the agreement, Metropolitan takes delivery of conserved IID agricultural and canal-lining water, and Metropolitan, in turn, provides the Water Authority with a like quality and quantity of water.

Other components of the supply diversification effort undertaken by the Water Authority and its member agencies include the following:

- **Groundwater** – Groundwater supplies are developed through management and recovery of good-quality alluvial groundwater or demineralization of poor-quality groundwater. Private wells are used to meet domestic and agricultural water needs within and outside the Water Authority's service area. A lack of groundwater pumping and demand data is a significant water management challenge in rural areas.
- **Seawater Desalination** – The Carlsbad Desalination Plant, built at the Encina Power Station in Carlsbad, delivers 50 mgd of potable water into the regional aqueduct system. The plant is permitted to produce up to 56,000 AFY.
- **Indirect Potable Reuse** – Potable reuse is being pursued by several member agencies as an option for supplementing potable water supplies with highly-treated recycled water. The Pure Water San Diego demonstration facility at the NCWRP is operating at 1 mgd capacity. Padre Dam MWD is expanding the Ray Stoyer WRF by 4 mgd to deliver recycled water for irrigation and to the AWPF for potable reuse. Pure Water Oceanside is a planned 3 mgd AWTF to recharge the Mission Groundwater Basin with purified recycled water. Other agencies are in the conceptual stage of planning potable reuse projects, as described in *Section 3.5.5*.

Taking into account projected water conservation savings, Table 3-40 presents a breakdown of projected water supplies and compares projected supplies with the demand forecast for a normal hydrologic year. As shown in Table 3-40, imported supplies from Metropolitan are projected to comprise approximately 35% of the total regional water demand by year 2040.

Table 3-40: Water Authority Water Supply Portfolio – Normal Water Year[1]

Demand Parameter	Projected Water Supply (acre-feet per year)				
	2020	2025	2030	2035	2040
Water Authority Supplies					
IID Water Transfer[1,2]	190,000	200,000	200,000	200,000	200,000
Canal Lining Projects[1,3]	80,200	80,200	80,200	80,200	80,200
Coachella Lining	*24,000*	*24,000*	*24,000*	*24,000*	*24,000*
All American Lining	*56,200*	*56,200*	*56,200*	*56,200*	*56,200*
Carlsbad Desalination Plant[1,4]	50,000	50,000	50,000	50,000	50,000
Water Authority Member Agency Supplies					
Local Surface Water[1,5]	51,580	51,480	51,380	51,280	51,180
Water Recycling[6]	40,459	43,674	45,758	46,118	46,858
Seawater Desalination	6,000	6,000	6,000	6,000	6,000
Potable Reuse	3,300	3,300	3,300	3,300	3,300
Groundwater[1,7]	30,040	31,630	32,670	32,670	32,670
Groundwater	*17,940*	*19,130*	*20,170*	*20,170*	*20,170*
Brackish Groundwater Recovery	*12,100*	*12,500*	*12,500*	*12,500*	*12,500*
Metropolitan Supplies[1]	136,002	181,840	207,413	224,863	248,565
Total Supplies[1,8]	**587,581**	**648,124**	**676,721**	**694,431**	**718,773**
Total Projected Demand with Water Efficiency Savings[1,8]	**587,581**	**648,124**	**676,721**	**694,431**	**718,773**

1 Verifiable expected water supplies for the Water Authority service area, as presented in 2015 Urban Water Management Plan (Water Authority, 2016a). Water budget data for the rural portion of the Region outside the Water Authority service area not available. Values rounded to nearest 10 acre-feet per year.

2 Expected Water Authority supply, per 1997 Water Conservation and Transfer Agreement between the Water Authority and the Imperial Irrigation District for the transfer of conserved agricultural water.

3 Expected Water Authority supply, per Quantification Settlement Agreement on the Colorado River. The supply includes 2,500 acre-feet of environmental water deliveries.

4 Carlsbad Desalination Project at Encina Power Station.

5 Expected average yield of member agency surface reservoirs during normal year hydrologic conditions.

6 Projected recycled water development based on member agency project implementation schedules.

7 Projected groundwater extraction yields by Water Authority member agencies during normal year hydrologic conditions. Includes groundwater recovery through demineralization treatment of brackish groundwaters.

8 Values may not add to exact total due to rounding.

In addition to assessing a normal hydrologic year, the Water Authority's *2015 Urban Water Management Plan* (2016a) also developed supply estimates under single dry and multiple dry water years. Table 3-41 presents the Water Authority's water supply and demand assessment for a single dry water year. The*2015 Urban Water Management Plan* concludes that no shortages are anticipated within the Water Authority's service area under single dry-year through 2035 provided that (1) projected Metropolitan, Water Authority, and member agency supplies are developed as planned, and (2) retail conservation targets are achieved.

The *2015 Urban Water Management Plan* indicates that, in multiple dry water years, the Region is at risk for shortages. The plan also notes that the most reliable method for alleviating shortages during a dry period is to utilize carryover storage (Water Authority, 2016a). The Water Authority also developed a *Water Shortage Contingency Plan* (Water Authority, 2017a) that identifies shortage management actions to minimize the impacts of drought-related imported water shortages and to equitably allocate supplies to member agencies.

Table 3-41: Water Authority Water Supply Portfolio – Single Dry Water Year[1]

Demand Parameter	Projected Water Supply (acre-feet per year)				
	2020	2025	2030	2035	2040
Water Authority Supplies					
IID Water Transfer[1,2]	190,000	200,000	200,000	200,000	200,000
Canal Lining Projects[1,3]	80,200	80,200	80,200	80,200	80,200
Coachella Lining	*24,000*	*24,000*	*24,000*	*24,000*	*24,000*
All American Lining	*56,200*	*56,200*	*56,200*	*56,200*	*56,200*
Carlsbad Desalination Plant[1,4]	50,000	50,000	50,000	50,000	50,000
Water Authority Member Agency Supplies					
Local Surface Water[1,5]	6,004	6,004	6,004	6,004	6,004
Water Recycling[6]	40,459	43,674	45,758	46,118	46,858
Seawater Desalination	6,000	6,000	6,000	6,000	6,000
Potable Reuse	3,300	3,300	3,300	3,300	3,300
Groundwater[1,7]	27,381	27,781	27,781	27,781	27,781
Groundwater	*15,281*	*15,281*	*15,281*	*15,281*	*15,281*
Brackish Groundwater Recovery	*12,100*	*12,500*	*12,500*	*12,500*	*12,500*
Metropolitan Supplies[1]	263,340	264,740	263,340	260,680	258,720
Total Project Supplies without Storage Takes[1,8]	**666,684**	**681,699**	**682,383**	**680,083**	**678,863**
Total Projected Demand with Water Efficiency Savings[1,8]	629,198	694,147	725,006	743,990	770,765
Potential Supply (Shortage) or Surplus	37,486	(12,448)	(42,623)	(63,907)	(91,902)
Utilization of Carryover Supplies	0	12,448	42,623	40,000	40,000
Total Projected Core Supplies with Utilization of Carryover Storage Supplies	**666,684**	**694,147**	**725,006**	**720,083**	**718,863**
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	37,486	0	0	(23,907)	(51,902)

1 Verifiable expected water supplies for the Water Authority service area, as presented in *2015 Urban Water* Management Plan (Water Authority, 2016a). Water budget data for the rural portion of the Region outside the Water Authority service area not available. Values rounded to nearest 10 acre-feet per year.

2 Expected Water Authority supply, per 1997 Water Conservation and Transfer Agreement between the Water Authority and the Imperial Irrigation District for the transfer of conserved agricultural water. Expected Water Authority supply, per Quantification Settlement Agreement on the Colorado River. The supply includes 2,500 acre-feet of environmental water deliveries.

3 Proposed Carlsbad Desalination Project at Encina Power Station.

4 Expected average yield of member agency surface reservoirs during single dry year hydrologic conditions.

5 Projected recycled water development based on member agency project implementation schedules.

6 Projected groundwater extraction yields by Water Authority member agencies during single dry year hydrologic conditions. Projected groundwater recovery is through demineralization treatment of brackish groundwaters.

7 Values may not add to exact total due to rounding.

Water demand projections and water supply diversification strategies developed by the Water Authority are acknowledged by DWR in the *California Water Plan Update 2013* (Bulletin No. 160). The *California Water Plan Update 2013* notes the importance of regional water supply planning, and describes water supply diversification strategies of the Water Authority and other Southern California agencies.

Cost of Water Supply Diversification

To meet the Region's water supply diversification goals, additional sources of local supply will need to be developed. However, development of new supplies to diversify the Region's portfolio will likely be more expensive than existing supplies. There are a number of factors that can influence supply development costs, such as, location, size, and configuration of a project. For example, brackish and seawater desalination project unit costs can vary based on the extent of the product water conveyance required, pumping requirements, access to existing infrastructure, and method of brine disposal.

Diversification Project Costs

Project Type	Estimated Unit Cost ($/AF)
Brackish Groundwater Desalination	**$800–$2,000**
Seawater Desalination	**$2,511**
Potable Reuse	**$2,300**

Proposed brackish groundwater desalination projects have an estimated unit cost of $500-$2,000 per acre-foot (OMWD, 2017; Sweetwater Authority, NDA). The purchase and delivery of water from the Carlsbad Desalination Plant in 2018 has a total unit cost of $2,511 per acre-foot.

The City of San Diego's Water Purification Demonstration Project confirmed the feasibility of a full-scale reservoir augmentation project, which is now designed to produce 30 mgd of potable water via reuse by 2021 (refer to *Section 3.5.5* for more information). In July 2012, the City of San Diego completed a *Recycled Water Study* that identified potable reuse opportunities in the Metropolitan Wastewater System service area (see Figure 3-12: Regional Wastewater/Recycled Water Infrastructure for map) and determined that 83 mgd of potable water production via reuse was foreseeable from various treatment sites. The estimated cost to produce potable water via reuse is $1,700-$1,900 per acre-foot. Phase 1 of the City of San Diego's Pure Water Program will expand the existing North City Water Reclamation Plant (NCWRP) and construct the adjacent North City Pure Water Facility to produce 30 mgd of potable water.

The primary drivers influencing wholesale water rates are the costs related to the purchase and treatment of water. Supply costs are tied to the purchase of imported water from Metropolitan and of transfer supplies through the Water Authority's transfer agreement with IID. As the cost of imported water increases, local supply options become more cost-competitive and cost-effective in comparison. Despite higher water rates that may be associated with water supply diversification, these efforts have largely received support from local residents and water rate payers, and such support has been documented in a number of public opinion polls. A 2017 public opinion poll conducted by the Water Authority indicated that the vast majority of respondents (79%) support the Water Authority's diversification plan (Water Authority, 2017b). The 2017 Water Authority poll showed that 41% of residents felt that rate increases are necessary to maintain water supply reliability. Of the respondents open to paying a surcharge for development of additional drought-resilient water supplies (76%), the mean willingness to pay for such development was $7.78 per month. In addition, 61% of respondents were in support of mixing advanced treated recycled water into the existing supply of drinking water.

3.11 Major Water Related Issues and Conflicts

As documented in this section, significant interrelationships exist among the Region's key water resources needs and IRWM Plan goals of enhancing water supply, enhancing recreation, and providing environmental stewardship. Table 3-342 summarizes key water management issues within the Region and potential conflicts that may occur in resolving the issues.

Table 3-42: Summary of Water Management Issues and Potential Conflicts

Water Management Issue	Potential Conflicts
Flood Control	• Difficulty in permitting invasive species removal and limitations on geographical or seasonal access to channel(s) • Potential conflicts with environmental protection or enhancement goals • Inconsistent or unreliable funding sources for flood control projects • Zoning or land use restrictions for protection of flood prone areas, including effectiveness of land use controls as well as implementing restrictions in areas that have already been developed and may be "grandfathered" in under older regulations
Stormwater	• Diverting noncompliant stormwater to groundwater recharge may conflict with groundwater protection goals • Diverting noncompliant stormwater to habitat improvement areas may conflict with surface water protection goals • Proposed stormwater BMPs may conflict with local land use regulation • Stormwater capture/use may reduce flows available to downstream beneficial uses • Managing the economic feasibility of stormwater capture and use • Securing funding or allocating existing funding to address stormwater needs while minimizing potential impacts to other areas of responsibility related to shifts in funding
Water Supply	• Local supplies (developed for reliability purposes) are limited or more costly than imported supplies • Imported water may not comply with Basin Plan water quality objectives • Basin Plan objectives may conflict with indirect potable reuse operations • Groundwater production or recharge may conflict with environmental protection needs of groundwater-dependent vegetation • Managing water supply cost increases • Increased water reuse (recycled and potable) may conflict with environmental and other downstream needs
Water Quality Standards	• The need to meet water quality concentration limits may result in reduced discharges or flows required to support downstream beneficial uses • 303(d) listing/TMDL process may prevent implementation of projects that improve water quality but do not result in attainment of water quality goals • Existing standards may not be representative of actual beneficial use protection needs • Current "one-size-fits-all" Basin Plan objectives do not take into account seasonal or flow influences • Assigning costs to water quality improvements (source identification) in regional reservoirs to augment surface water supply storage

Water Management Issue	Potential Conflicts
Institutional Issues	• Potential conflicts may occur between land use regulations and water quality protection needs • Available San Diego Water Board staffing levels may be inconsistent with staffing needs required to address priority Basin Plan modifications • Inter-border jurisdictional issues may hamper actions to achieve water quality objectives • Political conflicts outside of resource management agencies' control may result in impacts to natural resources • Water rights may limit development of certain groundwater basins and may conflict with use of return flows from imported water irrigation
Salinity/Brine Management	• Water conservation measures may lead to increased wastewater salinity • Brine discharges to sewer may conflict with water reuse (recycled and potable) needs • Brine discharges to ocean may conflict with environmental protection needs
Recreation	• Body contact and non-contact recreation may impact the water quality standards implemented to support such recreational uses • Sediment controls in watercourses may impact sand availability at downstream beaches
Climate Change	• Climate change may affect water supply availability because of droughts, seawater intrusion, changes in precipitation volumes and timing, altered fire and weather regimes, and potential changes in the availability of imported water supplies • Beneficial uses may be impacted by climate change or water quality standards more difficult to meet or no longer appropriate • Uncertainty related to climate change impacts make responses and mitigation efforts difficult to plan (low political support) • Sea level rise may compromise the integrity of coastal water resource infrastructure
Wastewater	• Cost drivers associated with wastewater systems, including treatment plant upgrades, ongoing treatment and operations, and infrastructure maintenance • Regulatory pressure associated with wastewater operations, including upgrading regional facilities such as the Point Loma Wastewater Treatment Plant • Potential conflict over ownership of wastewater as recycled and advanced treated water increase in value and use • Potential wastewater system operational impacts of measures to reduce water use and alteration of what's discharged to the system
DAC Water Systems	• Lack of municipal water and wastewater service in many rural DACs • Managing water infrastructure costs, including O&M • Lack of TMF (technical, managerial, financial) capacity of DAC water system operators

3.12 Neighboring and/or Overlapping IRWM Efforts

The San Diego IRWM is one of three IRWM efforts within the San Diego Water Board (Region 9) jurisdiction, which is designated by DWR as the San Diego Funding Area for the IRWM Program. The other two IRWM regions in the San Diego Funding Area are the South Orange County IRWM and the Upper Santa Margarita River IRWM. The South Orange County IRWM effort is led by an RWMG that is comprised of the County of Orange, Municipal Water District of Orange County, and South Orange County Wastewater Authority. The Upper Santa Margarita IRWM effort is led by an RWMG comprised of the Rancho California Water District, County of Riverside, and Riverside County Flood Control and Conservation District.

RWMG agencies from the three San Diego Funding Area IRWM groups have formed the Tri-County Funding Area Coordinating Committee (Tri-County FACC) through a Memorandum of Understanding (MOU) and have been meeting regularly since 2008. The Tri-County FACC facilitates integration of projects and policies across the San Diego Funding Area where appropriate and helps provide balance to the individual interests of the three IRWM Regions.

The Tri-County FACC governance structure also enables integrated management of watersheds and resources that cross jurisdictions, and specifically aims to coordinate work in the San Juan Watershed and the Santa Margarita River Watershed, both of which lie within at least two of the three IRWM regions (see Figure 3-23). As part of the MOU, the Tri-County FACC RWMGs have committed to coordinated planning and identification of opportunities to support common projects and goals. One example of this effort is a joint project between the Upper Santa Margarita River IRWM Region and the San Diego IRWM Region that seeks to provide better understanding of nutrient impacts in the Santa Margarita River Watershed, and to help determine appropriate levels of nutrients to protect beneficial uses. This project received Proposition 84, Round 1, and Round 2 funding from both planning regions.

The Tri-County FACC has entered into an agreement to share the IRWM funds allocated by DWR to the San Diego Funding Area. This agreement has facilitated coordination between RWMGs by reducing competition and conflicts over funding. The Tri-County FACC agreement is described below, and manages three different aspects: information sharing, shared infrastructure, and competing interests.

Information Sharing

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 the San Diego Water Board and the Stormwater Monitoring Coalition (SMC).

Each of the IRWM Plans in the San Diego Funding Area includes sections on data management and project selection. The Tri-County FACC acts as an advisory council to assist in the development of these sections, particularly in 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.

The SMC is comprised of all Phase I municipal stormwater NPDES Principal Permittees and NPDES regulatory agencies in Southern California. This coalition includes Tri-County FACC RWMG members from the County of Orange, Riverside County Flood Control and Water Conservation District, and County of San Diego. SMC members have pooled resources to address data gaps, develop technical information and tools, and improve monitoring effectiveness.

Tri-County FACC members also participate in the San Diego Water Board's stakeholder groups for the development of TMDLs during the TMDL Basin Plan amendment process. Members of the Upper Santa Margarita RWMG and the South Orange County RWMG are also non-voting RAC meetings, in order to stay better informed of the priorities and needs of the San Diego IRWM Region and provide feedback through the public participation process.

The Tri-County FACC worked collaboratively in 2018 to complete the funding area-wide Water Needs Assessment. The three IRWM Regions identified DACs, EDAs, and URCs, and coordinated workshops and outreach presentations to gather feedback to better address primary DAC water resource needs across the three regions.

Figure 3-23: Tri-County FACC Boundaries

WOODARD & CURRAN

Sources: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
L:\Projects GIS\0188-003 SDIRWM Plan Update\MXD\Set 060713\Fig3-18_TriCountyFACCBdy.mxd

Shared Infrastructure

Each of the IRWM Regions in the Tri-County FACC is dependent on imported water, supplied through Metropolitan. As such, they share much of the same water infrastructure. Shared imported water infrastructure includes the Colorado River Aqueduct, Diamond Valley Lake, Lake Skinner, and other major pipelines, all of which are owned and operated by Metropolitan. The Lake Skinner Water Treatment Plant, also owned by Metropolitan, serves over 4 million people in the Tri-County FACC area. In addition to Metropolitan-owned imported water infrastructure, members of the Tri-County FACC also share pipelines used to supply parts of Camp Pendleton. This use of shared infrastructure helps provide common interests between the members of the Tri-County FACC, promoting collaboration between the RWMGs.

Competing Interests

Entities in the three Tri-County FACC regions have occasionally found themselves in conflict over water supply issues in the watersheds in overlay areas. 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, and cooperative projects funded. The Tri-County FACC MOU also establishes how IRWM Proposition grant funds will be allocated to each of the IRWM Regions in the Funding Area, making grant applications non-competitive within the San Diego Funding Area, and improving relations between RWMGs by reducing funding-related conflict. Successful funding agreements have been achieved for each implementation round of Proposition 84 funding, and for the DAC Involvement funding round of Proposition 1. Though not all water-related conflicts have been resolved, the Tri-County FACC MOU shows the willingness of these agencies to work collaboratively to solve important water resource conflicts, furthering the integration of water resource management.

3.13 United States–Mexico Border Coordination

In addition to neighboring IRWM regions located to the north, the San Diego IRWM Region is bounded to the south by the country of Mexico. Due to this proximity, the Region shares several water resource planning and coordination efforts with Mexico.

With specific regards to water supply resources, the South Bay International Wastewater Treatment Plant, located in San Ysidro, was built to address issues associated with wastewater treatment needs in Mexico that had resulted in contamination of portions of the Tijuana River located in the United States (International Boundary and Water Commission, ND). In addition, the Otay Water District located in the Region has an emergency connection with Mexico to provide water supplies to the city of Tijuana in an emergency situation.

With respect to water quality, efforts have been under way to address pollution issues in the Tijuana River Valley Floodplain through the Tijuana River Valley Recovery Team (Recovery Team). The Recovery Team is organized through the San Diego Regional Water Quality Control Board, and has the goal of partnering with Mexico to implement watershed-based solutions to address issues that affect United States and Mexico portions of the Tijuana Watershed (San Diego Water Board, 2013b).

Coordination with Mexico on water-related issues continues to grow in the Region, and in 2012 the U.S. Environmental Protection Agency and the Secretary for the Environment and Natural Resources of Mexico signed the Border 2020 agreement, which aims to address environmental issues such as water quality (EPA, 2013). Further, the Otay Water District recognizes that Mexico may be a potential future customer for recycled water supplies, and is exploring opportunities to work bi-nationally on water supply projects.

The California Department of Parks and Recreation was recently awarded IRWM funding under Prop 1 to provide planning and environmental review for the restoration of the abandoned Nelson Sloan Quarry located in the Tijuana River Valley. The project will beneficially re-use sediment from the Goat Canyon Sediment Basin and other flood channels to fill the quarry and restore the area to its native habitat.

As stated in the *Tijuana River Valley Recovery Strategy (TRVRS)*, efforts to protect and restore Tijuana River Valley resources are not new; sediment management, land preservation and habitat restoration have been conducted in the Tijuana Watershed for many years. Local, state, and federal management agencies, along with non-governmental organizations and other stakeholders have invested substantial effort and funding in project planning and implementation both in the United States and in Mexico to improve conditions. Investments to improve wastewater treatment began in the 1980s and 1990s. Recent activities have included pollution prevention and source control for sediment and trash, water quality improvements, flood control, improved recreational opportunities, and public education and outreach. These projects demonstrate the dedication and wealth of experience that the various operating agencies and stakeholders have invested in the Valley and watershed (TRVRS, 2012).

The future brings many challenges for the Tijuana River Valley Recovery Team. The bi-national nature of the watershed is one major hurdle. It is well known that source control and pollution prevention activities can be the most cost-effective solutions to reduce sediment and trash loading. With the majority of the watershed situated in Mexico, planning and implementing source control and other projects across the international border present an added challenge to an already complex issue.

Despite existing and future planned efforts to coordinate with Mexico on water management and watershed-based solutions, the limited decision-making authority of bi-national agencies results in long processes and implementation challenges. The IRWM Program will continue to work with existing organizations in the Region to address cross-border issues and implement integrated water management solutions, as appropriate.

3.14 Climate Change

Global climate change is predicted to have significant impacts on the hydrologic conditions in the Region, within California, and in the Colorado River Basin. The three primary climate stressors that will impact the San Diego region are: 1) temperature increases, 2) precipitation regime changes, and 3) sea level rise; which together will have far reaching implications for water supply, water quality, hydrology, and infrastructure. Notably, climate impacts to other parts of California and to the Colorado River Basin will also affect the availability of imported water. A general hydrological implication is that climate change will give rise to more extreme future scenarios (i.e., drought and storm events) on more variable timelines, which confirms a need for resilience planning focused on holistic adaptation efforts. All climate models and the severity of their implications are dependent on greenhouse gas emissions and the extent to which mitigation is effective however; making climate mitigation an equally important component of climate resilience.

DWR coordinated a literature search on global climate change issues and summarized probable impacts within the *California Water Plan Update 2013* (DWR, 2013) and within *Progress on Incorporating Climate Change into Management of California's Water Resources* (DWR, 2006). As part of the California Fourth Climate Change Assessment, The Scripps Institution of Oceanography also coordinated the San Diego Region Report which includes an assessment of regional water and infrastructure vulnerabilities to climate change as well as emerging adaptation solutions. For that same assessment, the Climate Science Alliance produced the technical report "San Diego County Ecosystems: The Ecological Impacts of Climate Change on a Biodiversity Hotspot" which focuses on specific ecosystems impacts of climate change (Jennings et al., 2018). In addition, the Ocean Protection Council released the latest guidance for sea level rise planning, *State of California Sea-Level Rise Guidance: 2018 Update* (Resources Agency, 2018).

Key impacts documented and forecasted within these reports are summarized below:

- *Temperature.* By the end of the 21st century, scientists predict the annual average temperatures in the San Diego region will increase by 5-10 °F (Kalansky et al. 2018). Hot temperature extremes or 'heat waves' are expected to increase in their frequency, duration and intensity[2]. Shifts in temperature patterns may also adjust the timing and duration of seasons, such that the timing of spring may occur earlier and onset of winter may be delayed. Extreme temperatures may exceed physiological thresholds for temperature tolerance for some species. Importantly, climate warming is projected to take a toll on the region's current water supply sources. Estimated reductions of Colorado River flow range from 10-45% by mid-century (Udall and Overpeck, 2017). Supplies to the State Water Project are expected to reduce by 10% or more by 2050 and San Diego County's native surface water will be impacted by increased temperatures as well as by precipitation variability in particular which affects seasonal availability (Wang et al. 2018, Kalansky et al. 2018). Meanwhile, warmer temperatures may result in a higher demand in energy for cooling, and greater water demand by agriculture. Higher air temperatures will not only lead to greater evaporation of reservoirs and lakes, but also to earlier and potentially stronger thermal stratification of reservoirs. Increased air temperatures will also translate into higher water temperatures for freshwater streams and estuaries, which may have adverse effects for biological communities. These impacts may adversely affect cold water or other species, as well as increase the frequency and intensity of algae blooms and other water-borne agents. Additionally, warmer temperatures may result in a, higher demand in energy for cooling, and greater water demand by agriculture.
- *Hydrologic Patterns.* Precipitation will remain highly variable but will change in character; with wetter winters, drier springs, and more frequent and severe droughts punctuated by more intense individual precipitation events (Kalansky et al. 2018). Overall, climate models indicate that that by 2050 the region will become much drier due to an increase in the number of dry days and the dry years becoming drier, with a marked decrease of precipitation in the shoulder seasons of autumn and spring (Kalansky et al. 2018). More dry years also leads to an increase in the duration, frequency, and severity of droughts in the future. Higher temperatures will exacerbate future droughts leading to larger water deficits across the landscape and have other wide-reaching impacts to fire frequency, reservoir operations, water quality, and ecosystem (Kalansky et al., 2018). Recently (2012-2016), the state experienced a historic drought and mandatory use restrictions were enacted statewide. The extremely warm dry years of 2014 and 2015 are a harbinger of future droughts given the high temperatures during these drought years. (Dienbaugh et al., 2015). While days with measurable precipitation are projected to become less frequent in Southern California, extreme precipitation events will intensify (see Storm Intensity.) By the end of the century, the average wettest day every five years is projected to increase by 10-25% under a moderate emissions pathway and by 15-30% under a business-as-usual emissions

[2] the number of heat wave days is projected to increase between 20-50% under a 6 ℉ temperature increase

scenario (Kalansky et al 2018.) Abrupt transitions from extreme dry scenarios to extreme wet scenarios is characterized as "precipitation whiplash" and can have implications to hydrology and water management. For instance; long periods of drought can lower soil moisture conditions, inducing erosion and making flooding potentially more destructive. Climate change may also result in a shift in storm tracks. Existing data (DWR, 2006) show a trend of increasing precipitation in Northern California and decreasing precipitation in Southern California during the past century. For example, typically El Niño events bring higher precipitation to Southern California. However, during the 2015-2016 El Niño, a mass of anomalously warm water off the Pacific Northwest (a.k.a. the blob) facilitated the formation of a resilient atmospheric ridge, which blocked much of the expected precipitation to Southern California. As sea surface temperatures change, it remains unclear how the precipitation patterns typically expected by the El Niño Southern Oscillation may change.

- *Storm Intensity.* Climate change projections suggest that rain events will become more extreme, bringing larger and more intense storms to the region (see *Hydrologic Patterns*). These changes have implications for flood management, erosion, and water quality in surface reservoirs and freshwater, estuarine, and marine water bodies, including ephemeral streams and urbanized creeks. In addition, the risk of mudslides and debris flows increase, particularly following wildfires predicted to become more frequent and intense due to climate change. Increases in storm intensity may have negative environmental impacts as well as negative impacts to human health and safety. Particular infrastructure challenges related to intense storms include: Flood control challenges, where current flood control issues like debris build-up in basins are further intensified; wastewater infrastructure vulnerabilities; where large sewage spills in the region are already associated with large storm events impacting wastewater treatment centers; and other exposed infrastructure vulnerabilities — including the miles of sewage pipelines and treatment facilities located in canyons that will face increased risk from flooding or erosion (Kalansky et al. 2018).
- *Sea Level Rise.* In San Diego, sea level rise is projected to rise approximately 1 ft by 2050 and 3 feet or potentially much higher by 2100 (Kalansky et al. 2018.). There is a 1 in 20 chance that sea level could rise as much as 4.6 ft by 2100 (Resources Agencies, 2018). Higher mean sea level, in combination with high tide and storm events, may increase coastal erosion, impacting ecosystems and tidal wetlands. These combined forces may also lead to inundation of coastal wastewater infrastructure and storm drain systems, impacting the effectiveness of these systems to discharge to the ocean. Storm water pipes can become submerged under high sea level events, as was shown during the 2011 king-tide event (San Diego Union Tribune, 2011), potentially causing flooding issue upstream. Using the USGS Coastal Storm Model System (CoSMoS) maps, San Diego Region Report authors for the California Fourth Climate Change Assessment found that some pump stations are relatively more vulnerable, with one pump station in Otay Mesa being affected by a 20-year flood with 1.6 ft of sea level rise. (Kalansky et al, 2018). In addition, as sea level rises, there is an increased probability that salinity will intrude into the Sacramento Bay Delta, adversely impacting the quality of SWP supplies delivered to the Region. Similarly, groundwater basins in coastal areas may become more brackish in nature, potentially increasing the costs of utilizing groundwater resources for drinking water or other purposes. The ecological impacts of sea level rise include coastal erosion and the loss of coastal wetlands, which provide numerous ecosystem services including nutrient cycling, carbon storage, and biodiversity. Additionally, much of the coastline is populated by businesses, military and other government facilities, parks, and homes, which makes these structures at risk of inundation, subsidence, or erosion impacts.

- *Wildfire.* The frequency and severity of wildfires in the San Diego region have increased over the 20th Century. The reduced time intervals between fires may be too short for native vegetation to recover, resulting in the conversion of native shrub land to weedy annual grasses. These changes could dramatically reduce the region's biodiversity. More frequent, longer, or more intense drought could also lead to larger and more frequent fires, as drought increases dead and dry fuels available to burn. Similarly, climate change may also result in warmer Santa Ana winds, increasing their ability to dry out fuels. With predicted changes in precipitation, vegetation may exhibit reduced moisture content for longer periods of time, lengthening the fire season into the winter and even spring. As the climate changes, weather patterns are predicted to be more variable. For example, the fall of 2017 experienced extremely warm, dry, and in some parts of the state, fiery conditions, followed by an extreme rain event. As a result, severe erosion and mudslides occurred, washing the recently burned material downstream. While San Diego did not experience mudslides in 2017, the conditions that led to mudslides elsewhere in the state are present in the San Diego region, and associated risk expected to increase due to the effects of climate change. These events exemplify the type of conditions expected to occur more frequently in the future and may have significant impacts on watersheds, water quality, and communities in flood-prone and fire-prone areas.
- *Water Demand.* Potential global warming effects on vegetation evapotranspiration are currently unknown; however, irrigation demands could potentially increase. While increased temperature results in increased evapotranspiration, this may be partially offset by the fact that increased atmospheric carbon dioxide can result in reduced vegetation water consumption. Warmer and drier climactic trends are likely to result in increased water demands region-wide to support outdoor irrigation, similar to the summer demand peaks seen today. More water may also be needed for cooling in various sectors throughout the region due to higher temperatures.
- *Snowpack Changes.* While snowpack represents a negligible component of the water balance within the Region's local water supplies, snowpack in the Sierra Nevada Mountains represents California's largest water storage component. The Sierra Nevada snowpack is projected to decline by at least 25% by the year 2050 (DWR 2007), thereby reducing freshwater flows and the volume of water available for transport. Increasing winter and early spring temperatures will cause earlier melting of the Sierra Nevada snowpack and may also shift the type of precipitation from snow to rain. More snow falling as rain is likely to cause greater flows in the winter, when flooding is already a problem, and fewer flows in the summer when flows are low. These impacts may pose challenges for water storage, as a shift from snow to rainfall will require more storage to be available to capture rain (Resources Agency, 2009). Capturing rainfall will be particularly challenging during El Niño, when precipitation is generally higher. Shifts in precipitation patterns may also require additional flood control measures to account for higher rainfall and reduced snowpack.
- *Energy Demand.* Climate change may also result in increased energy demands that will require increased conservation and efficiency measures. 2035 projections show an increase in normal water demand by 20% from the average demand that occurred over the period of 2005-2010 (City of San Diego, 2015). In addition, California's hydroelectric power generation may be less reliable. Further, should the Region's demands for imported water increase due to a reduction in local supply reliability associated with the effects of climate change, energy will be required to pump the additional imported water to the Region.

In addition to the impacts listed above, recent events at Oroville Dam during the 2016/17 El Niño highlighted the direct impacts of extreme precipitation events on water infrastructure and flood risk. The heavy rainfall in Northern California that year led to a need for Oroville Dam to release water through its spillway, which was damaged in the process, requiring the use of the emergency spillway, which also experienced damage. Downstream communities were evacuated, flows in the Feather River rose substantially and quickly, the emergency spillway experienced substantial erosion, and tons of sediment was released downstream. DWR's Division of Safety of Dams (DOSD) established the Spillway Re-evaluation Program to assess dam structures and confirm they meet minimum safety standards. This Program, in addition to the regular DOSD dam evaluations, resulted in additional restrictions on dam operations, including limitations on water surface levels. As climate change impacts are anticipated to affect precipitation patterns and snowmelt timing, reservoir managers may need to maintain lower reservoir elevations in preparation for larger inundations when water does enter the reservoir. This may lead to more frequent dam releases or larger dam releases, which represent a missed opportunity for local water supply.

In the near term, the water resources and ecosystems in the region will be most threatened by landscape changes, habitat disturbance (loss, pollution, etc.), and fragmentation due to development and fire. In the long-term, climate variability will compound those stressors with increased temperatures, precipitation variability, occasional higher intensity flooding, more frequent and prolonged drought, and more destructive fires. Efforts to respond to climate change vulnerabilities within the Region are currently being developed. The *2017 SWRP* investigates the potential benefits of stormwater capture and use projects. Stormwater capture projects can be designed to enhance wetlands or riparian habitat. Healthy wetlands provide flood protection and mitigation to sea level rise, and act as carbon sinks. In addition, developing such a local supply can help to reduce the demand for imported water, thus reducing both the amount energy needed to transport water and the resultant GHG emissions.

DWR has also identified needs for further assessment of how global climate change may affect California water planning and management. The California Natural Resources Agency has outlined strategies to plan for and adapt to climate change. The *Safeguarding California Plan: 2018 Update* is the State's roadmap for everything state agencies are doing and will do to protect communities, infrastructure, services, and the natural environment from climate change impacts. This holistic strategy primarily covers State agencies' programmatic and policy responses across different policy areas, but it also discusses the ongoing related work to with coordinated local and regional adaptation action and developments in climate impact science. Regardless of the projected altered conditions, improving local stewardship of the Region's water resources will improve the Region's ability to withstand impacts from natural variability and changes in climate conditions.

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4 Tribal Nations of San Diego County

Please note that Chapter 4, Tribal Nations of San Diego County was not updated during the 2019 IRWM Plan Update – Phase 1. Some information in this chapter may no longer be current.

This chapter presents an overall summary of the Tribal Nations of San Diego County and the water resources on their reservations. A brief description of each Tribe, along with a summary of available information on each Tribe's water resources, is provided. The water management issues provided by the Tribe's representatives at the San Diego IRWM outreach meetings are also presented.

4.1 Reservations

San Diego County features the largest number of Tribes and Reservations of any county in the United States. There are 18 federally-recognized Tribal Nation Reservations and 17 Tribal Governments, because the Barona and Viejas Bands share joint-trust and administrative responsibility for the Capitan Grande Reservation. All of the Tribes within the San Diego IRWM Region are also recognized as California Native American Tribes. These Reservation lands, which are governed by Tribal Nations, total approximately 127,000 acres or 198 square miles. The locations of the Tribal Reservations are presented in Figure 4-1 and summarized in Table 4-1.

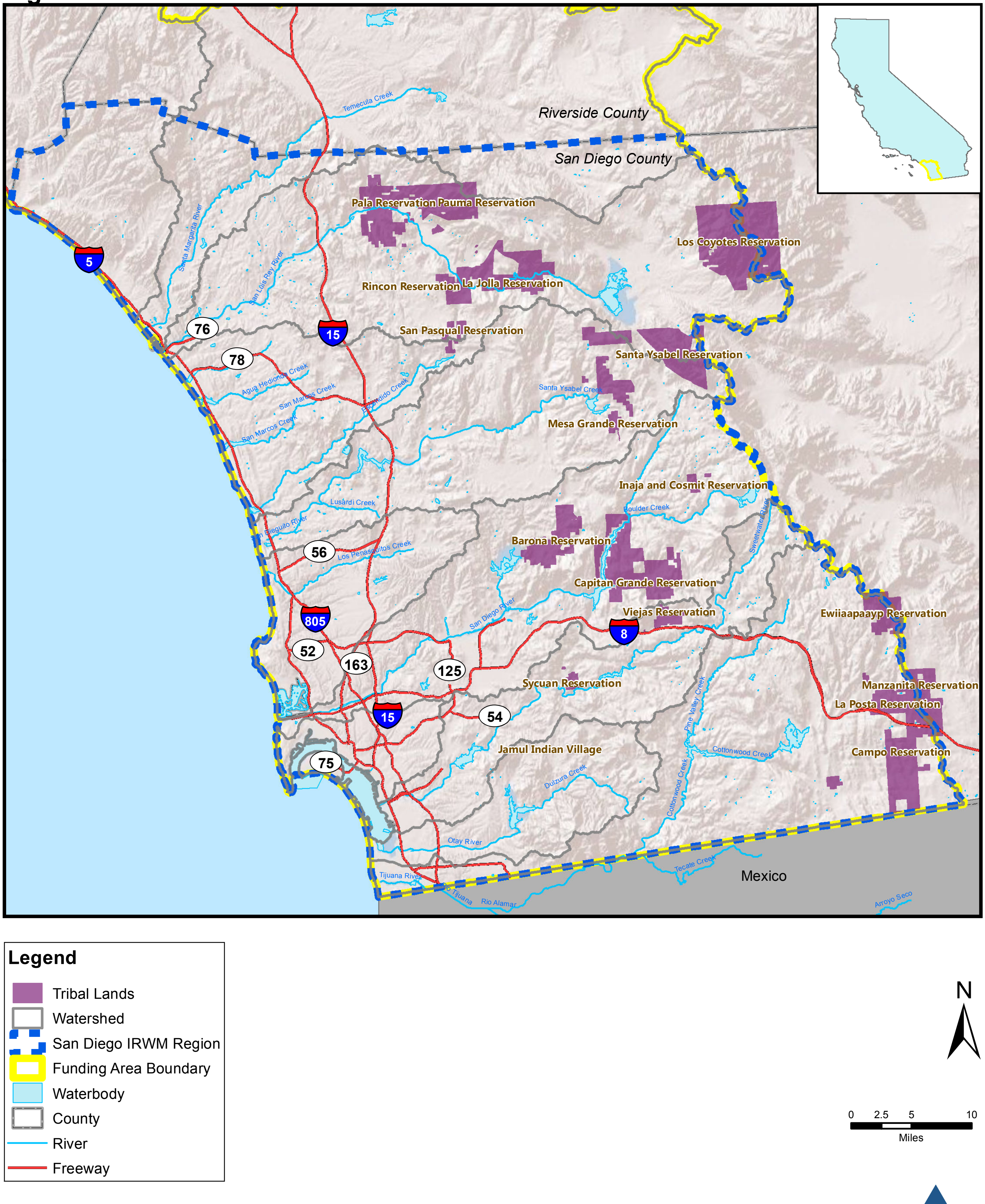
Two additional Tribal Governments do not have federally recognized lands: 1) the San Luis Rey Band of Luiseño Indians (though the Band remains active in the San Diego region) and 2) the Mount Laguna Band of Luiseño Indians.

Note that there may appear to be inconsistencies related to population sizes of tribes in Table 4-1. This is because not all Tribes may choose to participate in population surveys, or may identify with multiple heritages.

4.2 Cultural Groups

Native Americans within the San Diego IRWM Region generally comprise four distinct cultural groups (Kumeyaay/Diegueno, Luiseño, Cahuilla, and Cupeño), which are from two distinct language families (Uto-Aztecan and Yuman-Cochimi). These cultural groups are distributed throughout San Diego County and their respective traditional territories include areas in neighboring counties. In general, Luiseño, Cupeño, and Cahuilla cultural groups are located in the northern half of San Diego County, while Kumeyaay/Diegueno cultural groups are located in the southern half of San Diego County (see Figure 4-2). However, members of the various tribes in San Diego County have interacted for centuries and individuals may consider themselves part of multiple cultural traditions, despite being enrolled in a particular tribe (e.g., Barona Band of Mission Indians) or living on a particular reservation. Neighboring Tribes whose land falls outside the San Diego IRWM Region, but may have an interest in, or impact on, the water management and water issues of the Region include the Pechanga Band of Luiseño Indians, located near Temecula, CA; the Cahuilla Band of Indians, located near Anza, CA; and the Torres-Martinez Desert Cahuilla Indians, located near Coachella, CA.

Figure 4-1: Tribal Nation Reservations



Source: San Diego Association of Governments (SANDAG) - GIS Data Warehouse
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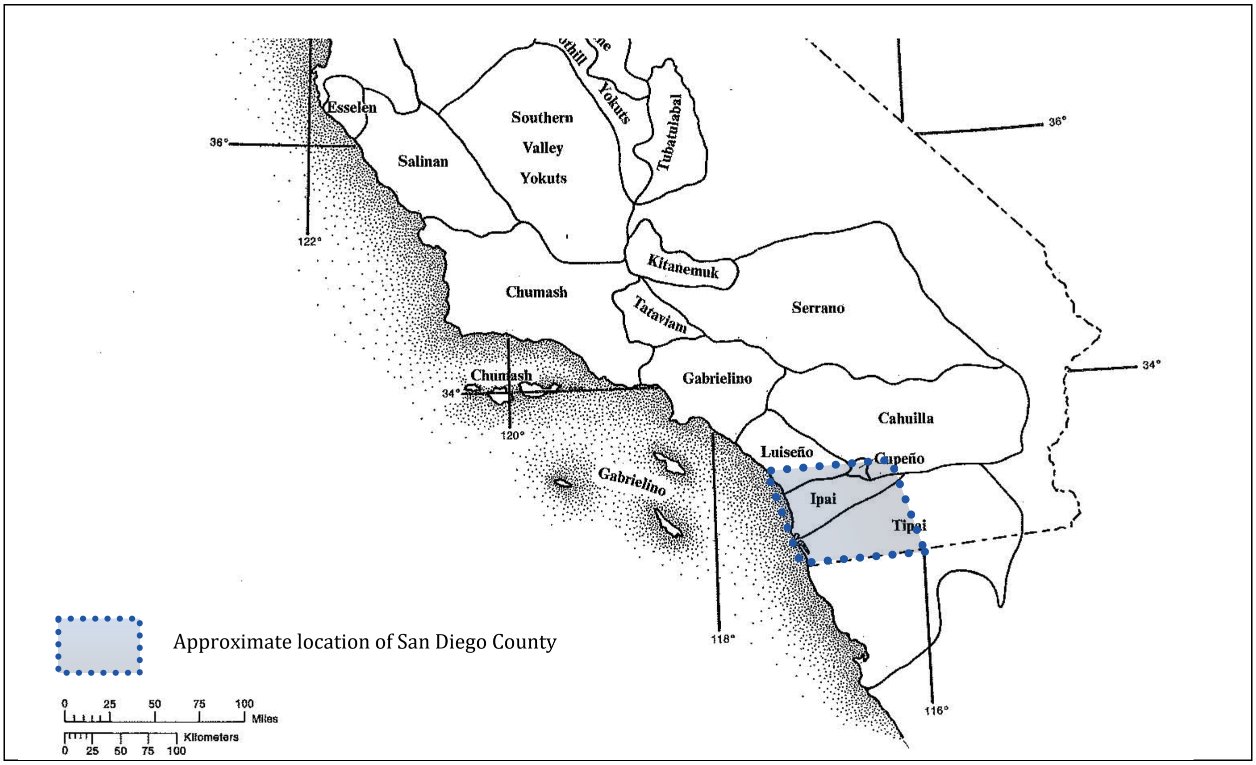
Table 4-1: San Diego County Tribal Governments and Reservations

No.	Name: Reservation	Name: Tribal Nation	Ethnology/Language	Acreage	Population: Total Tribal Members[1]	Population: Reservation Population (Tribal members and non-members)[2]	Housing Units
1	Barona Reservation	Barona Band of Mission Indians	Ipai-Tipai/Diegueno	5,664	536	640	219
2	Campo Reservation	Campo Band of Kumeyaay Indians	Kumeyaay/Diegueno	15,336	351	362	140
3	Capitan Grande Reservation	Capitan Grande Band of Mission Indians, consisting of the Barona and Viejas Bands	Kumeyaay/Diegueno	15,615	33	0	0
4	Ewiiaapaayp Reservation	Ewiiaapaayp Band of Kumeyaay Indians (formerly Cuyapaipe Band of Mission Indians)	Kumeyaay/Diegueno	4,156	N/A	0	0
5	Inaja & Cosmit Reservation	Inaja – Cosmit Band of Indian	Kumeyaay/Diegueno	846	15[2]	0	0
6	Jamul Indian Village	Jamul Indian Village	Kumeyaay/Diegueno	6.2[3]	60	0	0
7	La Jolla Reservation	La Jolla Band of Indians	Luiseño	8,822	390	476	181
8	La Posta Reservation	La Posta Band of Mission Indians	Kumeyaay/Diegueno	3,471	18	55	19
9	Los Coyotes Reservation	Los Coyotes Band of Cahuilla and Cupeño Indians	Cahuilla, Cupeño	25,050[3]	328[4]	98	35
10	Manzanita Reservation	Manzanita Band of the Kumeyaay Nation	Kumeyaay/Diegueno	3,563	69	78	35
11	Mesa Grande Reservation	Mesa Grande Band of Mission Indians	Kumeyaay/Diegueno	1,820	75	98	24
12	Pala Reservation	Pala Band of Mission Indians	Luiseño, Cupeño	12,333	1,573	1,315	425
13	Pauma and Yuima Reservation	Pauma/Yuima Band of Mission Indians	Luiseño	5,826[6]	186	206	63
14	Rincon Reservation	Rincon Nation of Luiseño Indians	Luiseño	5,500[3]	1,495	1,215	357
15	San Pasqual Reservation	San Pasqual Band of Indians	Ipai/Kumeyaay	1,500	500[3]	1,097	298
16	Santa Ysabel Reservation	Ipay Nation of Santa Ysabel	Diegueno	15,270	250	330	140
17	Sycuan Reservation	Sycuan Band of the Kumeyaay Nation	Kumeyaay/Diegueno	632	33	211	76
18	Viejas Reservation	Viejas Band of Kumeyaay Indians	Kumeyaay/Diegueno	1,696[3]	394	520	192
19	N/A	San Luis Rey Band of Luiseño Indians[5]	Luiseño	N/A		N/A	N/A
20	N/A	Mount Laguna Band of Kwaaymii Indians[5]		N/A		N/A	N/A

1 Based on latest information from Indian Reservations in San Diego County. Available: http://www.sandiego.edu/nativeamerican/reservations.php (Accessed 25 March 2012).
2 Based on U.S. Census Bureau. 2010. *U.S. Census Demographic Profiles*. Available: http://www.census.gov/2010census/popmap/ (Accessed: 26 April 2013).
3 Based on information from the Tribal Characterization Form submitted by the Tribes.
4 Based on information from Los Coyotes Indian Reservation. Available: http://www.kumeyaay.info/los_coyotes.html (Accessed 3/25/2013).
5 The San Luis Rey Band of Luiseño Indians and the Mount Laguna Band of Luiseño Indians are not federally-recognized tribes.
6 Of the 5,826 acres of the reservation, only 200 acres are developable.

As of 2010 only a small percentage of the Region's Native American population of 17,000 lived within the Tribal Nation Reservation lands. Brief descriptions for each Tribal Nation Reservation are presented in Section 4.6 below.

Figure 4-2: Traditional Territories of Tribal Nations in California



Source: *Handbook of North American Indians*, Robert F. Heiner, ed. Vol. 8: California. 1978.

4.3 Tribal Autonomy

While the Tribal Nations are sovereign and have autonomy over their lands, they are subject to Federal environmental laws and regulations. Sovereign Tribal Nations are not subject to State and local environmental laws and regulations, except for those required under a Compact with the State, and other independent agreements between the Tribal Governments and local agencies. While State and local governments do not have any authority over Tribal Lands, in a few cases, working relationships exists between the Tribes and local jurisdictions to address water and habitat issues. For example, Tribal representatives regularly meet with officials from with the San Diego Association of Governments (SANDAG) and serve on various working groups and committees. A position reserved for a Tribal representative on the Regional Advisory Committee (RAC) is open and awaits filling by the Southern California Tribal Chairmen's Association; in the past, Tribal representatives have participated on the RAC and on RAC workgroups.

Understanding that Tribes are important partners in water resources management, and acknowledging their cultural and historical ties to the Region and its resources, the Regional Water Management Group has made a concerted effort to reach out to the Tribes within the Region. These efforts are described in detail in *Chapter 6, Governance and Stakeholder Involvement*.

4.4 Tribal Resource Management

The primary function of each of the Region's Tribes is to serve as a government for the members of the Tribe. As such, many Tribes have environmental departments tasked with setting environmental regulations on Tribal lands and monitoring water resources for compliance with applicable federal laws and regulations. These tribal environmental agencies manage groundwater levels through recharge from rainfall on reservation land.

In addition to formal oversight through Tribal agencies, many Tribes have a cultural connection with their water resources. This is captured, in part, in the *Tribal Water Stories of Coastal Southern California* document produced during the tribal outreach conducted during development of the 2013 IRWM Plan. This document is a collection of stories, myths, songs, and poems from Tribes in Southern California, and is meant to educate and inform the reader, as well as honor the cultures and peoples from whom these stories come. The *Tribal Water Stories of Coastal Southern California* is included as Appendix 4-A.

Excerpt from Tribal Water Stories of Coastal Southern California*, a collection of stories, myths, and songs from Tribes in San Diego County, collected to entertain and educate readers, while honoring and celebrating the people and cultures from which these stories come. To download the entire collection, visit:* www.sdirwmp.org

AH-HA' WI-AH-AH' *WATER COLDER WATER*

The cold spring, located on the high peak of the Cuyamacas, is well known to all lovers of these mountains, and the Indians, who must ever have a reason for the existence of things, tell how it was created and named by one of their mythical creatures long ago.

At one time in the ages past, the Ah-ha' Kwe-ah-mac' (Water Beyond) mountains were infested by monstrous giants with loathsome, ill-shapen bodies, who terrorized the surrounding country. These marauders, lurking and watching their opportunity, frequently stole the Indian maids from their villages, keeping them in bondage as slaves.

One of the giants, named Hum-am' Kwish'wash (Whip to Kill People), lived in the vicinity of Pam-mum'am-wah' (Green Valley).

He reveled in the most fiendish greediness, but his innate sense of the beautiful was keen and strong. He not only selected the most delightful places to live, but surrounded himself with objects pleasing to the eye. Always he stole the fairest of the Indian maids and required them to weave the most exquisite designs known in their art of basket making.

His cruelty was extreme, and did his slaves displease him in the least, they met with the most horrible death imaginable.

This hideous being possessed supernatural powers, which he employed in various ways. It seems that he wanted nothing but the coldest water to drink. He tried the water in the streams and tried the water in the springs that abound throughout the country, but never did any of it suit his taste, so he created for himself a spring of colder water.

Tribal ecological knowledge (TEK) could be a valuable resource for water managers in the Region, because Tribes have been managing their water resources for thousands of years. Land management techniques of local tribes included irrigation, burning, pruning, sowing, selective harvesting, and tilling (Anderson and Nabhan 1991). Locally, the Kumeyaay Diegueno Land Conservancy (KDLC) actively uses tribal ecological knowledge to manage conservancy lands, and these practices are integrated within their partnerships and coordination efforts with Tribal, federal, and non-profit groups, including the Wildlife Conservation Board, US Fish and Wildlife (Tribal Wildlife Grant Program), Cuyamaca State Park, Back Country Land Trust, San Diego Parks and Recreation, and the US Bureau of Land Management, among others (Connolly 2013).

Two TEK practices highlighted by the KDLC that most influence and benefit water and water management systems are fire mosaics and rock drop/gabion structures.

Fire Mosaics

The TEK fire mosaic management technique involves applying fire to particular vegetation areas under specified environmental conditions and descriptors such as seasonality, fire-return interval, and dimensions to achieve select cultural purposes (Anderson and Nabhan 1991). Burning vegetation helps to recycle nutrients within the soil, promotes soil fertility, destroys insects, disease, and quick growing invasive plant species, and promotes a lush understory of vegetation that was essential to the Native American subsistence food supply (Martinez 1993). In addition to the benefits fire mosaics provide as land management, this practice directly influences the way water is retained and controlled. A post burn, open-growth landscape is known to make large trees more drought-tolerant, attract more native grasses, and create a permeable soil surface that manages surface erosion (Martinez 1993). The post burn environment sometimes includes downed logs that act as reservoirs, creating microclimates and promoting moisture retention (Martinez 1993). Fire mosaics promote the carrying capacity of the soil and increase groundwater recharge, both of which are very important to the southern Californian landscape (Connolly 2013).

Rock Drops and Gabions

One particularly important TEK water management technique used on Tribal lands and conservancy efforts is irrigation, by supplying select land areas with water through means of diversion and artificial channels (Anderson and Nabhan 1991). Rock drops and gabions are two types of water management tools used to manipulate the movement of water to increase its potential positive benefits in an area. When a stream or river runs too fast, the surrounding banks tend to erode, habitat potential is lost, and groundwater recharge is limited. In order to stabilize stream flow, enhance groundwater recharge, and create riparian habitats, rock drops are used (Connolly 2013). Similar to a dam, but much less invasive, rock drops are created by the dry (non-cemented) layering of large boulders perpendicular to the natural water flow. This causes the flow to slow and water to saturate the ground more deeply and with more breadth, recharging the water table and stabilizing the stream. The following images, presented by Michael Connolly of the Campo Kumeyaay Nation at the 2013 Tribal Water Summit, illustrate the substantial effect rock drop structures have on an environment.

River landscape before and after rock drop structure installation at Campo Reservation.

Photo credit: Michael Connolly at the 2013 Tribal Water Summit

Gabions are usually made of pillar-like installations of boulders, held together by wire mesh, and placed along the interior banks of a waterway. By manipulating the water flow patterns and creating areas of varying water speed, gabions help to create riparian habitat, stabilize stream flow, and increase groundwater recharge (Connolly 2013). Both rock drops and gabions have been shown to increase Native American traditional food supply, medicine, and building and craft materials, by attracting and fostering the growth of certain plants and cultivating additional biodynamic processes (Connolly 2013).

Following the Winters Doctrine (see box to the right), tribal water rights were established with the reservations, and have precedence over subsequent water claims – whether or not Tribes use their full allocation. In the San Diego IRWM Region, most Tribes have senior water rights over local agencies. Tribes in the San Diego Region also have full rights to the water that falls on their land.

Winters v. United States

The *Winters v. United States* Supreme Court Case (1907-1908) settled questions of water rights of Reservations. The court found that water rights were implied with the creation of a reservation, even if not explicitly stated. Further, the rights are in an amount to allow for a productive, successful settlement on the reservation. These rights have priority over other subsequent water rights. Further, the rights claimed by the reservation are not forfeited through lack of use.

Source: Winters v. United States: http://supreme.justia.com/cases/federal/us/207/564/case.html

4.5 Development on Tribal Lands

San Diego County has a semi-arid environment with limited local surface water and groundwater supply. The major forecasts for regional growth in San Diego County are conducted by SANDAG and the County of San Diego. SANDAG has recently completed its 2050 Regional Growth Forecast and the County of San Diego has prepared the San Diego County General Plan. These documents are used by the San Diego County Water Authority and other regional and local agencies for planning current and future water demand and water supply for the region. However, the recent and planned future developments on Tribal lands may not be adequately represented or considered in these planning efforts.

Development on tribal lands is driven by economic factors. Economic growth on the reservations has primarily come from the advent of gaming, though it is also driven by the renewable energy industry and agriculture, among others. Land use on Tribal lands in San Diego County was mostly limited to residential and minor agricultural activities until the Indian Gaming Regulatory Act of 1988 which regulated gaming activities on the Tribal Nations Reservations. Ten gaming facilities have been started on Tribal Reservations in San Diego County since 1988, more than in any other county in the United States, and more are under development. Some of the Tribes have also added malls, resorts, hotels, restaurants, and golfing to their reservation lands.

Development of gaming, visitor, recreational, and associated facilities on the Tribal lands, and the economic benefits associated with them, has resulted in increased development on the reservations. This trend is expected to continue. To support economic development on the reservations, tribes are relying on their previously unclaimed water rights under the Winters Doctrine to extract water from the underlying groundwater basins. The combined impact of water extractions both on and off reservation lands may result in overdraft of the groundwater basins. As such, improved regional and local planning efforts may be needed to maintain local groundwater supplies and incorporate future developments on Tribal Reservations when considering potential off-reservation development, particularly upstream of reservation lands. Tribal water rights, including for economic development, often take precedence over new, off-reservation development, so consideration of development on tribal lands is important when allocating water to new off-reservation development projects. Because many Tribes have environmental and planning departments that regulate development on tribal lands, communication between these and other agencies may be necessary when considering development projects sharing tribal groundwater sources. In the past, the Water Authority and other agencies in the Region have coordinated with tribes regarding annexation and exploring the potential for water supply delivery to reservation lands due to interest among some Tribes in obtaining imported water supplies.

Development on tribal lands is regulated by tribal planning agencies and departments. These planning efforts comply with federal law, including Tribal Environmental Impact Report (TEIR) requirements. TEIRs developed for the gaming and associated facilities generally present the following protection measures to manage local water and wastewater in a sustainable manner:

- Minimizing groundwater use by:
  - Using recycled water for irrigation
  - Enhancing infiltration systems and capacity for groundwater recharge
  - Accommodating all wastewater flows on Tribal lands
  - Maintaining groundwater extractions to below local basin’s sustainable yield levels
  - Implementing Groundwater Monitoring and Mitigation Plans (GMMPs)
- Maximizing water conservation by:
  - Using native, drought-resistant plants in landscaping
  - Using proper irrigation timing and duration
  - Implementing indoor water conservation practices in kitchens
  - Using waterless urinals
  - Using low flow toilets
- Managing water quality by:
  - Establishing and enforcing tribal water quality standards under the Clean Water Act
  - U.S. Environmental Protection Agency oversight of drinking water facilities to ensure compliance with the Safe Drinking Water Act
  - Complying with tribal environmental departments’ water quality programs

4.6 Tribal Nation Water Resources

A brief description of demographic information, environmental programs, and water resources for each Tribal Nation Reservation is provided below. The amount or detail of information available varies greatly by Tribe. The information contained in this section reflects the responses provided through a questionnaire sent to each Tribe, as well as other sources. Tribal participation in the questionnaire varied, as reflected by the varying level of detail presented herein, and some tribes expressed concern over how such data may be used.

4.6.1 Barona Band of Mission Indians

The Barona Indian Reservation was established in 1932, and is home to the Barona Band of Mission Indians. The Barona Band of Mission Indians is a federally-recognized Tribe governed by an elected Tribal Council. The reservation has its own museum, school, fire station, gas station, church, and community center, as well as the Barona Valley Ranch Resort & Casino. In the Tribe's continued efforts to preserve its culture, the reservation is also home to the Barona Cultural Center & Museum, a hands-on educational museum. Displays of handmade pottery, reed baskets, paintings, arrowheads, and other artifacts - over 2,000 in all - date back thousands of years, and bring to life the rich culture and history of San Diego's Native American community.

Barona's Water Resources

Barona's reverence for the environment spans thousands of years and the tribe practices energy and resource conservation throughout the reservation and resort property. Barona's first on-site water treatment facility went online in 1994; a second, more advanced water reclamation plant was completed and implemented in 2000. This facility uses ultraviolet (UV) disinfection to safely and efficiently produce sufficient supplies of clean water. Following its construction, the Tribe converted the Barona Indian Charter School from septic to sewer service. Barona's water reclamation plant treats water from many sources on the resort. At peak capacity, it can treat and filter 750,000 gallons of water per day.

An extensive water recovery program captures irrigation runoff from the golf course and resort landscaping, and rainwater from building rooftops, parking lots, storm gutters, and drains. The collected water is channeled to a series of retention ponds via an aqueduct. There, it is blended with treated water from the water reclamation plant. Four retention ponds have a total capacity of approximately 12 million gallons of water. Combined with the golf course ponds, Barona has a water storage capacity of almost 47 million gallons.

In addition to an aggressive water collection and reclamation system, Barona uses reclaimed water for golf course and landscaping irrigation, and further conserves water through the use of native, water-efficient plants and efficient irrigation systems in landscaping. Equipment, foot traffic, and pesticides are restricted in all habitat and nesting areas, providing protection for native wildlife and the environment.

In order to protect the groundwater resources, the Barona Band is trying to add an additional 600 acres of land to their reservation, which would allow it to pump from two separate aquifers, reducing their impact on a single aquifer.

4.6.2 Campo Band of Kumeyaay Indians

The Kumeyaay Nation once encompassed the lands from northern San Diego County to the dunes of the Imperial Valley and south beyond Ensenada, Mexico. The Kumeyaay were originally organized along clan lines called Sh'mulq, but when the Mexican-American War ended in 1848, the new international border was drawn through the heart of Kumeyaay lands. By 1875, the first of the Kumeyaay territories began to be converted to Reservation trust land. Further additions were taken into trust over the next 25 years, including the first portion of the Campo Indian Reservation in 1893.

In 1978, the Campo people designated the area near the Crestwood freeway off-ramp as an area for economic development. After considerable debate over various development proposals, a casino facility was constructed in 2001.

Campo's Water Resources

The Campo Environmental Protection Agency (CEPA) was created by order of the General Council of the Campo Band of Kumeyaay Indians in July 1990. Originally created to address concerns relating to a commercial development, the scope of CEPA activities has grown to all areas of environmental protection and protection of public health.

Traditional water management techniques, such as rock drop structures, are used on Campo lands. Without a natural fire regime and fire mosaic in the area, vegetation has become less diverse, and more of a monoculture, which has reduced the capacity of streams.

Commercial grazing was banned on tribal lands in January 1995, which has significantly assisted in the recovery of wetland species in riparian areas on tribal lands. CEPA anticipates expanding its stewardship efforts into the 36 miles of perennial and ephemeral streams of the reservation. The Campo Wetlands Restoration Project on Diebold Creek has received national recognition for restoring large stretches of stream habitat. Originally, an overgrazed stretch of valley with a 12 foot deep arroyo and ephemeral water flow, the creek now flows perennially, the arroyo is silted in and new riparian vegetation has grown to over 20 feet. This has all occurred since the original erosion structures were emplaced in 1992.

4.6.3 Capitan Grande Group of Mission Indians

During the 1840s and 1850s, San Diego experienced so much growth that some groups of Indians living in the Mission Valley area were pushed into what is now the East County. In 1853, many of these people established a village in the Capitan Grande area of the upper San Diego River. In 1875 the U.S. Army issued a federal permit for the Indians to inhabit the area, and the general public was warned against disturbing the Indians who resided there. The Capitan Grande Reservation was patented in 1891, and is jointly owned and managed by the Barona Band of Mission Indians and the Viejas Band of Kumeyaay Indians.

Capitan Grande's Water Resources

The Capitan Grande Reservation initially had extensive water resources from the upper San Diego River. However, through non-Tribal policy decisions, much of the water was diverted to meet the increasing water needs of a growing San Diego urban population. Much of the water that originally flowed through the Capitan Grande lands is now diverted to Lake Cuyamaca and El Capitan Reservoir.

4.6.4 Ewiiaapaayp Band of Kumeyaay Indians

The Ewiiaapaayp Reservation, formerly known as the Cuyapaipe Reservation, is a federal Indian Reservation created in 1891 by the US Congress. This Reservation is owned and managed by the Ewiiaapaayp Band, which is headquartered in Alpine, California.

The Ewiiaapaayp Reservation is mostly undeveloped, with no utilities and only a single, unpaved, narrow, and steeply graded access road. This limits the economic development of the Reservation. Additionally, the Ewiiaapaayp Reservation has limited water resources, and is considering the possibility of constructing a connection to the Padre Dam Water District distribution system. In 1986, the 8.6 acre Little Ewiiaapaayp trust land was taken into trust for the Ewiiaapaayp Band, and an additional 1.42 acre parcel was taken into trust in 1997. These parcels are not proclaimed as a part of the Ewiiaapaayp Indian Reservation. These two parcels are leased to the Southern Indian Health Council (SIHC) to host the SIHC Clinic. The SIHC is a healthcare organization formed in 1982 as a tribal organization by the Ewiiaapaayp along with several other local tribes (Campo Band of Diegueno Mission Indians, Jamul Indian Village, the Manzanita Band of Diegueno Mission Indians, La Posta Band of Diegueno Mission Indians, and the Capitan Grande Band of Diegueno Mission Indians (the Barona Group of the Barona Reservation and the Viejas Group of the Viejas Reservation) and Sycuan Band of the Kumeyaay Nation). Recently, the Ewiiaapaayp approached the National Indian Gaming Commission for a review a consulting services agreement and a development services agreement with WGSD, LLC, a subsidiary of Warner Gaming, LLC for a gaming facility on the lands where the SIHC is currently located.

4.6.5 Inaja-Cosmit Band of Indians

The Inaja-Cosmit Band of Indians is a federally-recognized tribe of Kumeyaay Indians. The Inaja-Cosmit Reservation was established in 1875 and is located in eastern San Diego County near the US-Mexico Border, though the Inaja–Cosmit Band is headquartered in Escondido, California.

The Inaja-Cosmit Reservation consists of two parcels of remote and inaccessible land near Cuyamaca Peak. At present there are no permanent inhabitants of these 852 acres, though some remodeling is underway on Inaja. Winter snows and a lack of facilities make these locations relatively inhospitable. However, the Tribe has received an approximately $21,000 grant under the American Recovery and Reinvestment Act of 2009 to rehabilitate tribal housing to make it more energy efficient.

4.6.6 Jamul Indian Village of California

The Jamul Indian Village sits on six acres east of the town of Jamul. After years of tenacious endurance, the Jamul village was finally declared a reservation. The reservation has administration offices and a community center.

The reservation receives drinking water from Otay Water District and wastewater is managed with onsite (septic) systems, which are pumped monthly. Upstream cattle and failing septic systems cause high nutrient levels and algae growth in surface water. Additionally, there is new development upstream that impacts the flow of stormwater through the reservation. The Tribe's stream, Willow Creek, is a direct result of runoff from the highway.

The Jamul Indian Village has a dedicated environmental protection group, the Jamul Environmental Agency (JEA). The JEA was created in 2001 to administer United States Environmental Protection Agency (EPA) related programs, monitor environmental issues, implement tribal environmental ordinances, consult with government agencies, and provide environmental education. JEA produces literature for members on pesticide safety, announces environmental and health hazards, and attends environmental trainings.

4.6.7 La Jolla Band of Luiseño Indians

La Jolla Indian Reservation, consisting of approximately 8,822 acres, is located in the foothills of the Palomar Mountains, on the banks of the San Luis Rey River.

The La Jolla Indian Reservation was established in 1875, though it has been home to the Luiseño (Payomkawichum) people for at least the last 10,000 years. Today, there are about 700 tribal members and a Tribal Council that governs the Tribe.

The La Jolla Tribe operates three EPA-regulated Public Water Supply Systems that provide treated groundwater to Tribal residents. La Jolla has had great success in properly managing water resources and has constructed a domestic water filtration plant, a groundwater monitoring system, and a wastewater treatment facility. The Tribe was the first in California to have an approved Drought Mitigation Plan. La Jolla maintains an Environmental Protection Office that manages multiple programs including a water quality monitoring program and a nonpoint source pollution control program, under Sections 106 and 319 of the Clean Water Act. Additionally, re-vegetation projects help to protect the natural environment. The Tribe has numerous other environmental initiatives including a wastewater management program, an Integrated Solid Waste Management Plan, Household Hazardous Waste and E-Waste collection for residents, and Source Waster Assessment Planning, that protect the environment and local water resources.

The Tribe is continually working on emergency preparedness and planning for natural disasters. Encroachment of the urban population and vehicular traffic on Highway 76 stresses the Tribal infrastructure, and a lack of sufficient funding to implement needed programs is an issue.

4.6.8 La Posta Band of Mission Indians

La Posta is a 3.8-acre reservation near Mount Laguna and the Cleveland National Forest. The La Posta Reservation is a federal Indian reservation, and was established in 1893.

It has occasional residents, and access to the land is mostly limited to Tribal members. The one entry road is either dusty or muddy, and is fenced off from intruders.

4.6.9 Los Coyotes Band of Cahuilla and Cupeño Indians

With approximately 25,000 acres of tribal land, the Los Coyotes Indian Reservation is the largest reservation in San Diego County. The Los Coyotes Reservation water source is groundwater and the wastewater system consists of septic systems for each house. The tribe does not have sufficient funds to hire a full time operator. The Los Coyotes Band has established the Los Coyotes Campground and Los Coyotes Horse Camp on their property for camping, hiking trails, horse riding, and biking.

Los Coyotes Indians and La Jolla Band of Luiseño Indians have a joint Tribal Wetlands Program. Los Coyotes Indian Reservation and the La Jolla Band of Luiseño Indians jointly obtained a Wetlands Development Grant from EPA in 2006 to initiate a watershed-based dual tribal Wetlands Program for the Upper San Luis Rey River and build on existing capacity for environmental management and study in the La Jolla Tribal Water and Environmental Resources Office. This program will characterize the wetlands of Los Coyotes Indian Reservation and study nutrient flow in the upper San Luis Rey River that may be impairing wetlands function.

4.6.10 Manzanita Band of the Kumeyaay Nation

The Manzanita Reservation was established in 1893 and is located in southeastern San Diego County within ten miles of the US-Mexico Border. The Manzanita, named for the brushy brush so common over drier California, occupies a 3,580-acre rectangle of infertile upland valleys and meadows in the western part of the Carrizo Desert. Homes of the residents are widely scattered, tucked behind boulders and hillsides for protection from the uncompromising summer sun.

4.6.11 Mesa Grande Band of Mission Indians

The Mesa Grande Reservation, a federal Indian reservation, was founded in 1875. Situated in a group of hills above the forests of Black Canyon (part of Cleveland National Forest), the Mesa Grande Reservation is often covered with snow in winter.

Water resources of the Tribe consist solely of groundwater pumped from wells on the Reservation. For their living during the year, the families commute to nearby towns, but also keep some horses and cows and maintain a few farms in a variety of frame, rock, adobe and mobile homes on 920 acres of land (some newly acquired from the Bureau of Land Management).

4.6.12 Pala Band of Mission Indians

The Pala Band of Mission Indians is comprised of two groups: Luiseños and Cupeños. The Luiseño people of Pala were given a reservation in 1875. In 1903, they were joined by the Cupeños, who had been evicted from the village of Cupa (present-day Warner Springs) and forcibly removed to the reservation at Pala. The San Luis Rey River runs through the Pala Reservation.

The Pala Casino Spa and Resort is the major economic driver of the reservation. Pala also has avocado and citrus groves. The tribe provides land for housing for tribal members and has an active construction program for tribal residents.

Pala's Water Resources

The Pala Tribe created the Pala Environmental Department (PED) in 1997 to protect and preserve the natural resources of the Pala Reservation. The San Luis Rey River is an important tribal resource, along with the groundwater throughout the Pala Basin. The river itself is a cultural feature, as water is considered a sacred resource to the Pala Tribe. PED's Water Resources Program oversees the protection of the Pala Tribe's water resources, including surface and groundwater resources, as well as the Tribe's drinking water system and compliance with federal Safe Drinking Water Act regulations. This program conducts various activities, including: monitoring both the water quality and quantity on the reservation, on-the-ground projects to reduce erosion and remove nonpoint source pollution, and identification of any water resource issues that might impact the Pala Tribe.

The Pala Reservation has two public water systems, both of which are served by local wells, and treated before use. These water systems comply with all Safe Drinking Water Act regulations. The Pala Environmental Department and Pala Utilities Department conduct bi-weekly tests of water safety and quality.

The Pala Band has a tertiary wastewater treatment plant that services most of the buildings on the reservation, including the casino. Many of the homes south of the San Luis Rey River still have septic tanks, although the majority of the reservation is on sewer service. Areas still on septic are monitored to ensure groundwater protection.

During exceptionally rainy years, the San Luis Rey River and tributary creeks can flood and cause problems on roads and for some buildings, including the casino. The Pala Tribe is continually working on emergency preparedness and long-term mitigation measures to prevent stormwater and flooding damage. Pala Environmental Department has installed some flood-warning stream gages around the reservation in order to monitor potential flooding.

4.6.13 Pauma Band of Mission Indians

Officially established in 1893, the nearly 6,000-acre Pauma reservation currently encompasses only a small portion of traditional Pauma territory, which expands into Northern San Diego, Riverside and Orange counties.

Pauma Band of Luiseño Indians has a thriving agricultural program, which are relatively sustainably managed. The T-Y Nursery, however, is impacting reservation wells. Tribal lands consist of four parcels equaling approximately 5,800 acres. The Tribe grows 60 acres of avocados, Valencia oranges, and lemons.

4.6.14 Rincon Band of Luiseño Indians

The Rincon reservation was established in 1875 and is home to the Rincon Luiseño Indian. Historically, the Luiseño tribes lived in the areas of San Diego, Riverside and San Bernardino Counties. The reservation is comprised of residential, agricultural, preserve/habitat, private and tribal land.

Rincon's Water Resources

The San Luis Rey River runs through the reservation. This riparian habitat is monitored by the Tribe and is a sanctuary for some endangered species. The Tribal Environmental Office oversees the natural resources on the reservation and works with the Tribal Council to ensure the land is protected. The Tribe collects and analyzes surface water and groundwater samples. No water quality issues have been observed and the sample results are within the limits.

The City of Escondido and the Vista Irrigation District [VID] deliver water from the San Luis Rey River to the Rincon Band of Mission Indians. The amount of water delivered depends upon the amount of surface water and groundwater available, and therefore varies on an annual basis.

The reservation is serviced by scattered site septic systems; however, the Tribe is interested in installing a sewer system on the reservation for protection of the groundwater.

4.6.15 San Pasqual Band of Indians

The San Pasqual Indian Reservation is located in northeastern San Diego County, California, near Valley Center. The ancestors of the San Pasqual Indians lived for thousands of years in the valley carved by the Santa Ysabel Creek, where modern Highway 78 now winds, near the present site of the San Diego Zoo's Safari Park. The San Pasqual Indian Reservation is adjacent to the Rincon Band of Mission Indians, and is nearby several other Indian Reservations, including Pauma, Pala, La Jolla, Santa Ysabel, Mesa Grande, Los Coyotes, and Pechanga.

The San Pasqual Indian Reservation was established by Presidential decree in 1910. Despite being one of the last reservations to be established in Southern California, much of the San Pasqual Indian Reservation has been removed from its original location. The original site is now occupied by Lake Wohlford and the San Diego Zoo's Safari Park. The compensatory land is now in five parcels, totaling 1,500 acres of trust land, on dry, scrub oak hills east of Valley Center. Indian administration and activities are centered at the Tribal Hall and education center.

San Pasqual encompasses approximately 1,500 acres of trust land and is considered a "checkerboard" Reservation, as it does not occupy one contiguous land mass. The San Pasqual

Reservation is divided into three non-continuous districts: A, B, and C. The topography consists of steep slopes and few irrigable lands and the average annual rainfall varies from 10 – 20 inches a year. The Reservation is near the headwaters of the San Luis Rey Watershed and rainwater falling on the area enters the San Luis Rey River via Paradise Creek to the north and Lake Wohlford to the south. Lake Wohlford is a storage reservoir for the City of Escondido. The Reservation land is located in both the San Luis Rey watershed and the Carlsbad watershed.

Tribal membership consists of approximately 500 people. The Reservation population is approximately 1,097 total residents, occupying 298 homes. The majority of homes and residents on the Reservation currently reside in Districts A and B, with a small population and clusters of homes in District C.

San Pasqual's Water Resources

The San Pasqual Water Department manages and operates a Public Water System serving the Tribal communities in Districts A and B. The majority of the Tribe's drinking water is purchased from Valley Center Municipal Water District.

The Reservation does not have a community sewer system and relies on individual home septic tanks and leach fields for collection and disposal of its waste water. The Tribe's Environmental Protection and Compliance Department monitors and manages the environmental health and quality of the Reservation including monitoring and testing surface water and groundwater quality.

4.6.16 Iipay Nation of Santa Ysabel

The Santa Ysabel Reservation was established in 1893. The Reservation is located on Hwy 79, in North San Diego County near Lake Henshaw between the towns of Santa Ysabel and Warner Springs. The homes on these 15,527 acres are mostly older. There have been some improvements to the tribal hall and clinic.

Historically, the area surrounding the Santa Ysabel Valley was known by the Indian name "Ellykwanan." The original inhabitants who lived in the Santa Ysabel village called themselves "Iipay," "the People." The Iipay are part of the larger Kumeyaay people who once populated much of the geographic area of present day San Diego County. The Iipay of "Ellykwanan" lived in the general vicinity of the Santa Ysabel Valley as well as the villages of Mataguay and San Felipe near S-2. The Iipay were governed by a "Kuseyaay" or "Captain" who managed the religious, political and economic life of the people as well as trade relations with other tribes.

The Santa Ysabel Patent to create the Reservation was approved in 1893. The villages of Ellykwanan, Mataguay, and San Felipe along with Tekemuk would be combined to comprise Tracts 1, 2, and 3 of the Santa Ysabel Reservation and would make up the population of the Santa Ysabel Band of Mission (Diegueno) Indians, the name by which the Tribe is most commonly known.

The Santa Ysabel Indian Reservation ranges from 3,200 feet to 5,700 feet in elevation and comprises a land base of over 15,000 acres on three tracts of land. The mountainous topography of the Reservation is home to a wide variety of indigenous plants and trees, including seven different species of oak trees, musky sage plants, verdant wild ferns, vibrantly blue lilacs, and waves of golden poppies that flourish along the hillsides and ridges of Volcan Mountain.

4.6.17 Sycuan Band of the Kumeyaay Nation

The Sycuan Reservation was established in 1891; however, Sycuan ancestors have lived in the San Diego area for nearly 12,000 years. Currently, there are 130 Sycuan tribal members.

As specified in the Tribal Outreach meeting held by the San Diego IRWM Program in August 2012, Sycuan has basic water resources needs including an antiquated water distribution on the reservation that should be modernized. The reservation also needs a new reservoir and to maximize its well system. The Sycuan Band has investigated the possibility of connecting to the Otay and Padre Dam water systems, in order to receive water from these water districts.

4.6.18 Viejas Band of Kumeyaay Indians

The Viejas Band of Kumeyaay Indians, one of the remaining 12 bands of the Kumeyaay Indian Nation, resides on a 1,600-acre reservation in the Viejas Valley, east of the community of Alpine. In 1875, a presidential executive order withdrew lands from the federal domain, setting aside a number of small reservations, including the Capitan Grande Reservation from which the Viejas Band descended. Capitan Grande, patented in 1891, included portions of ancestral land of the Los Coñejos Band.

As the non-Indian population grew, demand for water increased. The City of San Diego diverted most of the San Diego River water originally used by the Kumeyaay. The City later decided to dam the river and create El Capitan Reservoir. Congress granted the city permission to purchase much of the Capitan Grande Reservation, where many Kumeyaay had built homes. From the proceeds of this forced "sale" of lands, some of the valley's inhabitants, the Coapan Band, or Capitan Grande, bought Barona Valley and are now known as the Barona Band of Mission Indians.

Another 28 families, including members of the Los Coñejos Band, purchased the Viejas Valley land (once a ranch owned by Baron Long) and incorporated the name Viejas. After the move, the Viejas and Barona Bands were denied their water rights and each valley became solely dependent on meager supplies of rainfall and groundwater until the issue was resolved by court action.

Today, members of the Viejas Band of Kumeyaay Indians are the direct descendants of the families who pooled their shares of dam-site purchase money to buy Viejas Valley. The Viejas band continues to share a joint-trust patent with the Barona Band for the 15,000 remaining acres of the Capitan Grande Reservation. Tribal landscapes consist of wetlands and coastal mountain slopes. The key land use drivers within the tribal lands are agricultural, residential and commercial.

Viejas' Water Resources

Viejas operates a municipal water system to American Water Works Association (AWWA) water standards, including domestic water supply and wastewater compliance with Title 22. There are no identified water quality issues or stormwater or flood management issues. Storm water and floodwater are managed within federal standards.

The Viejas Band has converted all homes on the Reservation from septic to sewer in order to protect groundwater and has instituted water conservation measures at their casino and outlets, as well as at governmental facilities.

4.6.19 San Luis Rey Band of Luiseño Indians

The Spaniards established the Mission San Luis Rey in 1798 as part of the El Camino Real trail between Mission San Diego (1769) and Mission San Juan Capistrano (1776). During this period, the missionaries imposed the name San Luiseño on the original inhabitants of the land. The Mexican Period (1832 - 1848) included further social, cultural, economic, and political changes by relocating the Tribes to newly established ranchos. During the American Period and treaty negotiations of 1851, the American government wanted to consolidate all the San Luiseño people into a single representative group. In the 1870s, a few reservations were established for some of the San Luiseño people near Palomar Mountain. However, a reservation in the San Luis Rey Valley was denied the San Luis Rey Band of Luiseño Indians.

The San Luis Rey Band of Luiseño Indians has kept its identity as a people within the local communities that now exist on ancestral tribal lands. Elective leadership committees and volunteers help to oversee the affairs of the San Luis Rey Band. Today, the San Luis Rey Band of Luiseño Indians is focused on preserving and sharing their culture and heritage with future generations. The San Luis Rey Band of Luiseño Indians is associated with the other six Luiseño and Cupeño tribes: La Jolla, Pala, Pauma, Pechanga, Rincon, Saboba and their cultural departments as a Tribal Coalition, working together to preserve sacred ancestral cultural heritage with local governments and museums.

4.6.20 Mount Laguna Band of Kwaaymii Indians

The Mount Laguna Band of Kwaaymii Indians, and was once federally recognized with reservation lands. However, with only one surviving full-blooded member of the tribe, in 1947 the Mount Laguna reservation lands were transferred into private property – the 320-acre Lucas Ranch. It remains the only tribal reservation that has been successfully transferred from reservation into private land. The Lucas Ranch is located in the Laguna Mountains, and burned during the Cedar fire in 2003. Today, it is owned and managed by the daughters of the last of the Kwaaymii, who are committed to preserving both the land and legacy of their tribe.

4.7 Water Management Issues on Tribal Lands

Water resources of San Diego County consist of local surface water, local groundwater, imported surface water, reclaimed water and, soon, desalted seawater. San Diego County has eleven principal stream systems originating in the higher elevations of the eastern parts of the County that flow west to the Pacific Ocean. Dams and reservoirs have been built on most of these streams to capture and store the natural runoff and imported water.

The Water Authority was created in 1944 as a public agency to administer the region’s Colorado River water rights and later State Water Project water from Northern California. The Water Authority delivers imported water through several regional pipelines to its 24 member retail water agencies. A major effort in the region with significant impact on Tribal water resources is the San Luis Rey Indian Rights Settlement Act of 1988. Some of the reservations would benefit from water deliveries under this agreement; however, most Tribes have to rely on the limited water resources of the reservations.

4.7.1 Santa Margarita River Watershed Conflicts

The Santa Margarita River Watershed has been subject to over 80 years of litigation and conflicts over water rights. Conflicts began in 1926, with a lawsuit between Vail Ranch and Rancho Santa Margarita, which resulted in a division of water rights between the two parties, but failed to consider the 1930 water rights permit issued to Fallbrook Irrigation District. In 1966, after a series of court cases and appeals that included Congress, the federal government, the State of California, Department of Justice, and the Navy, in addition to the original parties, the water rights issue was decided by the Appellate Court, which upheld the original decision and validated Fallbrook's water rights. However, in the 1980s, studies by the Navy, BLM, and Fallbrook resulted in conflicting findings over the feasibility of implementation of solutions to the water rights conflict (Davies 2004).

Further water conflicts arose over the issues of recycled water and water quality. Under the "Four Part Agreement" in 1990, downstream users recognized the benefits of upstream users discharging recycled water into the river. An agreement was made to operate groundwater basins and treatment facilities as a conjunctive use project (Davies 2004). However, in 1992, effluent limits allowed by the Regional Board permit at the upstream Santa Rosa Water Reclamation Facility were found to exceed the water quality objectives of the downstream Murrieta Creek. This had led to conflict over the appropriateness of existing water quality objectives in the watershed and applicable permits, which has resulted in a decreased ability to recharge groundwater basins with recycled water.

The Santa Margarita River IRWM project, funded through a Proposition 84 – Round 1 Implementation Grant, aims to study the beneficial uses and water quality objectives, to determine if current objectives are appropriate and protective of beneficial uses, or if the Regional Board should consider changes to water quality objectives in the watershed.

The Anza and Cahuilla Indian Tribe is located in the Riverside County portion of the Santa Margarita River Watershed. In 2006, the Cahuilla tribe asked the courts to recognize their water rights, granted to them with the establishment of the reservation in 1908, prior to the water rights of other parties involved in litigation. The Cahuilla have rights to water flowing through and under their lands, which total approximately 13,000 acres. There is concern from the Tribe that these rights will be impacted with large developments in neighboring areas that also use groundwater. The result of this case may affect Rancho California, which has been involved in water rights disputes in the watershed for decades and serves over 130,000 people. Previously Rancho California was able to resolve water rights conflicts with the Pechanga tribe through an aquifer-sharing agreement (Kumeyaay 2010).

4.7.2 Waters of the San Luis Rey River and Colorado River

The San Luis Rey River, originating in Cleveland National Forest, is approximately 70 miles long and drains 560 square miles of northern San Diego County lands. The stream flow of this river ranges from 6 cubic feet per second (CFS) to as high as 170 CFS, with most months averaging less than 30 CFS. Portions of the river are dry for several months each year; however, flows as high as 95,500 CFS have been recorded during flood years prior to the completion of the Lake Henshaw Dam. Streamflow was measured near the City of Oceanside, where stream data has been collected (with some gaps) since 1913 (DFW 2010). The reservations of Los Coyotes, Santa Ysabel, San Pasqual, La Jolla, Rincon, Pauma/Yuima, and Pala are located within the San Luis Rey watershed.

Lake Henshaw, a reservoir with an area of more than 1,100 acres and a capacity of 52,000 AF, is located on the San Luis Rey River, about five miles east of the La Jolla Reservation. The lake was constructed in 1923 with construction of the 123-foot tall and 650-foot wide Henshaw Dam on the San Luis Rey River. Lake Henshaw is owned by VID.

A 200 square-mile watershed, mostly undeveloped and shared by Santa Ysabel and Los Coyotes Reservations and VID, provides runoff to Lake Henshaw. Natural runoff from this watershed along with groundwater pumped from the Warner Basin, a 37 square-mile basin to the east of Lake Henshaw, is stored in Lake Henshaw. Henshaw water is delivered to VID, the City of Escondido and the Rincon Band of Indians.

Lake Henshaw from Mesa Grande Road
Photo credit: Philip Erdelsky

In 1969, the Rincon and La Jolla Indian Bands initiated litigation against the City of Escondido and VID concerning use of the waters of the San Luis Rey River, Lake Henshaw and Warner Basin. The Indian Bands now included in this litigation are La Jolla, Rincon, San Pasqual, Pauma, and Pala Bands. A tentative settlement was reached in 1985 and enacted on November 17, 1988 as the San Luis Rey Indian Rights Settlement Act. The Settlement Act provided the following:

- Indian Bands were authorized to enter into a settlement agreement,
- A $30 million federal trust fund was established for settlement implementation, and
- The Secretary of the Interior was directed to arrange for the development of 16,000 acre-feet/year of supplemental water for use by the settlement parties.

However, it should be noted that at the time of the 2013 IRWM Plan, the settlement has not been implemented, and therefore no water has been delivered yet to the settlement parties.

The source of the supplemental water is a portion of the water savings produced by Water Authority projects to line portions of two large earthen canals that convey water from the Colorado River to the Imperial and Coachella valleys in Southern California, reducing water loss.

Three additional agreements were needed to bring the Colorado River water to the Bands. These agreements were signed in 2003 and consist of the following:

- Allocation Agreement – Water saved by lining portions of the All-American and Coachella Canals will be allocated as follows:
  - The first 16,000 acre-feet/year of the conserved water is allocated to the San Luis Rey Settlement Parties, consisting of the five Bands, VID, and City of Escondido.
  - The remaining conserved water, approximately 77,000 acre-feet/year, is allocated to the San Diego County Water Authority.
- Water Delivery Agreement – Metropolitan Water District will transfer the conserved Colorado River water from Lake Havasu, located on the border between California and Arizona, to northern San Diego County.
- Water Conveyance Agreement – San Diego County Water Authority will transfer the settlement water from northern San Diego County to the five reservations, Escondido, and VID. Any water not needed by the Bands may be sold to Escondido and VID.

To ensure that the Indian Bands have input in the San Luis Rey River Basin's water use and supply, the San Luis Rey Indian Water Authority was created by the La Jolla, Pala, Pauma, Rincon and San

Pasqual Bands of Mission Indians. Based on the information available from the San Luis Rey Indian Water Authority website, no settlement water has been delivered to the Bands' reservations.

4.7.3 Water Management Issues

Tribal Nations within the Region are located on lands mostly outside of the Water Authority's service area and are wholly dependent on local sources of water. However, in the past, the Water Authority has coordinated with tribes regarding potential annexation and exploring the potential for water supply delivery to reservation lands. Also, the Barona Band has approached the City of San Diego to explore means of delivering City water supplies to the reservation via a proposed agreement that would transfer supplies from a Colorado River Tribal Nation to San Vicente Reservoir. The San Pasqual Band already purchases water from Valley Center Municipal Water District. Though tribes may have adequate, modern, systems in place, they cannot purchase or receive imported water without annexing all or part of their systems to a water district, which can be a barrier because it may be considered a lack of acknowledgement of Tribes' sovereign governmental status.

The summary list below provides an overview of water management issues on tribal lands, which was compiled using information from: 1) Tribal outreach meetings in June 2010, 2) Tribal outreach meetings in August 2012, and 3) San Diego County General Plan Update Final Environmental Impact Report.

1. **Groundwater Management** – Some groundwater basins shared by tribes and other basin users are being overdrafted. Possible solutions include extending access by basin users to regional conveyance systems or a financial incentive system to eliminate overdraft. Because off- and on-reservation groundwater use affecting groundwater basins within some tribal lands may be unsustainable, supplemental water sources are already required to reduce potential overdraft concerns. Consideration of both reservation and non-reservation water rights when planning development could also help reduce potential future overdraft.
2. **Water from Water Agencies** - Tribes may concurrently annex into retail and wholesale water agency service areas in order to obtain imported water supplies, but prefer to manage their own water supplies. State law prevents both retail and wholesale water agencies from waiving water agency annexation requirements. Many tribes have viewed the annexation requirements as an infringement on their sovereign rights. Where tribes can locate alternative supplies, local agencies can assist the tribes with delivery of the water to their reservation through wheeling or other agreements. The Water Authority considers annexation of tribal lands consistent with its 2006 Annexation Policies. The 2006 Annexation Policies acknowledge the tribes as sovereign governments and provides an approach to handling the annexation of tribal lands.
3. **Future Water Demands** - County land use planning and associated groundwater basin demand projections need to consider reservation build-out and the associated assertion of tribal water rights. For planning purposes only, the Water Authority's long-term water demand forecast, included in its 2010 Urban Water Management Plan, does contain estimated demands of tribes that have demonstrated interest in the past to annex tribal lands, but does not include all tribal lands within the San Diego IRWM Region.
4. **County Groundwater Ordinance** - Tribal lands generally are not subject to the San Diego County Groundwater Ordinance; some Tribes have tribal groundwater ordinances in place to protect groundwater supplies. As a result, County and Tribal planning strategies may not consider the entire demand on the basins. Better coordination of planning for future

groundwater use would ensure that all parties understand the full impact on groundwater supplies. Where imported water supplies are unavailable and groundwater is not adequate to meet all needs, this may inherently lead to conflict.

5. **Impact of Neighboring Communities** – Tribal lands located near other communities, areas with high development densities, or near land uses with large water demands will likely experience more substantial groundwater availability issues than average tribal lands, which are generally located in rural areas away from water-intensive land uses.
6. **Water Recycling Facilities** - Expansion of water recycling facilities at casino sites and other developed areas on tribal lands would provide greater supply reliability.
7. **Additional Wastewater Treatment** - Cumulative development within tribal lands, like other development, could result in the need for additional wastewater treatment services.
8. **Adverse Impact of Groundwater Depletion on Water Quality** - Groundwater depletion can concentrate adverse water quality constituents (such as radio-nucleotides). Naturally occurring uranium has also been identified in groundwater in rural areas in levels above drinking water standards.
9. **Increased Runoff from Newly Developed Impervious Surfaces** - Development of tribal lands, like other development, can potentially increase impervious surfaces and cause water quality impacts.
10. **Impact of Imported Water** – Concern has been expressed about the water quality impacts associated with imported water supplies, namely the importing of constituents of concern (e.g., TDS), to the Region.
11. **Chlorine Sediments** – Chlorine sediments in the watershed are an issue for area tribes. Possible sources may be imported water from Northern California.
12. **Inadequate Flood Protection Infrastructure** - Need to mitigate flooding on tribal lands. Culverts are undersized; only a portion of culverts were improved using FEMA funding after 2007 wildfires. Section 3.5.10 in this Plan addresses flood protection infrastructure and the County's Flood Warning Program, which includes tribal lands within the County's jurisdiction.
13. **Tribal Lands in Flood and Inundation Areas** - Tribal lands may be located within known flood areas or downstream of a dam (within a dam inundation area).
14. **Coordination of Multiple Species Conservation Planning** – Tribes would like to see better coordination of planning and implementation of MSCP and habitat conservation plans in areas adjacent to Tribal lands. Coordination is important, because many tribal lands have been mapped as assumed wildlife corridors or natural spaces that will not be developed in the County's MSCP without consultation with tribes or acknowledgement of tribal development plans.
15. **Water quality impact from off-reservation sources** – Off-reservation activities can impact water quality on tribal lands. Some sources of water quality issues on tribal lands that originate off-reservation include: atmospheric deposition from poor air quality in surrounding areas, high nitrates from pesticide and fertilizer use on agricultural lands, sedimentation from erosion, and nutrients from cattle operations.

Related to some of the issues described above, there exists conflict between Tribes and surrounding communities over water supplies and quality. Of particular concern are the availability of groundwater supplies and the impact of projects on water quality and runoff. The County of San Diego has identified actions to help address some of the water conflicts that exist between Tribes and other communities. These actions include increased communication and cooperation between Tribal and local governments, and an increased awareness of how one party's projects will impact another party's water resources.

The regulatory framework for environmental compliance on tribal lands includes development and enforcement of tribal environmental policies, compliance with the Federal Clean Water Act and Safe Drinking Water Act, and compliance with NEPA for Federal projects. Most tribes are delegated primacy for implementation of the Clean Water Act and develop their own set of water quality standards. Most tribes rely on the EPA to oversee their drinking water supplies to ensure compliance with the Safe Drinking Water Act. State environmental laws, including the California Environmental Quality Act (CEQA), do not apply to tribal reservations. Funding agreements for project sponsors under Proposition 84 require submittal of documentation of compliance for applicable CEQA requirements to the Department of Water Resources. However, for the tribes there are no applicable requirements. Any attempt to apply CEQA requirements to tribes would be a significant barrier to tribal participation in the IRWM Program since it would require tribes to give up their tribal sovereignty in order to use State funding for a project on tribal land.

This chapter mainly addresses the water resources conditions of the Tribal Nations Reservations. Several other factors that may impact the quantity and quality of available water at the reservations were not considered. These factors include endangered species and the Multiple Species Conservation Plan in San Diego County, climate change impacts, developments in areas neighboring the Tribal Reservations, excluding long-term needs of Indian Reservations in shared basins, and county-wide flood management planning and implementation activities.

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5 Watershed Characterizations

Please note that Chapter 5, Watershed Characterizations was not comprehensively updated during the 2019 IRWM Plan Update – Phase 1. Minor updates were made in response to public comments. Some information in this chapter may no longer be current.

The San Diego IRWM Region addressed in this IRWM Plan is composed of eleven hydrologic units (HUs) or watersheds that are defined by the San Diego Regional Water Quality Control Board (Regional Board) and are tributary to coastal waters. Seven of the watersheds comprise major regional water courses and four of the watersheds are comprised of multiple small sub-watersheds, each draining to coastal waters or coastal wetlands. In this Plan, the eleven HUs are referred to as watersheds.

This chapter was developed in conjunction with watershed-based stakeholders throughout the Region. As discussed in *Chapter 6, Governance and Stakeholder Involvement,* four watershed workshops were held in September 2012 throughout the Region to solicit input and information from watershed-based stakeholders. Due to the variation in stakeholders, available data, and other factors between each of the Region's watersheds, the information in the following sections may vary in terms of detail and content.

El Capitan Reservoir with snow-capped Cuyamaca Mountain in background.

Photo credit: Rob Hutsel, San Diego River Park Foundation

Morena Reservoir, looking east.

Photo credit: Jeff Pasek, City of San Diego

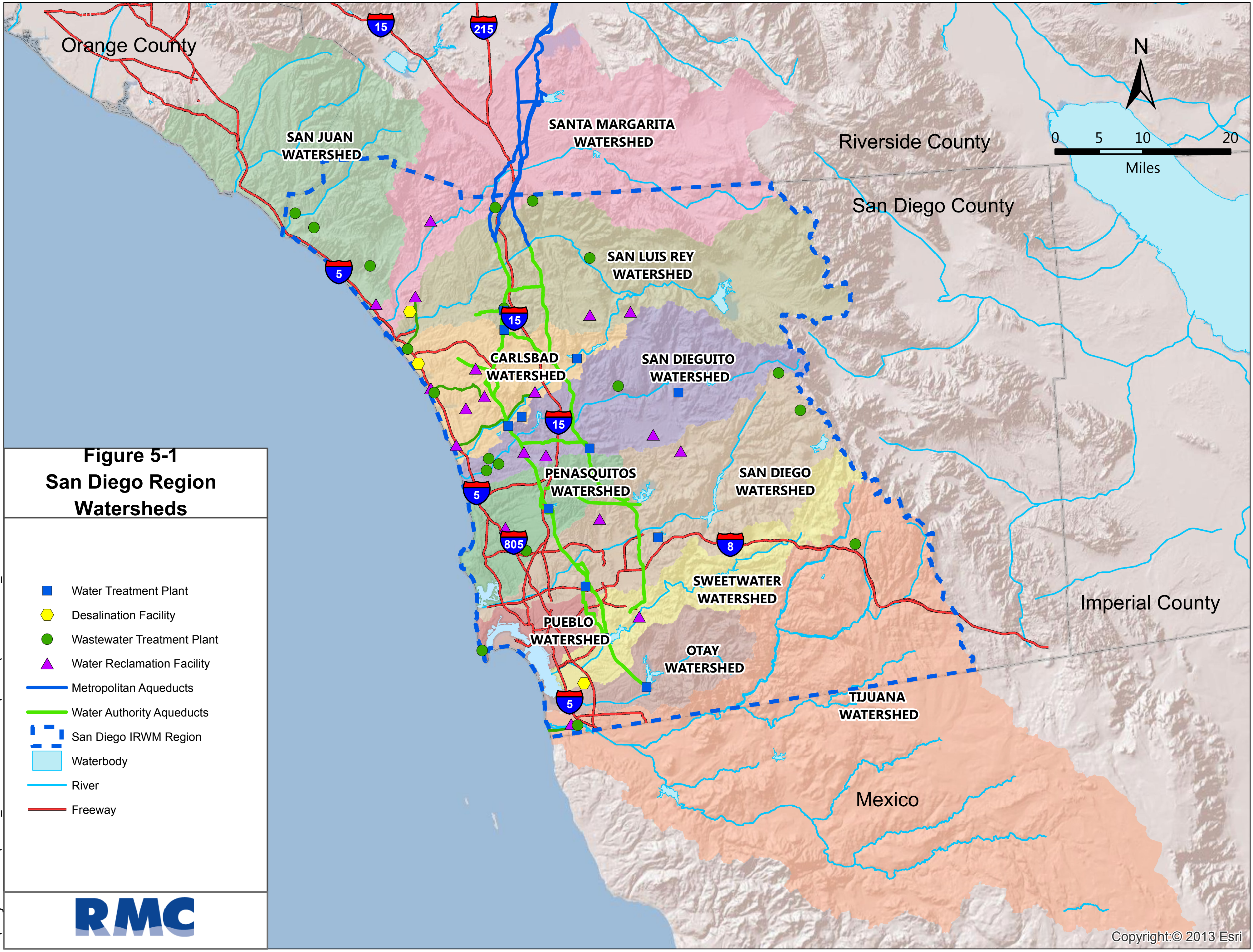

Figure 5-1
San Diego Region Watersheds

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5.1 San Juan Watershed

The San Juan Watershed (San Juan Hydrologic Unit or San Juan HU (901)) is comprised of five hydrologic areas, and lies within all three of the IRWM Regions in the San Diego IRWM Funding Area designated by DWR (refer to Section 3.14 in *Chapter 3, Region Description* for more information on neighboring IRWM Regions). Two of the watershed's five hydrologic areas are within San Diego County:

- San Mateo Hydrologic Area (HA) (the drainage area of San Mateo Creek)
- San Onofre HA (which includes drainage areas of San Onofre Creek, Las Pulgas Creek, and Stuart Mesa)

Approximately 30% of the San Juan Watershed is located within San Diego County, covering approximately 150 square miles and lying within the jurisdiction of the Camp Pendleton, a United States Marine Corps (USMC) Base. Figure 5-2 presents a map showing boundaries of the watershed and its principal features.

Camp Pendleton lands are largely open space and support nearly intact habitats. Water supply within the Camp Pendleton portion of the San Juan Watershed is from local groundwater and imported water.

A portion of the San Mateo HA lies within Riverside County, and while this hydrologic area is included in the Upper Santa Margarita Watershed IRWM Region, it does not have developed water infrastructure or identified water management needs (RCWD, 2009).

The majority of the remaining three hydrologic areas are located within the South Orange County IRWM Region. The South Orange County IRWM Region defines the San Juan Watershed on a finer scale than hydrologic areas in their 2013 IRWM Plan, describing seven sub-watersheds of the larger San Juan Watershed that are located within the South Orange County IRWM Region (County of Orange, 2013).

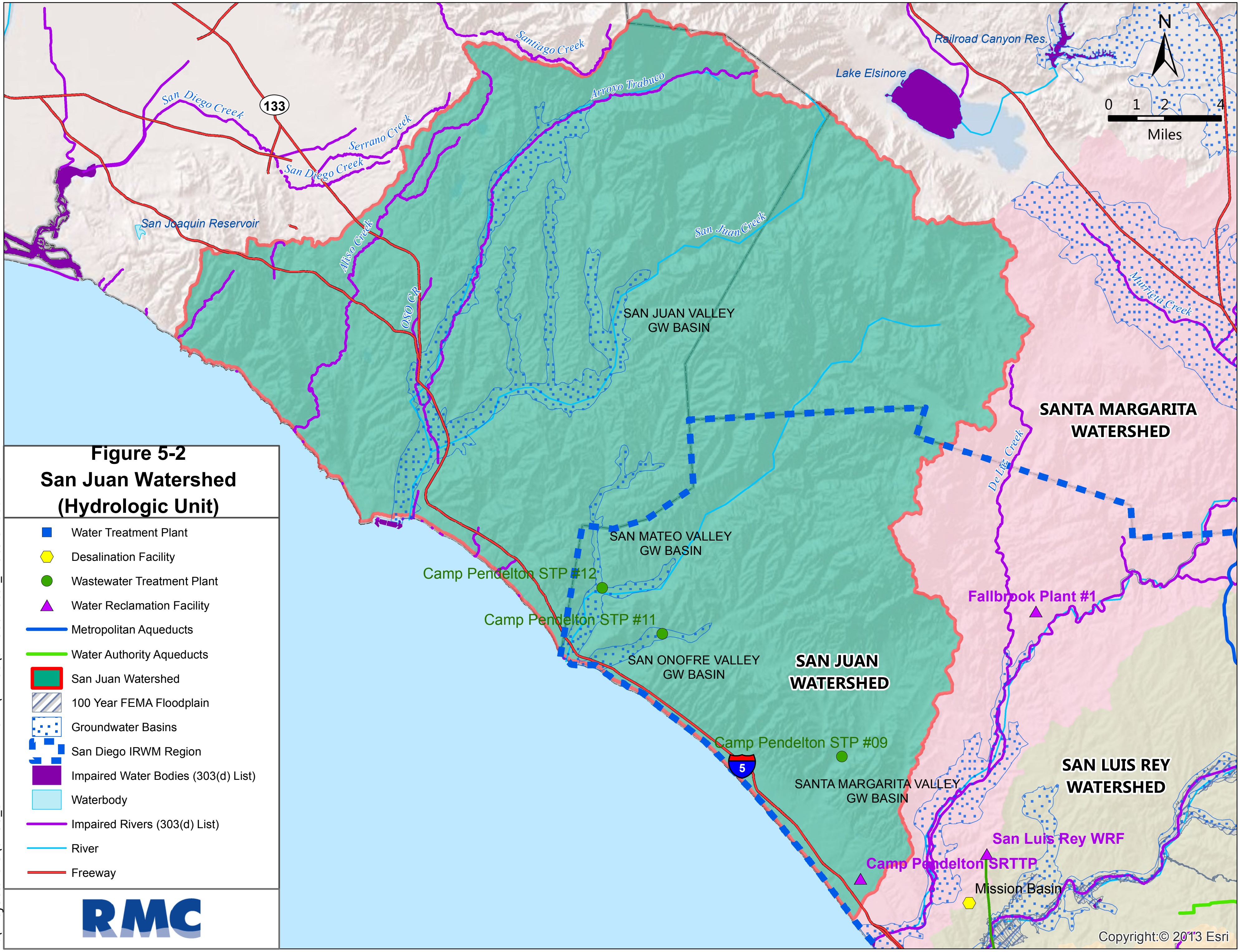

Figure 5-2
San Juan Watershed
(Hydrologic Unit)

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San Juan Watershed
Hydrology The San Juan Watershed has major creek systems within the San Mateo and San Onofre HAs, all of which drain west into the Pacific Ocean. The creeks within the San Juan Watershed are generally intermittent, and may run dry from July through November (PCW, No Date [N.D.]). In the watershed as a whole, the two major drainages are associated with the San Juan Creek (located in the South Orange County IRWM Region) and the San Mateo Creek (within both the San Diego IRWM Region and the South Orange County IRWM Region). The San Mateo HA drains San Mateo Creek, which is the second largest creek in the San Juan Watershed and is located in all three IRWM Regions in the San Diego Funding Area. The San Onofre HA includes drainage areas of San Onofre Creek, Las Flores Creek, and Aliso Canyon basin (PCW, N.D.).
Water Systems Water systems within the San Diego IRWM Region's portion of the San Juan Watershed lie largely within the jurisdiction of the USMC, which is responsible for providing water and wastewater services within Camp Pendleton. Camp Pendleton receives imported water supplies from the San Diego County Water Authority, although these supplies are generally limited to approximately 850 acre-feet per year (SDCWA, 2011). Water supply for Camp Pendleton is primarily provided by surface water and local groundwater basins (USMC, 2011). Much of the water in the South Orange County portion of the watershed is imported, though some areas rely heavily on groundwater as well (County of Orange, 2013). Groundwater basins within the San Juan Watershed include the San Juan Valley (9-01), San Mateo Valley (9-02) and the San Onofre Valley (9-03) basins. According to Bulletin 118, the San Mateo Valley basin has recharge areas along San Mateo Creek, and the San Onofre Valley basin has recharge derived from percolation of runoff from rainfall and from treated wastewater effluent (DWR, 2003 and DWR (a), 2004). While treated wastewater recharges groundwater, recharge occurs downgradient from drinking water supply wells in the San Mateo and San Onofre basins; treated wastewater does not contribute to the drinking water supply. Camp Pendleton extracts groundwater for use within each basin in San Diego County, as well as for transfer between the San Mateo and San Onofre Basins (USMC, 2011). The San Juan groundwater basin is a high priority basin for a Salt and Nutrient Management Plan (SNMP), but lies within the South Orange County IRWM Region, and is not discussed further in this Plan. Both the San Mateo and San Onofre groundwater basins are considered medium priority (Tier B) for SNMPs. Water supply and wastewater agencies within the portion of the San Juan Watershed that lies within the Region include USMC Camp Pendleton and Fallbrook Public Utilities District.
Internal Boundaries and Land Uses The San Juan Watershed spans Riverside, Orange, and San Diego Counties. Within San Diego County, the San Juan Watershed is primarily within the jurisdiction of the Federal Government, and specifically within the jurisdiction of the USMC Base Camp Pendleton. The San Juan Watershed also includes jurisdictional boundaries for the County of San Diego, and the Fallbrook Public Utility District (PUD). Furthermore, the USMC Base Camp Pendleton and the Fallbrook Public Utilities District are member agencies of the San Diego County Water Authority, so portions of the San Juan Watershed lie within the Water Authority's service area. Nearby jurisdictions include the cities of Oceanside and San Clemente to the south and north, respectively, and the community of Fallbrook to the east. Within the South Orange County IRWM Region, the coastal portions of the watershed are highly developed, and include ten incorporated cities (County of Orange, 2013). The land uses within the San Onofre and San Mateo HAs include open space, military base operations, agriculture, and very limited residential areas. In addition, there is a state beach and campground along the Interstate 5 corridor near the northern boundary of Camp Pendleton, and a golf course near the southern boundary (PCW, N.D.). The San Onofre nuclear power plant is also located within the watershed, in proximity to Camp Pendleton. There are no tribal lands located within the portion of the San Juan Watershed that lies within the San Diego IRWM Region.

San Juan Watershed

Water Quality and Water Quality Impairments

There are no water bodies within the San Diego County portion of the San Juan Watershed on the 303(d) list of impaired water bodies. However, past water quality monitoring has indicated that surface waters in the San Juan Watershed are high in total dissolved solids (TDS) (SCCWRP, 2007). In addition, several elevated constituents have been reported in groundwater wells at Camp Pendleton, including nitrates, TDS, iron, and sodium, although there appear to be no long-term trends in the occurrence of these constituents (PCW, N.D.). The South Orange County portion of the watershed has multiple 303(d)-listed waterways including all or part of: Aliso Creek, Dana Point Harbor, San Juan Creek, Aliso Beach, Dana Point Hydrologic Subarea, Laguna Beach Hydrologic Subarea, lower San Juan hydrologic subarea, Poche Beach. San Clemente City Beach, San Capistrano Beach, South Capistrano County Beach, Arroyo Trabuco, English Canyon, Laguna Canyon Channel, Moro Canyon Creek, Oso Creek, Prima Deshecha Creek, and Segunda Deshecha Creek for selenium, toxicity, nutrients, pesticides, metals, total coliform, *Enterococcus*, or bacteria.

A Water Quality Improvement Plan will be developed for the entire San Juan Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits.

There are specific water quality objectives established in the Basin Plan for the San Mateo and San Onofre HAs. Water quality objectives are established separately for inland surface water bodies, groundwater. There are specific water quality objectives established for TDS, chlorides, sulfates, sodium, nitrates, nitrogen-phosphorus ratios, iron, manganese, methylene blue-activated substances (MBAS), boron, turbidity, color, and fluoride (SDRWQCB, 2010).

Stormwater and Flood Management

Stormwater and flood management within the San Juan Watershed portions of San Diego County fall under the jurisdiction of the County of San Diego and the USMC Base Camp Pendleton. Most of the San Diego County lands within the San Juan Watershed consist of undeveloped, park, and agricultural uses, so stormwater management by San Diego County is limited in the San Juan Watershed. However, Camp Pendleton stormwater management activities focus on water quality protection where parking lots and other developed areas feed surface waters (USMC, 2011). Flood control in the South Orange County IRWM Region portion of the watershed fall under the jurisdiction of the Orange County Flood Control District, which manages Orange County's Regional Backbone Flood Control Infrastructure to protect against the 100-year flood event (County of Orange, 2013).

Natural Resources

Only 7% of the watershed is developed, primarily in the northwestern portion of the San Juan watershed along the coast, with the remaining 93 percent undeveloped land in the southern and eastern portions of the watershed. Due to the largely undeveloped nature of the San Juan Watershed, it contains various wildlife, habitats, and special-status species. Within San Diego County, Camp Pendleton contains 21 recognized plant communities including coastal sage scrub, oak woodlands, chaparral, grasslands, coastal dunes, salt marshes, and riparian woodlands and also supports 16 threatened or endangered plant and animal species. In addition, the undeveloped low-lying creeks and streambeds found within Camp Pendleton function as wildlife corridors for various wildlife species to travel within the base, as well as travel to surrounding open space areas such as the Cleveland National Forest located in Riverside County (PCW, N.D.).

There are sixteen species of plants and animals listed under the federal Endangered Species Act (ESA) that reside within Camp Pendleton. Of particular interest from a water resource standpoint are: the Southern California steelhead, and the arroyo toad, both of which utilize stream corridors on Camp Pendleton; the tidewater goby, which resides in brackish water and coastal lagoon habitats on Base; and least Bell's vireo and southwestern willow flycatcher, two bird species that rely on riparian habitats on Base (USMC, 2011).

San Juan Watershed
Potential Climate Change Impacts Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the San Juan Watershed include but are not limited to: • Decrease in imported water supply • Decrease in groundwater supply • Decrease in surface water availability • Water quality concerns related to lower surface water flows • Sea level rise • Decrease in availability of necessary habitat • Exacerbation of wildfires Due to the relatively low level of imported water supply used within the San Diego IRWM Region portion of the San Juan Watershed, decreases in imported water supply are anticipated to be a potential although non-critical climate change impact. However, due to the use of groundwater and surface water within the San Juan Watershed, reductions of these resources could impact water users including the USMC Base Camp Pendleton and the Fallbrook PUD. Furthermore, due to the extensive amount of habitat and open space located within the San Juan Watershed, reduced water availability and potential water quality concerns could impact or decrease available habitat that is necessary for species survival. Due to the San Juan Watershed's location along the coast, sea level rise could potentially impact this watershed and its coastal ecosystems and habitats. Lastly, wildfires, which occurred within the San Juan Watershed as recently as 2007, could potentially occur more frequently due to climate change, which could substantially impact water quality and habitat within the watershed (RWMG, 2009).
Management Issues and Conflicts Management of the San Juan Watershed presents unique challenges due to its location within three different counties. Through the IRWM Program, the San Diego IRWM Region coordinates with Orange County and Riverside County (the Tri-County FACC) to discuss and address relevant issues within overlapping watersheds such as the San Juan Watershed. Furthermore, high military presence within the San Juan Watershed presents an additional jurisdictional layer (the Federal Government), which can impart management challenges and conflicts.

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5.2 Santa Margarita Watershed

The Santa Margarita Watershed (Santa Margarita Hydrologic Unit or Santa Margarita HU (902)) encompasses 750 square miles in northern San Diego and southwestern Riverside Counties. Twenty-seven percent (200 square miles) of the watershed is within San Diego County (and the region addressed in this 2013 IRWM Plan). Figure 5-3 presents a map showing primary features and boundaries of the Santa Margarita Watershed.

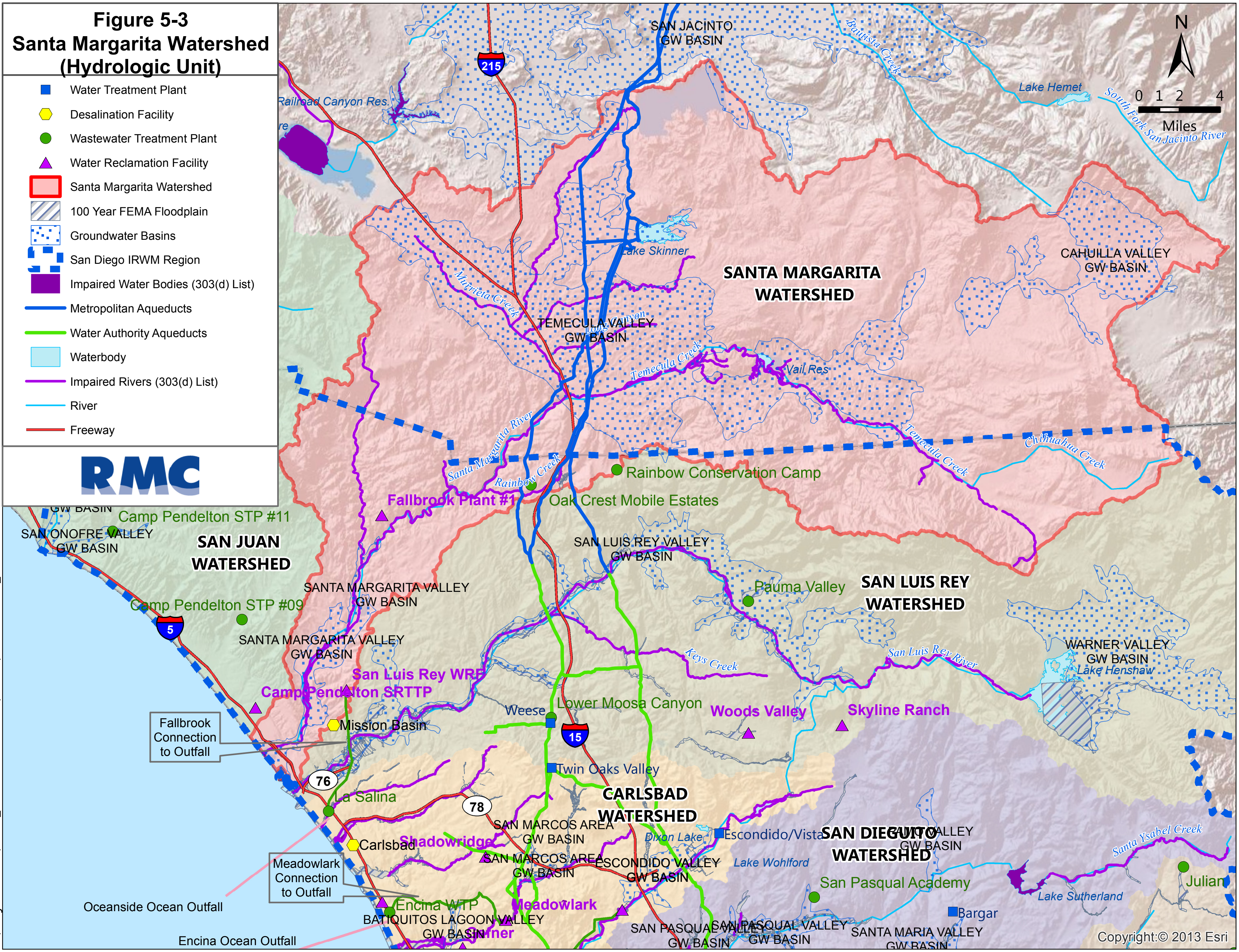
The Santa Margarita River is the primary watercourse in the watershed. The river is formed by the confluence of Temecula and Murrieta Creeks immediately upstream from the San Diego-Riverside County border. Rapidly urbanizing areas of Riverside County exist in the basin upstream of the confluence, while the lower portion of the watershed within San Diego County is largely undeveloped and includes portions of the USMC Base Camp Pendleton. The watershed features annual grasslands, coniferous forests, broad-leaved forests, desert transition, chaparral-covered hillsides, riparian woodlands, and coastal marshes. The San Diego Region portion is primarily chaparral, riparian woodlands, and coastal marshes. The Santa Margarita River discharges to an estuary in an undeveloped downstream portion of Camp Pendleton.

Groundwater basins within the lower portion of the Santa Margarita River Watershed represent an important local water supply source within the Region, and represent the primary source of supply to Camp Pendleton. Camp Pendleton is in the process of implementing a series of federally-funded master-planned water supply projects that include groundwater treatment for iron and manganese and a future-proposed groundwater demineralization facility.

The Santa Margarita Conjunctive Use Project – funding by Proposition 50 – provides for enhanced recharge and recovery from the groundwater basin to provide a water supply for both Camp Pendleton and Fallbrook as resolution of a long-standing water rights dispute with input from the United States Bureau of Reclamation.

Photo credit: Jack Bebe, Fallbrook Public Utilities District

Figure 5-3
Santa Margarita Watershed (Hydrologic Unit)



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Santa Margarita Watershed

Hydrology

The major surface water body within the Santa Margarita Watershed is the Santa Margarita River, which drains in a westerly direction from headwaters in Riverside County to the Santa Margarita Estuary and the Pacific Ocean. Major tributaries to the Santa Margarita River include Temecula Creek, Murrieta Creek, De Luz Creek, Sandia Creek, and Rainbow Creek (County of San Diego, 2008).

The Santa Margarita Watershed is comprised of nine hydrologic areas (HAs), five of which have portions within the San Diego IRWM Region. These hydrologic areas include Ysidora HA (902.1), De Luz HA (902.2), Pechanga HA (902.5), Aguanga HA (902.8), and Oakgrove HA (902.9). Four HAs lie entirely within the Upper Santa Margarita Watershed IRWM Region: Murrieta HA (902.3), Auld HA (902.4), Wilson HA (902.6), and Cave Rocks HA (902.7), De Luz, Pechanga, Aguanga, and Oakgrove HAs are in both the Upper Santa Margarita and San Diego IRWM Regions. Oceanside Harbor exists along the Pacific Ocean within the watershed but is not hydrologically connected to the watershed. The Santa Margarita River estuary (river mouth) fluctuates between being open to tidal flushing and closed due to lack of flow along the river.

According to the County of San Diego, the Santa Margarita River is the longest free-flowing, un-dammed river along the southern California coast. The Santa Margarita River is largely undeveloped and has not been channelized within the lower 27 miles (County of San Diego, 2008).

Water Systems

The westernmost segment of the Santa Margarita Watershed lies largely within the jurisdiction of the San Diego County Water Authority's member agencies: USMC Base Camp Pendleton, Fallbrook PUD, and Rainbow Municipal Water District. In addition, localized groundwater pumping and surface water diversions from the Santa Margarita River provide water supplies to Camp Pendleton and the unincorporated community of De Luz (County of San Diego, 2005). Groundwater supplies are sourced from the Santa Margarita Valley Groundwater Basin (9-04) (DWR (b), 2004). According to Bulletin 118, natural recharge to the Santa Margarita Valley Groundwater Basin occurs primarily from percolation of the Santa Margarita River (DWR (b), 2004). As described in *Chapter 7, Regional Coordination* (see Section 7.5.3 Salt/Nutrient Management Plans in the Region), the Lower Santa Margarita River Basin is a high priority Salt and Nutrient Management Plan (SNMP) basin. RCWD and USMC Camp Pendleton are developing an SNMP for the greater basin, with Fallbrook Public Utility District providing support. The Temecula/Murrieta groundwater basins, located in the Upper Santa Margarita IRWM Region are also considered high priority (Tier A) basins for SNMPs, but lie outside the bounds of the San Diego IRWM Region. While the Temecula/Murrieta groundwater basins are not discussed in detail in this Plan due to their distance from the San Diego IRWM Region, those basins are high-priority basins and are being actively managed by local stakeholders for both water quantity and water quality purposes.

Water use varies between the upper portion of the Santa Margarita (located in Riverside County) and the lower portion of the Santa Margarita (located in the San Diego IRWM Region). Within the San Diego IRWM Region, surface water from the Santa Margarita River is diverted and used directly, and is also used to recharge local groundwater basins. Within Camp Pendleton, water from the Santa Margarita River is diverted to Lake O'Neill through a diversion weir, which also diverts surface water from the Santa Margarita River to recharge ponds that are used to recharge the Santa Margarita Valley Groundwater Basin (USMC, 2011). Fallbrook PUD, Camp Pendleton, and the United States Bureau of Reclamation are moving forward on a conjunctive use project that would extract and treat additional groundwater from the basin.

Although surface water, groundwater, and imported water comprise all current water supplies within the Santa Margarita Watershed, it is possible that desalination and indirect potable reuse will provide future water supply sources within this watershed. The USMC and the Water Authority are currently working on feasibility studies for a potential seawater desalination plant on Camp Pendleton near the mouth of the Santa Margarita River. Desalination efforts are still in the planning stage within Camp Pendleton, but could potentially result in a 50 to 150 million gallons per-day (MGD) seawater desalination plant (SDCWA, 2011).

Water supply agencies within the portion of the Santa Margarita Watershed that lies in the Region include USMC Camp Pendleton, Fallbrook PUD, and Rainbow Municipal Water District. The aforementioned agencies also

Santa Margarita Watershed
function as wastewater agencies within the watershed. The Cahuilla, Pechanga, and Ramona tribal reservations are located within the Upper Santa Margarita Watershed IRWM Region, and a portion of the Pauma Reservation is located within the San Diego IRWM Region's portion of the Santa Margarita Watershed (RCWD, 2007). The Pechanga Reservation pumps groundwater from the Temecula and Pauma groundwater basins, and the Pauma Reservation uses groundwater wells on reservation lands. Water rights have been a challenge for this watershed since the 1920s beginning with Rancho Santa Margarita suing Vail Ranch (both land grants) for water rights. The legal conflict over water rights was further complicated in 1930 when the state of California issued an appropriate permit to Fallbrook Irrigation District (later to become Fallbrook PUD). Groundwater use in the Temecula Valley Groundwater Basin (located in Riverside County) further complicated matters by reducing downstream flows necessary to recharge the groundwater basins on Camp Pendleton. Since 1975, a Court-appointed Watermaster has been tasked with administering and enforcing various legal provisions pertaining to water rights and water systems associated with underground and sub-surface waters within the Santa Margarita River Watershed that support the sub-surface flow of all creeks, rivers, and stream systems (USMC, 2011). In 1989, the Court appointed a Steering Committee to oversee actions of the Watermaster. The Steering Committee is comprised of representatives from the following entities: United States (USMC Base Camp Pendleton) Eastern Municipal Water District, Fallbrook PUD, Metropolitan Water District of Southern California, Pechanga Tribe, Western Municipal Water District, and Rancho California Water District (RCWD) (Santa Margarita Watermaster, 2011).
Internal Boundaries and Land Uses Within San Diego County, land use authority for the lower Santa Margarita Watershed is split between the jurisdiction of San Diego County, covering the unincorporated communities of De Luz, Fallbrook, and Rainbow, and federal lands belonging to Marine Corp Base Camp Pendleton and Naval Weapons Station Fallbrook (County of San Diego, 2008). In addition, the lower Santa Margarita Watershed includes jurisdictional boundaries for the USMC Base Camp Pendleton, Fallbrook PUD, a small portion of the City of Oceanside, and Rainbow Municipal Water District, all of which are member agencies of the San Diego County Water Authority. In the upper Santa Margarita Watershed falling within the San Diego IRWM Region, portions of Pechanga HA, Oakgrove HA, and Aguanga HA include Cleveland National Forest lands, which fall under the jurisdiction of the U.S. Forest Service, portions of the Pauma Indian Reservation, Bureau of Land Management lands, and rural unincorporated areas of San Diego County (County of San Diego, 2005). In the Upper Santa Margarita Watershed IRWM Region, internal boundaries include the cities of Murrieta and Temecula, Riverside County, Anza Borrego State Park, Bureau of Land Management and U.S. Forest Service lands, ecological reserves, and water and wastewater agencies. Land uses within the San Diego County portion of the Santa Margarita Watershed include undeveloped, military uses, open space, spaced rural residential, and agriculture (County of San Diego, 2008). Of these, undeveloped and military uses dominate the watershed, comprising 39% and 30% of the watershed, respectively. There are tribal reservations associated with four tribes in the Santa Margarita Watershed. These lands are largely located within the Riverside County (upper) portion of the watershed, although a small portion of the Pauma Reservation is located within the lower Santa Margarita Watershed in San Diego County. Less than 1% of the lower Santa Margarita Watershed (within San Diego County) includes tribal lands.
Water Quality and Water Quality Impairments Several water bodies within the Santa Margarita Watershed are listed on the 303(d) list of impaired water bodies. Due to management issues and rapid population growth expected in the Riverside County portion of the watershed, water quality issues may worsen in the future (County of San Diego 2008). In 2011, the following 303(d) listings were applied to water bodies within the San Diego County portion of the Santa Margarita Watershed (SDRWQCB, 2009): • Oceanside Harbor for copper • Santa Margarita Lagoon for eutrophication

Santa Margarita Watershed
• Lower Santa Margarita River for *Enterococcus*, fecal coliform, phosphorus, and total nitrogen • Upper Santa Margarita River for phosphorus and toxicity • De Luz Creek for iron, manganese, nitrogen, and sulfates • Rainbow Creek for iron, nitrogen, phosphorus, sulfates, and TDS • Sandia Creek for TDS, iron, and sulfates Within the Santa Margarita Watershed as a whole, Warm Springs Creek, Long Canyon Creek, Santa Gertrudis Creek, Redhawk Channel, Temecula Creek, and Murrieta Creek, are also listed as impaired for metals, nutrients, TDS, toxicity, E. coli, fecal coliform, or pesticides (SDRWQCB, 2009). In 2005, a TMDL was adopted for total nitrogen and total phosphorus in Rainbow Creek. Water quality listings stated above pertaining to eutrophication, nitrogen, and phosphorus are likely due to nutrient applications from agriculture, nursery operations, municipal wastewater discharges, urban runoff, and septic systems (PCW, N.D.). In addition to nutrient-related concerns, other water quality concerns within the watershed include excessive sedimentation, groundwater degradation and contamination, habitat loss, channelization, flooding, and scour (erosion) (Project Clean Water, N.D.). There is concern that imported water upstream is contributing to increased levels of salts through the lower Santa Margarita Watershed (County of San Diego, 2005). Rancho California Water District is preparing a salt and nutrient management plan (see below), which may result in potential Basin Plan amendments and mitigation measures for the future control of salinity, which would benefit the Lower Santa Margarita Watershed. In light of these water quality concerns in the watershed, efforts are underway to address the water quality needs of the watershed and the sources of pollution. For example, the Santa Margarita Watershed Nutrient Initiative is working with stakeholders to develop and use modeling and the nutrient numeric endpoint (NNE) methodology to assess and address water quality in the watershed. It is hoped that this effort will clarify appropriate water quality standards in the watershed, and through stakeholder outreach and involvement, engage communities in working towards protecting and improving water quality in the watershed. Furthermore, a Water Quality Improvement Plan will be developed for the entire Santa Margarita Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits. USMC Base Camp Pendleton has specific water quality concerns pertaining to groundwater quality. Manganese levels within on-base groundwater wells have been detected at levels exceeding secondary drinking water standards; this water quality concern is likely due to natural features associated with the surrounding bedrock. In addition, the Naval Facilities Engineering Command is currently managing groundwater monitoring and remediation activities on Camp Pendleton to address volatile organic compounds in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (USMC, 2011). Per the State's Recycled Water Policy, Camp Pendleton is developing and implementing strategies to reduce salts and nutrients in groundwater in the Lower Santa Margarita River. Additionally, RCWD is leading development of a salt and nutrient management plan for the Upper Santa Margarita River that overlies the Temecula Valley Groundwater Basin (within Riverside County and the Upper Santa Margarita River IRWM Region). More information on the SNMP is found in *Chapter 7, Regional Coordination*. The Basin Plan establishes specific water quality objectives for all hydrologic areas included within the Santa Margarita Watershed (SDRWQCB, 1994). For the HAs included within San Diego County, there are specific water quality objectives established for TDS, chlorides, sulfates, sodium, nitrates, nitrogen-phosphorus ratios, iron, manganese, methylene blue-activated substances (MBAS), boron, turbidity, color, and fluoride.

Santa Margarita Watershed

Stormwater and Flood Management

Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 500 acres, and includes the following: agriculture, 146 acres; commercial and services, 38 acres; industrial, 4 acres; open space and recreation, 273 acres; residential, 42 ; and transportation, communications, and utilities, 40 acres.

Stormwater and flood management within the San Diego County portions of the Santa Margarita Watershed fall under the jurisdiction of the County of San Diego and Camp Pendleton. In 2008, the County of San Diego updated the Santa Margarita Watershed Urban Runoff Management Plan (WURMP) to meet revised requirements of the 2007 San Diego Municipal Stormwater Permit (County of San Diego, 2008). The 2008 WURMP focuses on management activities that can be taken to reduce urban runoff draining into the Santa Margarita Watershed, and therefore focuses on addressing water quality concerns associated with urban runoff. Stormwater and floodwater management in the Riverside County portions of the Santa Margarita Watershed can impact those portions falling within the San Diego IRWM region. Specifically, channelization and other flood management efforts can lead to increased sedimentation and debris downstream following a storm event (County of San Diego, 2005). The Riverside County Flood Control and Water Conservation District is responsible for stormwater and flood management in the Upper Santa Margarita watershed.

The County of San Diego conducts additional flood management efforts within the Santa Margarita River to reduce and address flood flows associated with FEMA-designated flood areas. According to the County of San Diego, localized flooding within Sandia Creek, a tributary of the Santa Margarita River, impacts access to the communities of Fallbrook and De Luz (County of San Diego, 2007).

The USMC reports that flooding on the Santa Margarita River has damaged infrastructure on Camp Pendleton several times since 1943 (USMC, 2011). Specifically, floods in 1969, 1978, 1980, and 1993 damaged the diversion weir on the Santa Margarita River that diverts water to Lake O'Neill. Flood protection measures on USMC Base Camp Pendleton consist of an earthen levee constructed along the southern edge of the main-stem of the Santa Margarita River channel. Completed in 1999, the levee construction also included the replacement of the bridge over the Santa Margarita River on Basilone Road. The levee and bridge are designed to protect against the 100-year storm event. Camp Pendleton's flood protection program also includes detention basins distributed throughout cantonment areas for the purpose of flood control, as well as measures to safeguard potable water wells in the floodplain against flood damage (USMC, 2011).

Natural Resources

Due to relatively undeveloped nature of the Santa Margarita Watershed, this watershed contains an abundance of habitats and wildlife (County of San Diego, 2008). Habitats within the Santa Margarita River Watershed include chaparral, riparian woodlands, coastal marshes, oak woodlands, and montane habitats (PCW, N.D.). These habitats also support the largest populations of seven federally or state-listed endangered species (County of San Diego, 2008). Tribal nations in the Region have indicated concern that jurisdictional habitat conservation efforts to address sensitive habitats and species may not consider current or future tribal developments, and tend to categorize tribal lands as open space.

According to the USMC, there are sixteen special-status species located on Camp Pendleton (USMC, 2011). Of these species, the southern population of steelhead trout and the arroyo toad use stream corridors on Camp Pendleton, the tidewater goby uses brackish water and coastal lagoon habitats associated with the Santa Margarita Estuary, and the least Bell's vireo and the southwestern willow flycatcher both rely on riparian habitats (USMC, 2011). The Santa Margarita River steelhead population is considered a Core 1 population, assigned highest priority in recovery actions (NMFS, 2012). Fish passage was previously thought to be impeded by the Lake O'Neill diversion weir, but confirmed sightings of the Southern California steelhead in 2009 above the Lake O'Neill diversion weir indicate that fish passage is possible. Several invasive species have been identified on Camp Pendleton, including the bullfrog (*Lithobates catesbeiana*), the salt cedar (*Tamarix spp.*), and the giant reed (*Arundo donax*) (USMC Camp Pendleton 2011). Additionally, the perennial pepperweed (*Lepidium latifolium*) has been identified as a threat to Santa Margarita River habitat, while crayfish has been identified as widespread in the watershed (County of San Diego, 2005).

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In 2006, stakeholders from the Santa Margarita Watershed and the San Luis Rey Watershed signed a Memorandum of Understanding that established a Weed Management Area and defined actions necessary to prevent the introduction, establishment, and spread of invasive non-native plants within the Santa Margarita and San Luis Rey Watersheds (Mission Resource Conservation District et al, 2006).

Potential Climate Change Impacts

Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the Santa Margarita Watershed include but are not limited to:

- Decrease in imported water supply
- Decrease in groundwater supply
- Decrease in surface water availability
- Water quality concerns related to lower surface water flows
- Sea level rise
- Saltwater intrusion
- Decrease in availability of necessary habitat
- Exacerbation of wildfires

Due to the relatively low level of imported water supply used within the San Diego IRWM Region portion of the Santa Margarita Watershed, decreases in imported water supply are anticipated to be a potential although non-critical climate change impact. However, due to the use of groundwater and surface water within the Santa Margarita Watershed, reductions of these resources could impact water users including the USMC Base Camp Pendleton and Fallbrook PUD. Furthermore, due to the extensive amount of habitat and open space located within the Santa Margarita Watershed, reduced water availability and potential water quality concerns could impact or decrease available habitat that is necessary to support endangered species.

Due to the Santa Margarita Watershed's location along the coast, sea level rise could potentially impact this watershed and its coastal ecosystems and habitats. Furthermore, several military support facilities and training areas are located within proximity to the coast, and could potentially be impacted by sea level rise. Lastly, major wildfires, which occurred within the Santa Margarita Watershed as recently as 2007, could potentially occur more frequently due to climate change, which could substantially impact water quality and habitat within the watershed (RWMG, 2009).

Management Issues and Conflicts

Management of the Santa Margarita Watershed presents unique challenges due to cross-jurisdictional management issues, as well as ongoing water quality and water rights litigation within the watershed. In addition, rapid development within the upper watershed area (primarily within Riverside County) and corresponding urbanization and population growth present further challenges associated with increased impervious surfaces, exacerbated water quality issues, and loss of natural resources (County of San Diego, 2005).

Through the IRWM Program and other efforts, local jurisdictions are working collaboratively to address issues within the watershed, and in particular have focused on water quality issues within the Santa Margarita River. In 2011, the San Diego IRWM Region and the Upper Santa Margarita IRWM Region were awarded grant money from DWR to implement a multi-jurisdictional project that will evaluate nutrient water quality objectives for the Santa Margarita River Estuary and the entire Santa Margarita River.

In 1940, a Stipulated Judgment ("1940 Judgment") was issued directing the use and allocation of groundwater and surface water for the stipulating parties. Although considered an adjudicated basin, quantified water rights have not been assigned. In 1963, a Final Judgment and Decree was issued further defining the use of groundwater in the region, and in 1966, a Modified Final Judgment and Decree ("Fallbrook Case") was entered incorporating interlocutory judgments and the 1940 Stipulated Judgment. This document produced an Application to Appropriate

Santa Margarita Watershed
Unappropriated Water to the Department of Water Resources (DWR) in the Temecula Creek, but was not fully executed until 2009 when the State Water Resources Control Board (SWRCB). These judgments were followed by years of court cases and power struggles by multiple parties, including the Federal government (U.S. Marine Corps Camp Pendleton) over water use in the watershed basins, citing the judgments did not fully meet the needs of the parties for effective water management. Finally, after many years, a settlement agreement, "Cooperative Water Resource Management Agreement between Camp Pendleton and Rancho California Water District", was reached and executed in March 2002. This agreement does not supersede the previous judgments (1940 Judgment and Fallbrook Case), but suspends inconsistent terms of the 1940 Stipulated Judgment for so long as the Cooperative Water Resource Management Agreement remains in effect. The Watermaster prepares the "Santa Margarita Watershed Annual Watermaster Report", providing annual reporting of water conditions in the watershed, but does not manage the groundwater basin. The Court has retained jurisdiction over all surface flows of the Santa Margarita River Watershed and all underground waters determined by the Court to be subsurface flow of streams or creeks or which is determined by the Court to add to, support or contribute to the Santa Margarita River stream system. Local vagrant groundwaters that do not support the Santa Margarita River stream system are outside the Court jurisdiction.

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5.3 San Luis Rey Watershed

The San Luis Rey Watershed (San Luis Rey Hydrologic Unit or San Luis Rey HU (903)) is the largest watershed completely within the San Diego IRWM Region. Figure 5-4 presents a map showing the watershed boundaries and primary features.

The San Luis Rey River is the primary watercourse within the watershed, and discharges to the Pacific Ocean north of the City of Oceanside. The watershed is bounded by the Monserate Mountains to the north, Cleveland National Forest and Camp Pendleton to the northwest, and the cities of Oceanside, Vista, San Marcos, and Escondido to the south. Lake Henshaw is the only major drinking water reservoir in the San Luis Rey Watershed.

Roughly one-fourth of the land area in the watershed is located west of Interstate 15, and this area has multiple uses including open space/ undeveloped, residential, commercial/industrial, and agricultural. East of Interstate 15, most of the land is either undeveloped or agricultural. Land use authorities include the County, the State, the Federal government, and several tribal nations.

Groundwater and surface waters in the upstream portion of the San Luis Rey Watershed are an important local supply source for the Vista Irrigation District, City of Escondido, Pala/Pauma communities, and local Indian Tribes. However, several large water agencies within the watershed (e.g. Valley Center Municipal Water District, Rainbow Municipal Water District, Fallbrook PUD) are virtually 100% reliant on the availability of imported water. The City of Oceanside, which is also a member agency of the San Diego County Water Authority and relies on imported water sources, is the only agency in the downstream portion of the watershed that develops any sort of local water supplies, through demineralization of brackish groundwater from the Mission Groundwater Basin.

The North San Diego County Regional Recycled Water Project – funded by Proposition 84-Round 1 – enables expansion of recycled water throughout the North County watersheds.

Photo credit: Kim Thorner, Olivenhain Municipal Water District

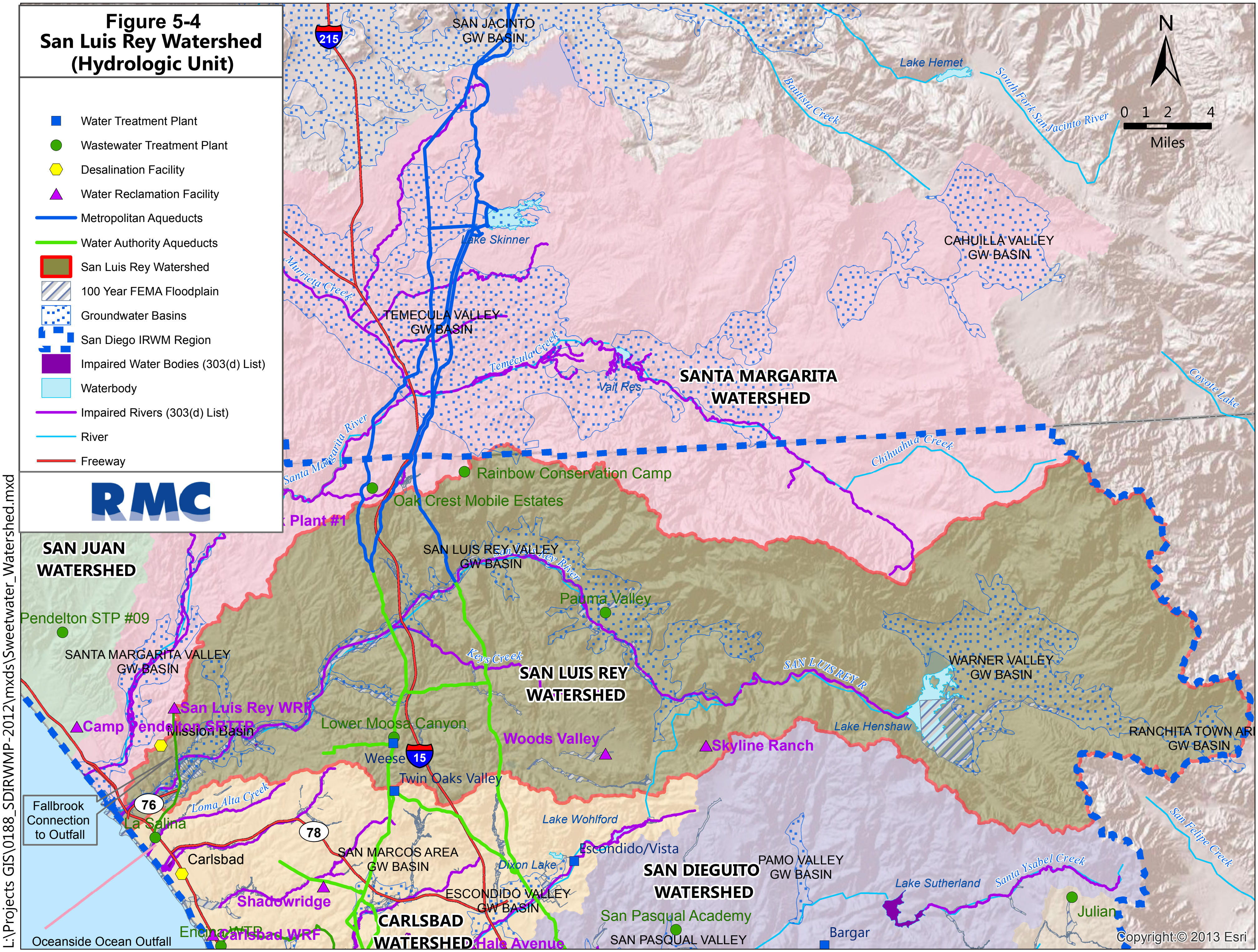
Figure 5-4
San Luis Rey Watershed
(Hydrologic Unit)
Water Treatment Plant
Wastewater Treatment Plant
Desalination Facility
Water Reclamation Facility
Metropolitan Aqueducts
Water Authority Aqueducts
San Luis Rey Watershed
100 Year FEMA Floodplain
Groundwater Basins
San Diego IRWM Region
Impaired Water Bodies (303(d) List)
Waterbody
Impaired Rivers (303(d) List)
River
Freeway
RMC
N
0 1 2 4
Miles
SAN JACINTO GW BASIN
Lake Hemet
Bautista Creek
South Fork San Jacinto River
Lake Skinner
Murrieta Creek
TEMECULA VALLEY GW BASIN
Temecula Creek
Vail Res
SANTA MARGARITA WATERSHED
CAHUILLA VALLEY GW BASIN
Coyote Lake
Santa Margarita River
Chihuahua Creek
Rainbow Conservation Camp
Oak Crest Mobile Estates
SAN JUAN WATERSHED
SAN LUIS REY VALLEY GW BASIN
San Luis Rey River
Pauma Valley
Pendelton STP #09
SANTA MARGARITA VALLEY GW BASIN
Keys Creek
SAN LUIS REY WATERSHED
SAN LUIS REY R
WARNER VALLEY GW BASIN
San Luis Rey WRF
Camp Pendelton SRTTP
Mission Basin
Lower Moosa Canyon
Woods Valley
Skyline Ranch
Lake Henshaw
RANCHITA TOWN ARI GW BASIN
Weese
15
215
Twin Oaks Valley
Fallbrook Connection to Outfall
76
Loma Alta Creek
La Salina
78
Lake Wohlford
Escondido/Vista
Carlsbad
SAN MARCOS AREA GW BASIN
Dixon Lake
PAMO VALLEY GW BASIN
SAN DIEGUITO WATERSHED
San Felipe Creek
Santa Ysabel Creek
Lake Sutherland
Shadowridge
ESCONDIDO VALLEY GW BASIN
San Pasqual Academy
Julian
CARLSBAD WATERSHED
Encina WTP
Carlsbad WRF
Hale Avenue
Bargar
SAN PASQUAL VALLEY
Oceanside Ocean Outfall
Copyright:© 2013 Esri
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San Luis Rey Watershed

Hydrology

The 562-square mile San Luis Rey Watershed is the largest watershed completely within the San Diego IRWM Region. The San Luis Rey Watershed is comprised of three hydrologic areas (HAs) including: Lower San Luis HA (903.1), Monserate HA (903.2), and Warner Valley HA (903.3).

The major surface water body within the San Luis Rey Watershed is the San Luis Rey River. The San Luis Rey River has headwaters in the Palomar Mountains and the Hot Springs Mountains, as well as several other mountain ranges along the eastern border of the San Diego IRWM Region. The San Luis Rey River flows in a westerly direction, draining into the Pacific Ocean near the City of Oceanside (Project Clean Water, N.D.).

There are four water supply reservoirs in the San Luis Rey Watershed, described in *Water Systems* below. The San Luis Rey River is hydrologically connected to Lake Henshaw, a manmade impoundment created by the Henshaw Dam (Vista Irrigation District, 2011). The Escondido Canal, located downstream of Lake Henshaw, conveys flows from Lake Henshaw to the City of Escondido via Lake Wohlford in the Carlsbad Watershed (City of Oceanside et al, 2008). West of the Escondido Canal, the San Luis Rey River is intermittent and perennial, as is common for many streams within Southern California (Oceanside et al, 2008).

Guajome Lake, a manmade lake located in Guajome Regional Park, is a small surface water body that is primarily used for recreational purposes (City of Oceanside, N.D.). Foss Lake, one of the only inland salt water wetlands in San Diego County, was previously expanded over 75 acres within the San Luis Rey Watershed (City of Oceanside et al., 2008).

Water Systems

Water systems within the San Luis Rey Watershed include those used to convey flows from the reservoirs and the San Luis Rey River. There are two water supply reservoirs in the San Luis Rey Watershed, including:

- Lake Henshaw, owned by Vista Irrigation District and stores surface water
- Turner Reservoir, owned by Valley Center Municipal Water District and stores surface water

Lake Henshaw, which is owned and operated by Vista Irrigation District, which has a cooperative agreement with the City of Escondido to provide flows to Lake Wohlford (located within the Carlsbad Watershed) through the Escondido Canal (City of Oceanside et al., 2008).

Water supply agencies within the San Luis Rey Watershed include the City of Oceanside, Vista Irrigation District, Valley Center Municipal Water District, Fallbrook PUD, Rainbow Municipal Water District, and Yuima Municipal Water District. In addition, a small portion of the USMC Base Camp Pendleton is located within the San Luis Rey Watershed; the USMC is responsible for providing water services within Camp Pendleton. All of the aforementioned water supply agencies are member agencies of the San Diego County Water Authority, and therefore receive imported water through the Water Authority's imported water aqueducts. In addition, three of the tribal nations located within the San Luis Rey Watershed have regulated Public Water Systems that supply water to their respective reservations. Those tribal nations include: Pala Band of Mission Indians, La Jolla Band of Luiseño Indians, and San Pasqual Band of Indians. The Rincon Band of Luiseño Indians purchases raw water from Escondido and the Vista Irrigation District, and the San Pasqual Band of Indians purchases treated water from Valley Center Municipal Water District.

Wastewater agencies within the San Luis Rey Watershed include the City of Oceanside, Fallbrook PUD, the Valley Center Community Services District, the City of Vista, the Rainbow Municipal Water District, and the Pauma Valley Community Services District. The Pala Band of Mission Indians operates a tertiary wastewater treatment plant that serves most of the buildings located on the Pala Reservation.

Groundwater basins underlying the San Luis Rey Watershed include the San Luis Rey Valley (9-7), Warner Valley (9-8), and Ranchita Town Area (9-25) basins defined according to DWR Bulletin 118. According to DWR, major recharge areas within the aforementioned groundwater basins include the San Luis Rey River and its tributaries and infiltration of runoff (DWR (c), 2004, DWR (d), 2004, and DWR (e), 2004). Vista Irrigation District operates groundwater wells in the Warner Valley basin, and groundwater from the basin is generally conveyed to Lake Henshaw, and then to the San Luis Rey River/Escondido Canal (Vista Irrigation District, 2011). The City of

San Luis Rey Watershed
Oceanside also operates groundwater wells to extract brackish groundwater from the Mission Basin, which is part of the San Luis Rey Valley basin (City of Oceanside, 2011). The Salt and Nutrient Management Planning guidance document developed by the Southern California Salinity Coalition and the San Diego County Water Authority further divides the San Luis Rey Valley groundwater basin into five subbasins: Oceanside/Mission, Bonsall, Pala, Pauma, and Moosa. The Pauma and Pala subbasins are a medium priority (Tier B) basin for SNMPs, while the Bonsall and Moosa subbasins are low priority (Tier D-2) for SNMPs. The Warner Valley groundwater basin is a lowest priority (Tier E) basin for SNMP. See *Chapter 7, Regional Coordination,* for more information on basin SNMP prioritization.
Internal Boundaries and Land Uses The San Luis Rey Watershed resides almost entirely within San Diego County, although a small portion (0.2% of the total watershed) lies within Riverside County. Within San Diego County, the San Luis Rey Watershed is primarily within the jurisdiction of San Diego County (95.2% of the watershed), but is also within the jurisdiction of the City of Oceanside (4.4%), the City of Vista (0.2%), and the City of Escondido (<0.1%). Other governmental agencies residing within the watershed include the United States (USMC Base Camp Pendleton), the Forest Service (Cleveland National Forest), and State of California lands (parks, state roadways, etc.) (City of Oceanside et al, 2008). Furthermore, there are several tribal land holdings within the watershed, including the Pala Reservation (approximately 12,333 acres), the Pauma and Yuima Reservation (approximately 5,826 acres), the Rincon Reservation (approximately 3,918 acres), the La Jolla Reservation (approximately 8,798 acres), the San Pasqual Reservation (approximately 1,412 acres), the Santa Ysabel Reservation (approximately 15, 270 acres), and the Los Coyotes Reservation (approximately 24,762 acres) (University of San Diego, N.D.). Approximately 15% of the total area within the San Luis Rey Watershed contains tribal lands. The majority of the watershed is undeveloped (55%); agriculture and residential uses serve as the most dominant land uses in developed areas. The remaining 22% of the watershed contains residential, parks/open space, commercial/industrial, recreation, and schools (City of Oceanside et al, 2008).
Water Quality and Water Quality Impairments Several water bodies within the San Luis Rey Watershed are listed on the 303(d) list of impaired water bodies. Impaired water bodies include: • Guajome Lake for eutrophication • San Luis Rey River (lower) for chloride, TDS, *Enterococcus*, fecal coliform, phosphorus, nitrogen, and toxicity • San Luis Rey River (upper) for nitrogen • Keys Creek for selenium • Pacific Ocean Shoreline, Mouth of the San Luis Rey River for *Enterococcus* and total coliform Monitoring data suggests that nutrients entering Guajome Lake from residences, commercial nurseries, commercial horse facilities, and residential horse facilities could be the cause of eutrophication. Chloride and TDS within the San Luis Rey River may be due to salt water intrusion, and may also be due to natural causes. Foss Lake, one of the only inland salt water wetlands in San Diego County, has naturally elevated salt levels. The source of bacteria along the Pacific Ocean Shoreline within the San Luis Rey Watershed is unknown at this time. Nitrogen and phosphorous-containing compounds found in the local streams are known to originate from urban runoff, wastewater/sewage spills, septic tank leaks, and agriculture sources (City of Oceanside et al., 2011). The 2011-2012 Annual Report for the San Luis Rey River Watershed Urban Runoff Management Program (WURMP) noted that a number of activities aimed at improving water quality are underway in the watershed. For example, two pet waste removal projects removed an estimated 8,823 pounds of pet wastes from the watershed, reducing the bacteria entering the waterways. It also described the water quality in the upper part of the watershed as generally high (City of Oceanside et al., 2013). Furthermore, a Water Quality Improvement Plan will be developed for the entire San Luis Rey Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve

San Luis Rey Watershed
water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits. The Basin Plan establishes specific water quality objectives for all hydrologic areas included within the San Luis Rey Watershed. For the three specific HAs included within the San Luis Rey Watershed, there are specific water quality objectives established for TDS, chlorides, sulfates, sodium, nitrates, nitrogen-phosphorus ratios, iron, manganese, methylene blue-activated substances (MBAS), boron, turbidity, color, and fluoride. The Water Board has the authority to waive the requirements for a person to file a report of waste discharge and/or be issued waste discharge requirements (WDRs) and instead grant waivers for applicable discharges. One of the conditional waivers available, Discharges from Agricultural and Nursery Operations, is for discharges that contain pollutants that can percolate to groundwater or runoff to surface waters (Regional Board, N.D.). Groundwater quality in the San Luis Rey Watershed is generally of low concern, except for the Pala/Pauma subbasin, which is a Tier B basin for SNMPs. To date, there has been no progress towards developing an SNMP for the subbasin, though is it anticipated that an SNMP will be developed in the future (Regional Board, 2013).
Stormwater and Flood Management Major drainages within the watershed include Keys Canyon Creek, Moosa Canyon Creek, Pilgrim Creek, and San Luis Rey River, which encompass drainage areas of approximately 31.58, 34.7, 19, and 562 square miles, respectively. The peak discharges during a 100-year event for Keys Canyon Creek, Moosa Canyon Creek, and Pilgrim Creek are 22,911, 13,000, and 1,925 CFS, respectively. The peak discharges during a 100-year event for San Luis Rey River at three locations range from CFS41,000 to 51,000 CFS. Within the watershed, the acreage of land uses within mapped flood hazard zones total nearly 16,000 acres, and includes the following: agriculture, 2,382 acres; commercial and services, 917 acres; industrial, 264 acres; open space and recreation, 8,262 acres; residential, 1,953; and transportation, communications, and utilities, 1,012 acres (see Appendix 7-B, Integrated Flood Management Planning). Stormwater and flood management within the San Luis Rey Watershed generally fall under the jurisdiction of the County of San Diego, the City of Oceanside, and the City of Vista. The County has jurisdiction over the 95.2% of the watershed. The cities of Oceanside and Vista, County of San Diego, and California Department of Transportation (CalTrans) are also responsible for implementing provisions included in the San Luis Rey River Water Quality Improvement Plan (WQIP), which focuses on an outcome-driven approach to water quality protection and improvements related to stormwater (City of Oceanside et al., 2016). The U.S. Army Corps of Engineers (USACE) has been involved in flood control management associated with the San Luis Rey River since authorization of the San Luis Rey River Flood Control Project in 1970 (USACE, 2013). This project included design and construction of a flood control channel along portions of the San Luis Rey River to convey flood flows during a Standard Project Flood (89,000 CFS), and also includes vegetation and sediment removal operation and maintenance efforts to maintain the channel's flood control capacity (USACE, 2013). Under permit from the USACE and California Department of Fish and Wildlife, the City of Oceanside routinely mows vegetation within the flood channel. The USACE oversees habitat management and restoration activities in the lower San Luis Rey River. Although the San Luis Rey Flood Control Project has a rated capacity of 89,000 CFS, local stakeholders are still concerned about future flooding and potential flood impacts. In 1916 the San Luis Rey River experienced a very large flood event that inundated the entire San Luis Rey Valley and had a stakeholder-reported flow rate of 96,000 CFS (USGS 1918). If a flood of this magnitude were to occur again there could be substantial damage to nearby properties and infrastructure as the flood control channel would be unable to handle flood flows greater than those modeled for a Standard Project Flood (89,000 CFS). Although much of the San Luis Rey River is unchannelized, within the City of Oceanside the river has been channelized by levees for flood control purposes. Flood flows within the San Luis Rey River are limited as this river is intermittent and perennial in nature; stream gage data suggests that flood flows have been substantially reduced within the river since construction of Henshaw Dam (City of Oceanside et al., 2008).

San Luis Rey Watershed
The County of San Diego conducts additional flood management efforts throughout the San Luis Rey Watershed to reduce and address flood flows associated with FEMA-designated flood areas, including a comprehensive flood forecast model to cover the entire San Luis Rey Watershed and its primary tributaries (County of San Diego, 2007). According to the County of San Diego, localized flooding occurs in several reaches of the San Luis Rey River, including: • Between Lake Henshaw and the La Jolla Indian Reservation • Along Cole Grade Road • At Shearer Crossing (where the river meets Interstate 15) • Along Pauma Valley Drive • Along Wiskon Way • Along Valley Center Road and in the vicinity of the Rincon Casino Flooding and mudslide events during rain events have occurred in the San Luis Rey Watershed following fires. Wildfires compromise the stability of soils and create land disturbances that increase erosion processes during/after rain events. 55,000 acres of land in the San Luis Rey Watershed burned during the 2007 Rice and Poomacha wildfires. Rain events increased sediment runoff (high concentrations of TDS and Total Suspended Solids, and turbidity) and mudslide type events at and around the burned site (DFG, 2010).
Natural Resources Due to relatively undeveloped nature of the San Luis Rey Watershed, the watershed contains intact habitat and wildlife areas comprised of 36 vegetation communities, the dominant of which area coastal sage scrub, chaparral, and grasslands. The San Luis Rey Watershed also contains defined freshwater fish communities including upland, lowland, and coastal lagoons (City of Oceanside et al., 2008). The San Luis Rey Watershed had a historic population of native fish, including the Southern California Steelhead, which declined in the 1930's upon completion of the Henshaw Dam. In 2007, an adult steelhead trout (*Oncorhynchus mykiss*) was observed within the San Luis Rey River, and the northern area of the watershed continues to support a population of native rainbow trout (Coastal Watershed Planning and Assessment Program, 2008). The San Luis Rey Watershed contains numerous protected and special-status species and vegetation communities, and is included in the North County Subarea of San Diego County's Multiple Species Conservation Program (MSCP) (City of Oceanside et al., 2008). Wetland habitats along the San Luis River are inhabited by endangered avian species; development in and around the river may be restricted due to the presence of such species. In 2006, stakeholders from the Santa Margarita Watershed and the San Luis Rey Watershed signed a Memorandum of Understanding that established a Weed Management Area and defined actions necessary to prevent the introduction, establishment, and spread of invasive non-native plants within the Santa Margarita and San Luis Rey Watersheds (Mission Resource Conservation District et al., 2006). Tribal nations located within the watershed have indicated concern that jurisdictional habitat conservation efforts such as the County's MSCP do not consider current or future tribal development plans, and tend to categorize tribal lands as open space.
Potential Climate Change Impacts Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the San Luis Rey Watershed include but are not limited to: • Decrease in imported water supply • Decrease in groundwater supply • Decrease in surface water availability • Sea level rise • Decrease in availability of necessary habitat • Exacerbation of wildfires

San Luis Rey Watershed
Due to the complicated nexus between imported water, groundwater, and surface water (refer to Management Issues and Conflicts below), climate change could potentially impact water resources within the San Luis Rey Watershed if the availability or quality of any of these resources changes substantially due to climate change. Because of the San Luis Rey Watershed's proximity to the coast, sea level rise has the potential to impact several municipalities and resources within the watershed. Saltwater intrusion has been a historic issue within the San Luis Rey River groundwater basin, and changes to the level of seawater could potentially exacerbate this issue. Lastly, wildfires are an identified issue within the San Luis Rey Watershed, and several recent ones have occurred within the watershed (RWMG, 2009). If the frequency of wildfires increases due to climate change, local water quality and habitat within the watershed could be adversely impacted.
Management Issues and Conflicts The San Luis Rey Watershed had a historical population of native fish, including the Southern California Steelhead, which declined in the 1930's upon completion of the Henshaw Dam (Coastal Watershed Planning and Assessment Program, 2008). Dams, water diversions, and flood control structures have had the most severe impacts on steelhead trout populations throughout California by cutting off access to upstream spawning and rearing habitats and reducing the flows necessary for immigration of adult and emigration of juvenile steelhead trout (Hunt and Associates, 2008). Surface water and shallow aquifer issues within the San Luis Rey Watershed have been well documented and persistent for several decades. Prior to the 1960's, groundwater pumping in the western portion of the watershed led to lowering of groundwater levels, which led to seawater intrusion between two to six miles inland from the Pacific Coast. Delivery of imported water into the San Diego Region after completion of the first San Diego Aqueduct in 1947 led to reduced groundwater pumping. Over time, reduced groundwater pumping allowed groundwater levels to recover to historical levels, which also reduced effects associated with seawater intrusion. However, during this same time period, increased development and increased irrigation with imported water led to increased salt loading into the watershed, which affected groundwater quality to the point that groundwater use declined. As a result of severely reduced groundwater pumping, the depth of groundwater has risen such that perennial waters in the San Luis Rey River have moved upstream (City of Oceanside et al., 2008). The San Luis Rey Watershed Council was created in 1997 to develop and implement a comprehensive resource management plan for the San Luis Rey River and its tributaries. In 2001, the San Luis Rey Watershed Council developed a list of priority issues identified for the watershed, including the following (San Luis Rey Watershed Council, 2001): • Water Quality and Quantity – focusing on NPDES permits and TMDLs, water quality monitoring and analysis, and improving quality of surface water and groundwater. • Heavy Industrial Uses – focusing on the proposed Gregory Canyon Landfill. • Extractive Uses – focusing on sand and gravel mining. • Invasive Plant Species Management – focusing on the San Luis Rey River Weed Management Area. • Agricultural Uses – focusing on maximizing irrigation and fertilizer efficiency, maximizing pesticide efficiency/integrated pest management, and improving erosion control measures. • Fire Management – focusing on improving coordination between stakeholders. • Wildlife Management – focusing on the San Diego County MSCP, and City and SANDAG-based Multiple Habitat Conservation Plans. • Public Open Space Management – focusing on recreation and species habitat management. • Floodplain Management and Flood Warning – focusing on National Weather Service Flood Forecasting and San Diego County's ALERT Storm Warning System. • Recreational Uses – focusing on golf courses, parks, tourism, hiking, fishing, and camping.

San Luis Rey Watershed
• Wetlands Protection and Restoration – focusing on the Wilderness Gardens Preserve and proposed mitigation sites. • Preserve Historical and Cultural Legacies Sand replenishment along the coast has also been an issue in the San Luis Rey Watershed due to upstream development preventing the transport and deposition of sand. The lower San Luis Rey River valley is channelized which prevents sand deposition in the alluvial plain (Coastal Morphology Group et al., N.D.).

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5.4 Carlsbad Watershed

The Carlsbad Watershed (Carlsbad Hydrologic Unit or Carlsbad HU (904)) features a significant number of the Region's coastal lagoons. The Carlsbad Watershed is comprised of six small hydrologic areas, including Loma Alta (904.1), Buena Vista Creek (904.2), Agua Hedionda (904.3), Encinas (904.4), San Marcos (904.5), and Escondido Creek (904.6). The aforementioned creeks all drain in a westerly direction, draining into one of four major coastal lagoons (Buena Vista Lagoon, Agua Hedionda Lagoon, Batiquitos Lagoon, and San Elijo Lagoon), the Loma Alta Slough, or the Pacific Ocean.

Figure 5-5 presents a map of the Carlsbad Watershed showing principal features and boundaries. Approximately half of the 211 square mile Carlsbad Watershed is urbanized, with a high percentage of the undeveloped land in private ownership. Urban and agricultural runoff is a critical concern within the Carlsbad Watershed, and can impact both the coastal lagoons and local beaches.

Water supply reliability is also critical issue within the Carlsbad Watershed, as some water agencies (e.g. City of Carlsbad) are currently 100% reliant on imported supply. Surface reservoirs within the Carlsbad Watershed include Lake Wohlford, Dixon Lake, Lake San Marcos, Olivenhain Reservoir, and San Dieguito Reservoir.

Only a limited quantity of groundwater exists within the Carlsbad Watershed, and groundwater salinity represents a limitation to its use as a potable supply.

Lake Wohlford is the largest surface water reservoir in the Carlsbad Watershed.

Photo credit: Craig Whitmore, City of Escondido

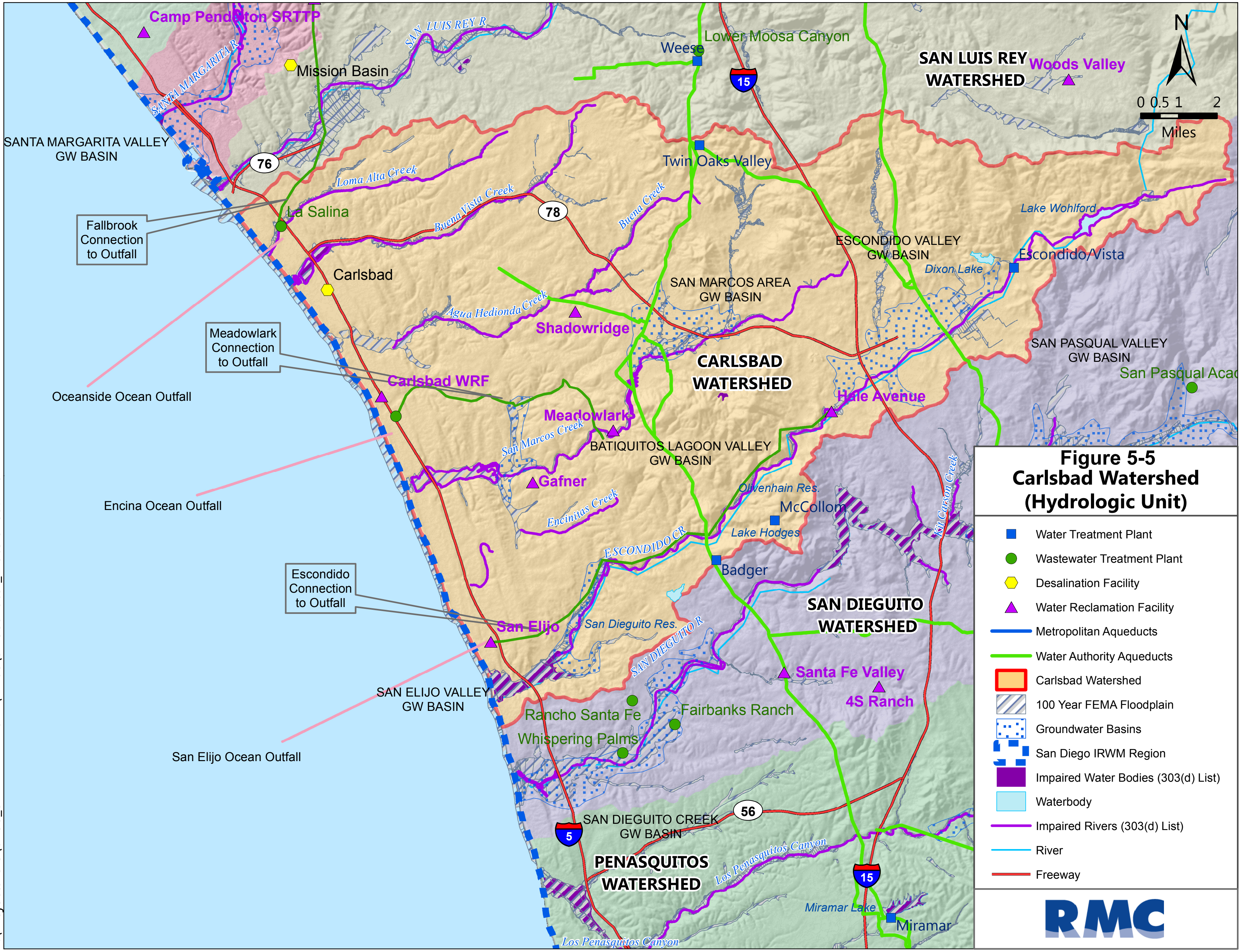

Figure 5-5
Carlsbad Watershed
(Hydrologic Unit)

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Carlsbad Watershed

Hydrology

The Carlsbad Watershed contains several major stream systems that are each associated with the six small hydrologic areas (HAs), including:

- Loma Alta HA (904.1), which drains into Loma Alta Slough,
- Buena Vista Creek HA (904.2), which drains into Buena Vista Lagoon,
- Agua Hedionda HA (904.3), which drains into Agua Hedionda Lagoon,
- Encinas HA (904.4), which drains to the Pacific Ocean,
- San Marcos HA (904.5), which drains into Batiquitos Lagoon, and
- Escondido Creek HA (904.6), which drains into San Elijo Lagoon.

The other major surface water bodies within the Carlsbad Watershed include five reservoirs and storage lakes, described in *Water Systems* below.

Source water for Escondido Creek is from Lake Wohlford and Dixon Lake, which include waters transferred from the San Luis Rey Watershed via the Escondido Canal. San Marcos Creek drains into Lake San Marcos. Olivenhain Reservoir, created by the Olivenhain Dam, is located within the Carlsbad Watershed and is connected to Hodges Reservoir (within the San Dieguito Watershed) as part of the San Diego County Water Authority's Emergency Storage Project (OMWD, 2011). San Dieguito Reservoir, which is located on the border of the Carlsbad and San Dieguito Watersheds, stores raw water and is co-owned and operated by the Santa Fe Irrigation District and the San Dieguito Water District (SFID, 2011).

Water Systems

There are five major surface water bodies in the watershed, which are used to store surface water or imported water:

- Lake Wohlford, owned by City of Escondido and stores surface water
- Dixon Lake, owned by City of Escondido and stores surface water and imported water
- Lake San Marcos, a privately owned lake (Citizens Development Corporation) that stores surface water
- Olivenhain Reservoir: owned by Water Authority, stores natural runoff
- San Dieguito Reservoir: owned by San Dieguito Water District and Santa Fe Irrigation District, stores imported water from the Water Authority's Second Aqueduct and upstream releases

Water systems within the Carlsbad Watershed are complex, containing all or portions of seven cities (Carlsbad, San Marcos, Encinitas, Oceanside, Vista, Escondido, and Solana Beach), the County of San Diego, and a small portion of the San Pasqual Band of Indians' Reservation. In addition, the Carlsbad Watershed contains all or portions of ten water agencies (City of Escondido, City of Oceanside, Carlsbad Municipal Water District, Olivenhain Municipal Water District, Rincon del Diablo Municipal Water District, Santa Fe Irrigation District, San Dieguito Water District, Vallecitos Water District, Valley Center Municipal Water District and Vista Irrigation District) that are member agencies of the San Diego County Water Authority. The San Pasqual Band of Indians operates a Public Water System and also purchases water from the Valley Center Municipal Water District. As such, within the Carlsbad Watershed there is a large amount of imported water use and limited amounts of other water supplies.

Within the Carlsbad Watershed, local water sources include runoff that is collected within Lake Wohlford and Dixon Lake. The Carlsbad Watershed is home to three potable water treatment plants: Escondido/Vista (capacity of 65 MGD), McCollom (capacity of 34 MGD), and Badger (capacity of 40 MGD). Water produced at these plants come from storage or surface water in both the Carlsbad Watershed and the San Dieguito Watershed, and may be used outside the Carlsbad Watershed.

Groundwater basins underlying the Carlsbad Watershed include the Batiquitos Lagoon Valley (9-22), San Elijo Valley (9-23), San Marcos Area (9-32), and Escondido Valley (9-9) basins defined according to DWR Bulletin 118. According to DWR, major recharge areas within the aforementioned groundwater basins include corresponding rivers or creeks and their tributaries as well as infiltration of runoff (DWR (f), 2004; DWR (g), 2004; DWR (h), 2004;

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and DWR (i), 2004). As described in *Chapter 7, Regional Coordination*, Rincon del Diablo Municipal Water District is developing a Salt and Nutrient Management Plan (SNMP) for the medium priority (Tier B) Escondido Valley groundwater basin, in coordination with the Regional Board and the City of Escondido. The San Marcos Basin is also a Tier B groundwater basin, though no SNMP is currently under development for this basin. However, it is anticipated that a SNMP will be developed in the future (Regional Board, 2013). The Batiquitos and San Elijo basins are low priority (Tier D-2) basins, which are unlikely to require a SNMP.

In November 2012, the Water Authority's Board of Directors voted to approve a 30-year Water Purchase Agreement to purchase up to 56,000 acre-feet of water annually from Poseidon Water (Poseidon) (SDCWA, 2012). Poseidon is currently constructing a reverse-osmosis seawater desalination facility and 10 miles of pipeline in Carlsbad. Two Water Authority member agencies, Vallecitos Water District and Carlsbad Municipal Water District, will purchase a combined total of 6,000 acre-feet of the desalinated water as their own local supply under separate agreements with the Water Authority. The facility is expected to produce 50 MGD of water starting in 2016 and by 2020 will generate 7% of the region's water demand (SDCWA, 2011; SDCWA, 2012 and Poseidon 2013). The desalination facility will enhance the Region's water reliability through supply diversification. The plant will be located at the Agua Hedionda Lagoon next to the Encina Power Plant, a favorable location due to its proximity to the ocean and the available use of an existing intake and outfall (Poseidon, 2013).

Upper San Marcos Creek at Via Vera Cruz, San Marcos, CA.

Photo Credit: Erica Ryan, City of San Marcos

Since 2009, the City of San Marcos with oversight from the San Diego Regional Water Quality Control Board, has led a unique consortium of volunteer stakeholders that includes the County of San Diego, City of Escondido, California Department of Transportation, San Marcos Unified School District, and Vallecitos Water District to identify and implement a holistic solution to the estimated 18,000-acre watershed area of Upper San Marcos Creek and Lake San Marcos. In addition, the City of San Marcos has integrated its new downtown, per the San Marcos Creek Specific Plan, with the overall stakeholder effort for the Upper San Marcos Creek through implementing key watershed sustainability goals for water resource management, efficient water use, reduction in reliance on imported water through groundwater resources, creek restoration, improvements in water quality, and reduction of hydromodification effects from the Upper San Marcos Creek.

Internal Boundaries and Land Uses

The Carlsbad Watershed crosses multiple local jurisdictional boundaries including the cities of Carlsbad, San Marcos, Encinitas, Oceanside, Vista, Escondido, Solana Beach, and unincorporated portions of San Diego County (City of Carlsbad et al., 2008). A very small portion of the San Pasqual Reservation is located within the eastern portion of the Carlsbad Watershed, along the border of the San Luis Rey Watershed. Population growth is expected to increase in the aforementioned jurisdictional areas from existing levels of approximately 500,000 to over 700,000 by 2015, making the Carlsbad Watershed the third most populous watershed within San Diego County (PCW, N.D.).

The majority of the Carlsbad Watershed is urbanized (69%), and is therefore dominated by urban-related land uses including residential (32%), commercial/industrial (13%), freeways and roads (10%), agricultural (6%), open space (11%), leaving a small portion of the watershed (18%) as vacant or undeveloped (Carlsbad et al., 2008).

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Population increases as described above are anticipated to occur largely on vacant or undeveloped lands, as the majority of these lands are in private ownership (PCW, N.D.). Therefore, as population increases in the watershed, the amount of vacant or undeveloped land is expected to decrease. Tribal lands are limited within the Carlsbad Watershed; less than 1% of the watershed contains tribal lands.

Water Quality and Water Quality Impairments

Multiple water bodies within the Carlsbad Watershed are listed on the 303(d) list of impaired water bodies. Impaired water bodies and the constituents for which they are listed are provided below:

- Agua Hedionda Creek for *Enterococcus*, fecal coliform, phosphorus, nitrogen, toxicity, manganese, selenium, and TDS
- Buena Creek for DDT (dichlorodiphenyltrichloroethane, an insecticide), nitrate, and nitrite
- Buena Vista Creek for sediment toxicity and selenium
- Buena Vista Lagoon for indicator bacteria, nutrients, and sedimentation/siltation
- Pacific Ocean Shoreline, Cardiff State Beach at Cardiff Lagoon for total coliform
- Cottonwood Creek for DDT, selenium, and sediment toxicity
- Encinitas Creek for selenium and toxicity
- Escondido Creek for *Enterococcus*, fecal coliform, DDT, manganese, nitrogen, phosphate, selenium, sulfates, toxicity, and TDS
- Lake San Marcos for ammonia as nitrogen and nutrients
- Loma Alta Creek for selenium and toxicity
- Pacific Ocean Shoreline, Loma Alta Creek mouth for indicator bacteria
- Loma Alta Slough for eutrophication and indicator bacteria
- Pacific Ocean Shoreline, Moonlight State Beach at Cottonwood Creek outlet for total coliform
- San Elijo Lagoon eutrophication, indicator bacteria, and sedimentation/siltation
- San Marcos Creek for DDE (dichlorodiphenyldichloroethylene, a byproduct of DDT), phosphorous, selenium, and sediment toxicity
- Pacific Ocean Shoreline, San Mateo Creek outlet for total coliform

The Basin Plan established specific water quality objectives for the Carlsbad Watershed, as well as beneficial uses for individual water bodies. Due to water quality impairments listed above, several water bodies within the watershed are also experiencing impairments to beneficial uses. Specifically, three of the four coastal lagoons within the watershed (Agua Hedionda, Buena Vista, and San Elijo) are impaired due to excessive bacteria and sediment loading from upstream sources (PCW, N.D.). A Water Quality Improvement Plan was developed for the entire Carlsbad Watershed in accordance with the 2013 MS4 Permit, which addresses some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits.

In 1997 and 1998, the Carlsbad Watershed Network (CWN) was formed to protect, restore, and enhance water quality, habitat, and natural resources in the Carlsbad Watershed. The CWN is comprised of eleven member organizations that have developed a variety of projects or programs to support the goals of the CWN and benefit the Carlsbad Watershed (CWN, 2004). One of these projects is the Agua Hedionda Watershed Management Plan, developed by the City of Vista, which is a geographically focused plan to manage a smaller area within the watershed (City of Carlsbad et al., 2013). The Agua Hedionda Watershed Management Plan contains a series of recommendations to protect the watershed and improve water quality, such as stream restoration to manage sediment (City of Vista). For the Carlsbad Watershed, which contains multiple parallel watersheds, this approach taken by the Agua Hedionda Watershed Management Plan may be more appropriate than a more general, overarching watershed management plan.

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Several stakeholders in the Carlsbad Watershed have worked together on successful efforts to reduce pollutant loading into Cottonwood Creek, which drains into Moonlight Beach in Encinitas (Rasmus and Weldon 2003). These efforts have resulted in implementation of upstream best management practices and development of plans to implement an urban runoff treatment facility to further reduce pollutant loading to the beach (Rasmus and Weldon 2003). Efforts associated with Cottonwood Creek and Moonlight Beach have resulted in improved beach water quality ratings for Moonlight Beach; the beach received poor water quality ratings by environmental groups in 2000 (Rasmus and Weldon 2003), but a revised 2012 scoring by the Natural Resources Defense Council showed that the beach received 4 out of 5 stars for water quality (NRDC 2012).

The SNMP currently under development for the Escondido Valley groundwater basin will identify sources of salts and nutrients in the basin, set goals and objectives for the basin, determine if any reduction in loading is necessary, and identify potential ways to achieve load reduction. See Chapter 7, Regional Coordination for more information.

Various Total Maximum Daily Loads (TMDLs) are being developed for the Carlsbad Watershed to improve the water quality of Section 303(d) listed water bodies. TMDLs that are under investigative order or will be completed at a later date include Loma Alta and San Marcos. Loma Alta slough has been identified with bacteria and eutrophication pollutant/stressor (City of Carlsbad, 2011).

Stormwater and Flood Management

Major drainages within the watershed include Agua Hedionda Creek, Buena Vista Creek, Escondido Creek, and San Marcos Creek, which encompass drainage areas of 23.8, 20.8, 77.7, and 28.1 square miles, respectively. The peak discharges during a 100-year event for the above creeks are 9,850, 8,500, 22,000, and 15,700, respectively. Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 5,000 acres, and includes the following: agriculture, 354 acres; commercial and services, 1,345 acres; industrial, 271 acres; open space and recreation, 2,474 acres; residential, 1,721; and transportation, communications, and utilities, 1,082 acres (see Appendix 7-B, Integrated Flood Management Planning Study).

Stormwater and flood management within the Carlsbad Watershed is complex due to multiple jurisdictional agencies involved in these activities, as well as urbanization, which presents unique stormwater and flood management issues. Several jurisdictions within the Carlsbad Watershed work together to jointly implement the Carlsbad WQIP, which identifies and prioritizes water quality problems within the Carlsbad Watershed that can be potentially, attributed to discharges from municipal storm drain systems (City of Carlsbad et al., 2018).

Flood control within the Carlsbad Watershed often includes channelizing major surface water bodies to prevent private property flood damage. Major flood control projects were generally constructed from 1950-1980, including channelization of Escondido Creek, channelization of Reidy Creek (connected to Escondido Creek), and channelization of Buena Vista Creek. In addition, detention basins have been constructed within portions of the Buena Vista Creek to address 100-year flood flows. Despite channelization efforts, flooding continues to be a major concern for jurisdictions such as the City of Oceanside (Loma Alta Creek), the City of San Marcos (San Marcos Creek), and the City of Escondido (Escondido Creek) (CWN, 2002).

Natural Resources

Urbanization and development within the Carlsbad Watershed have led to habitat degradation and loss, as well as the introduction of invasive species within the watershed. Remaining native habitats within the watershed primarily include upland vegetation consisting of coastal sage scrub, chaparral scrub, and small areas of oak woodlands. In addition, the watershed contains native grasslands, riparian forests/woodlands, riparian scrubs, marsh/wetlands, and open water areas (CWN, 2002).

All four of the coastal lagoons located in the watershed (Agua Hedionda, Batiquitos, Buena Vista, and San Elijo) are important natural resources located within the Carlsbad Watershed. Agua Hedionda Lagoon is characterized as a salt water marsh; however, it is not extensive due to increased urbanization in the region. Most of the salt marsh vegetation can be found in the upper reaches of the lagoon. The lagoon was also recently identified as a critical habitat for the Tidewater Goby (*Eucyclogobius newberryi*), a federally listed endangered species. Much of Agua Hedionda Lagoon is now used for recreational boating and water sports (CWN, 2002). The western portion of the lagoon is used as a cooling water source for the Encina Power Plant as well as for two aquaculture facilities

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– a white sea bass research facility managed by Hubbs/Seaworld and California Department of Fish and Game and a commercial company cultivating shellfish for a wide-ranging market (City of Carlsbad, N.D. and San Diego Coast Life, N.D.). The power plant cooling intake system will be converted to serve as the intake for the under-construction Carlsbad Desalination Plant (planned for completion in 2016), when the Encina Power Plant is eventually retired (Carlsbad Desalination, N.D.). Batiquitos Lagoon, which is 600 acres in size, is considered one of the most important estuarine systems along the Southern California coast (CWN, 2002). The lagoon is owned by the California Department of Fish and Wildlife (formerly California Department of Fish and Game), and is maintained by the department as an Ecological Reserve (CWN, 2002). Buena Vista Lagoon is one of the largest areas of freshwater marsh habitat in San Diego County. In 1940, a weir was constructed at the mouth of Buena Vista Lagoon eliminating all tidal flow and converting it into a freshwater lake. Sedimentation is one of the most significant issues at Buena Vista Lagoon. This is due to the effects of urbanization, stream channel modification, and lack of tidal flushing of the lagoon system. Sedimentation poses a long-term threat to the freshwater marsh and open water mosaic that currently exists at the lagoon. If sedimentation in the lower portions of the watershed and lagoon are not slowed, Buena Vista Lagoon will be in danger of becoming a large freshwater marsh with no open water mosaic. Increased management of the lagoon is necessary to reduce many of the sedimentation issues. Efforts such as opening the mouth of the Buena Vista Lagoon to increase tidal exchange are currently underway (CWN, 2002). San Elijo Lagoon is the southernmost lagoon in the Carlsbad Watershed, and is noted for being surrounded by steep coastal bluffs that cause sediment issues in the lagoon due to erosion (CWN, 2002). The lagoon also contains the most extensive stands of freshwater marsh vegetation in the watershed (CWN, 2002). Similar to the Buena Vista Lagoon, the San Elijo Lagoon experiences excessive sedimentation associated with erosion; sedimentation and sand deposition require regular dredging of the lagoon to maintain its connectivity with the ocean (CWN, 2002). The Carlsbad Watershed contains numerous protected and special-status species and vegetation communities, and is partially included in the North County Subarea of San Diego County's Multiple Species Conservation Program (MSCP) (CWN 2002). Several of the city jurisdictions, including the City of Carlsbad, City of Encinitas, City of Oceanside, and the City of Escondido have individual habitat management or conservation plans such as Multiple Habitat Conservation Plans (MHCPs) that provide habitat management within the watershed. Special status plant and animal species in the watershed include six estuarine species, eight riparian species, and ten upland species. The Carlsbad Watershed also contains invasive exotic species that may cause water-related issues. Such species include *Arundo donax,* a species of eucalyptus (*Eucalyptus globulus*), Castor Bean (*Ricinus communis*), Pampas Grass (*Cortaderia selloana*), and Tamarisk (*Tamarix* spp.). Although the Agua Hedionda Creek previously experienced issues related to the invasive green algae *Caulerpa taxifolia,* this species was eradicated by the Southern California Caulerpa Action Team (part of the California Regional Water Quality Control Board, San Diego Region SDRWQCB) (CWN, 2002). Tribal nations in the Region have indicated concern that jurisdictional habitat conservation efforts such as those described above may not consider current or future tribal developments, and tend to categorize tribal lands as open space during habitat and conservation planning efforts.
Potential Climate Change Impacts Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the Carlsbad Watershed include but are not limited to: • Decrease in imported water supply • Decrease in groundwater supply • Decrease in surface water availability • Water quality concerns related to several factors • Sea level rise • Increased severity of storms (flooding)

Carlsbad Watershed
• Exacerbation of wildfires Due to the reliance on imported water supplies within the Carlsbad Watershed, decreases in imported water supply availability could have potentially large impacts within the watershed. However, the Water Authority's Emergency Storage Project will help to alleviate such impacts by facilitating water transport to the Carlsbad Watershed from other watersheds and water sources within the Region. Other water-supply related issues could occur due to the reduction of existing (albeit limited) groundwater and surface water sources. Water quality concerns are already substantial within many water bodies in the Carlsbad Watershed. Climate change-related impacts could potentially exacerbate existing water quality issues due to increased pollutant concentrations (caused by reduced surface water flows and increased flood events) or increases in sedimentation (caused by increased wildfire occurrences and increased flood events). As such, increased wildfire occurrences and increased flood events due to climate change could potentially cause water quality-related issues in the Carlsbad Watershed. Due to the Carlsbad Watershed's location along the coast, sea level rise could potentially impact this watershed and its coastal ecosystems and habitats (lagoons) or coastal municipalities and associated land uses.
Management Issues and Conflicts The Carlsbad Watershed has particular water quality-related issues that are generally associated with urban development. Although other issues may exist within the watershed, the WURMP lists sedimentation, nutrient loading, and bacteria and pathogens as the primary management issues within the Carlsbad Watershed (City of Carlsbad et al, 2012). Due to urban development, many of the surface water bodies that drain into the watershed's lakes and lagoons have been channelized or otherwise modified. Sedimentation has been linked to bacteria loading, as sediments may provide a breeding location for bacteria. Bacteria-related issues have led to temporary closures of recreational areas as well as impacts to natural resources. Outside of specific sedimentation-related issues, the Carlsbad Watershed is also impacted by general water quality issues associated with bacteria and eutrophication. Agricultural runoff and construction-related runoff have been identified as major contributors to water quality impairments, and have therefore been targeted to address water quality issues. Although to a lesser degree, urban non-stormwater related runoff from pet wastes (bacteria) and excessive fertilizer usage (nutrients) have also been identified as contributors to water quality issues within the Carlsbad Watershed (CWN, 2002). Potential Impacts to the watershed's water bodies and lagoons due to urbanization and highway development could pose future management issues (i.e. increased sedimentation, and water quality issues). Urbanization may also increase the amount of invasive species in the watershed, which can jeopardize native species and habitats (CWN, 2002). As described above, Poseidon is in the process of developing an alternative local water supply source via the construction of a reverse-osmosis seawater desalination facility in the Carlsbad Watershed. Construction is underway on the desalination plant and associated pipeline. There have been concerns raised regarding the intake of 300 MGD of water from the Agua Hedionda Lagoon and its impact on fisheries and local habitats. (San Diego Coastkeeper, N.D.). Environmental permits that have been issued for the project include provisions to address the potential impacts. The intake for the Carlsbad Desalination Plant is located in the western reach of the Agua Hedionda Lagoon. The Water Authority is working on permitting required to modify the intake. Erosion is a concern along coastal bluffs along various cities in the Carlsbad Watershed, and has the potential to impact the watershed's lagoon systems. Upstream development and urbanization along the coast has resulted in a loss of sediment and sand supply, narrowing beaches and exposing the public to potential bluff collapses. Ideas that have been considered to stabilize shorelines have included beach nourishment, shoreline armoring, and improved sediment management strategies (City of Encinitas, 2012).

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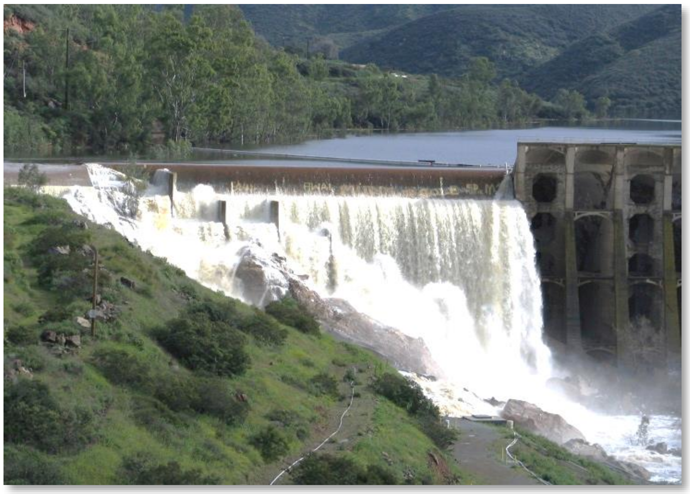
5.5 San Dieguito Watershed

The San Dieguito Watershed (San Dieguito Hydrologic Unit or San Dieguito HU (905)) covers 346 square miles. Eighty percent of the watershed is in the unincorporated portion of San Diego County. Figure 5-6 is a map that shows the principal watershed features and boundaries.

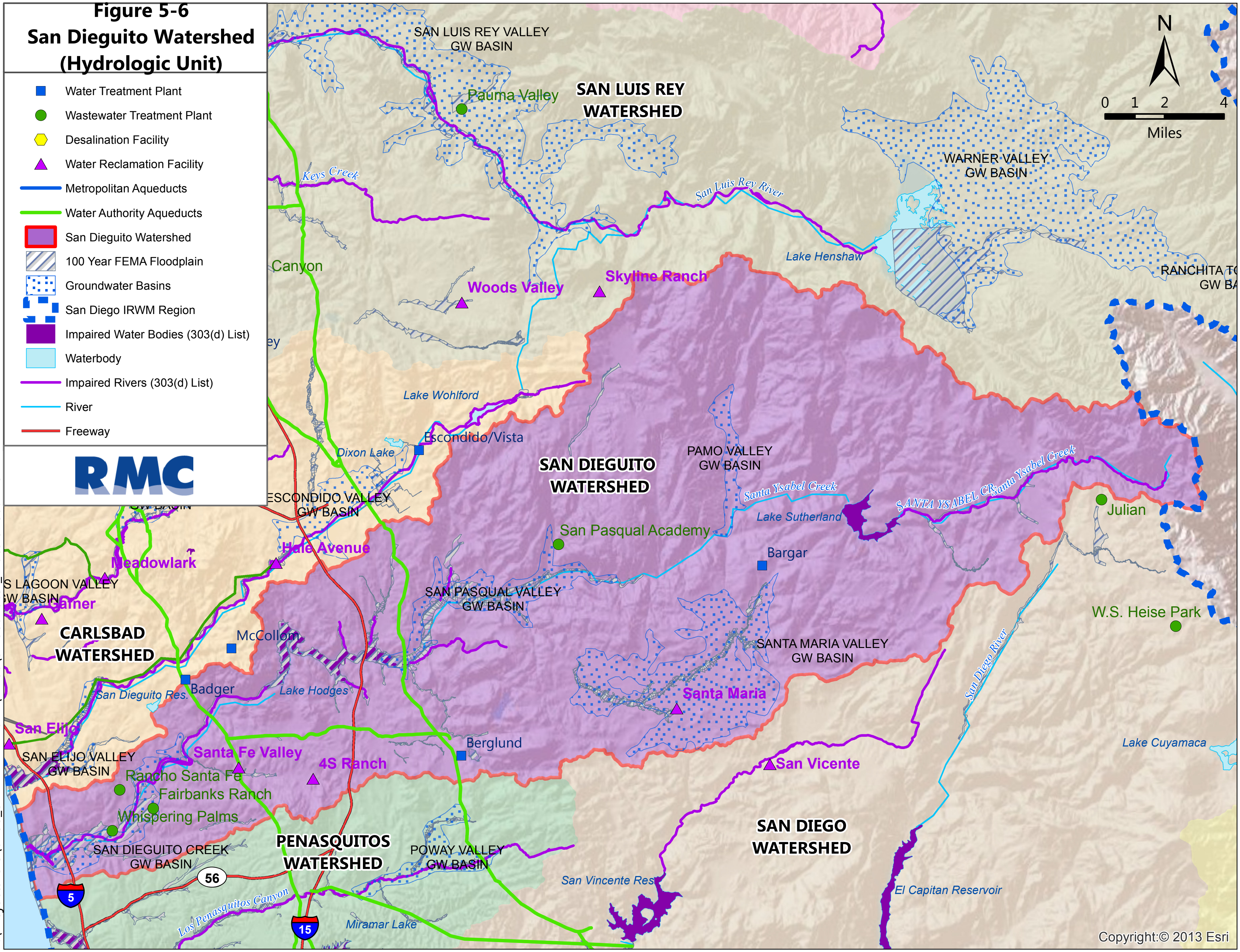
The watershed includes two major surface water reservoirs: Sutherland Reservoir and Hodges Reservoir. The City of San Diego owns a significant portion of the land in the immediate river valley between these two reservoirs and leases much of the land for agriculture. Lake Poway and Lake Ramona are two smaller water supply reservoirs in the watershed.

There are four distinct groundwater basins located in the San Dieguito Watershed: Pamo Valley, San Dieguito Valley, San Pasqual Valley and Santa Maria Valley. The majority of the San Pasqual Valley groundwater basin (in the middle watershed) is owned by the City of San Diego. While public water supply is not currently developed from the San Pasqual basin, the basin represents a potential source of local water supply. The San Dieguito Valley, San Pasqual Valley, and Santa Maria Valley basins all have high TDS levels, while the Santa Maria Basin also has high nutrients and selenium levels. According to DWR Bulletin 118, the Pamo Valley groundwater basin is suitable for domestic and irrigation uses, and does not have high TDS levels (DWR 2004).



The Lake Hodges (Hodges Reservoir) Water Quality and Quagga Mitigation Measures Project – funded by Proposition 84-Round 1 – will evaluate options to improve water quality and the ecosystem in Hodges Reservoir to maximize use of the reservoir.

Photo credit: Toby Roy, San Diego County Water Authority



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San Dieguito Watershed

Hydrology

The San Dieguito Watershed is comprised of five Hydrologic Areas (HAs): Solana Beach (905.1), Hodges (905.2), San Pasqual (905.3), Santa Maria Valley (905.4), and Santa Ysabel (905.5). The major surface water bodies within the San Dieguito Watershed are the San Dieguito Lagoon, San Dieguito River, Hodges Reservoir, Santa Ysabel Creek, Santa Maria Creek, Sutherland Reservoir (also referred to as Lake Sutherland), Lake Poway, and Lake Ramona (City of Del Mar et al, 2008).

The San Dieguito River is the primary drainage in the watershed, with headwaters originating in the Witch Creek Basin. Drainage from the Witch Creek and the Sutherland Basins flows into the Sutherland Reservoir, a man-made reservoir that was created in 1954 with construction of the Sutherland Dam. From Sutherland Reservoir, the main drainage, Santa Ysabel Creek, continues westward to the San Pasqual Valley where it becomes San Dieguito River. San Dieguito River then flows into Hodges Reservoir, a water supply reservoir and recreation site located just west of Interstate 15. There are multiple tributaries that join the San Dieguito River below Hodges Reservoir, which all ultimately flow into the Pacific Ocean via the San Dieguito Lagoon (City of Del Mar et al, 2008).

Hydrology within the San Dieguito Watershed is diverse, as the watershed extends from the Pacific Ocean in the west to mountain areas in eastern San Diego County. As such, rainfall varies in the watershed from 10.5 inches along the coast to 31.5 inches in the inland mountain areas (City of Del Mar et al, 2008).

Water Systems

Water supply infrastructure within the San Dieguito Watershed is dominated by local reservoirs that store imported water and surface water runoff for multiple jurisdictions. There are four water supply reservoirs within the San Dieguito Watershed, which contain either imported water or surface water runoff, or a combination of both sources. Each reservoir is summarized below (City of Del Mar et al, 2008):

- Sutherland Reservoir: owned by the City of San Diego, contains natural runoff.
- Lake Ramona: owned by the Ramona Municipal Water District, stores imported water from the Water Authority's First Aqueduct.
- Lake Poway: owned by the City of Poway, stores imported water from the Water Authority's First Aqueduct.
- Hodges Reservoir: owned by the City of San Diego, stores imported water from the Water Authority's First Aqueduct and natural runoff.

Water supply agencies within the San Dieguito Watershed include the Santa Fe Irrigation District, San Dieguito Water District, Olivenhain Municipal Water District, City of San Diego, Rincon del Diablo Municipal Water District, City of Poway, and Ramona Municipal Water District. All of the aforementioned water supply agencies are member agencies of the San Diego County Water Authority, and therefore receive imported water from the Water Authority via the First and Second Aqueducts. Two potable water treatment facilities are located in the San Dieguito Watershed: Bargar, which can treat up to 4 MGD potable water and Berglund, which can produce up to 24 MGD. The Bargar filtration plant is not currently in operation.

Groundwater basins underlying the San Dieguito Watershed include the following four basins as defined according to DWR Bulletin 118:

- San Pasqual Valley: Recharge in the San Pasqual Valley Basin occurs from infiltration of precipitation and percolation of excess irrigation waters. In normal years all surface runoff within the San Pasqual Valley becomes groundwater recharge (DWR (j), 2004).
- Santa Maria Valley: Santa Maria Valley Basin recharge occurs from infiltration of precipitation. In addition, because a large portion of the population within this area is not connected to municipal sewer systems, some recharge likely comes from septic systems (DWR (k), 2004).

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- San Dieguito Valley: Recharge within the San Dieguito Valley Basin comes from many sources, including recharge by percolation of flows in the San Dieguito River, precipitation to the valley floor, underflow beneath Hodges Reservoir, and underflow through other nearby sediments (DWR (l), 2004).
- Pamo Valley: The Pamo Valley Basin has recharge from percolation of ephemeral stream flow in Temescal and Santa Ysabel Creeks (DWR (m), 2004).

A preliminary Salt and Nutrient Management Plan (SNMP) is being developed by the City of San Diego Public Utilities Department for the high priority (Tier A) San Pasqual groundwater basin. The draft SNMP has been completed and characterizes the basin, identifies sources of salts and nutrients, and calls for increased monitoring of well and surface waters and agricultural runoff. The Santa Maria groundwater basin is a medium priority (Tier B) basin, but no progress has yet been made on SNMP development. It is anticipated that a SNMP will be developed in the future (Regional Board, 2013). More information can be found in *Chapter 7, Regional Coordination*. The San Dieguito Valley groundwater basin is a low priority (Tier D-2) basin, and is not anticipated to require a SNMP. Although the Pamo Valley Basin is recognized in this Plan, it is not a designated groundwater basin in the Salinity/Nutrient Management Planning guidance document (Water Authority, 2010).

The San Dieguito Watershed also has facilities that are part of the County Water Authority's Emergency Storage Project. The Hodges Reservoir Projects of the Emergency Storage Project connects Hodges Reservoir to Olivenhain Reservoir (located in the Carlsbad Watershed) through pipelines and pump stations, which provides multiple benefits. First, this connection allows the City to access runoff captured in Hodges Reservoir that the City did not previously have access to. This is in addition to the historical use by Santa Fe Irrigation District and San Dieguito Water District. Second, this connection allows for water conveyance between Olivenhain Reservoir and Hodges Reservoir, which will keep Hodges Reservoir at a more constant level during dry seasons, allowing for more water to be captured during rainy seasons, and reducing spills over Hodges Reservoir (City of San Diego, 2011). Lastly, the Hodges Reservoir Project will make water in Hodges Reservoir potentially available to the Region if needed, because the Olivenhain Reservoir is connected to the Water Authority's Second Aqueduct (San Diego County Water Authority, 2011).

Internal Boundaries and Land Uses

The San Dieguito Watershed resides entirely within San Diego County, and contains multiple land use and water-related agencies. The San Dieguito Watershed includes portions of the cities of Del Mar, Escondido, Poway, San Diego, and Solana Beach, as well as unincorporated County areas. The majority of land within the San Dieguito Watershed (80%) is within the County's jurisdiction. There are seven water-related agencies in the San Dieguito Watershed, which are listed in the section above regarding water systems.

The San Dieguito Watershed also contains lands that are owned and managed by the San Dieguito River Valley Regional Open Space Park Joint Powers Authority (San Dieguito River Park), an agency that was formed in 1989 by the County of San Diego and cities of Del Mar, City of Escondido, City of Poway, City of San Diego, and City of Solana Beach. The San Dieguito River Park's mission is to preserve and restore land within the San Dieguito River Park, a 55-mile long area that extends from the Volcan Mountains in the east to the ocean at Del Mar, focusing on the San Dieguito River corridor and including both Lake Sutherland and Hodges Reservoir (San Dieguito River Park JPA 2002).

Land use within the San Dieguito Watershed is classified primarily as vacant and undeveloped land (39%), and other major land uses are open space/parks and recreation (22%), residential and spaced rural residential (18%), and agriculture (14%) (Copermittees, 2012). Transportation, commercial, industrial, public facility, under construction, and water land use classifications combined comprise the remaining 7% of the watershed (San Diego Association of Governments (SANDAG), 2009). Undeveloped and open space areas reside largely within the eastern portion of the watershed; the developed portion of the western watershed is generally typical of urbanized coastal areas in Southern California (City of Del Mar et al, 2008). The San Dieguito Watershed also contains a variety of land uses that support recreational activities, including Lake Poway, Sutherland Reservoir, and Hodges Reservoir, which support fishing and boating. In addition, there are

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many hiking trails within the San Dieguito Watershed, including a vision to develop the "Coast to Crest Trail" (City of San Diego, 2006).

Residential development is expected to increase, along with an equitable loss in undeveloped and agricultural lands, in the San Dieguito Watershed. The 2030 SANDAG Land Use Plan projects almost a 300% increase in residential developed land, while the County of San Diego General Plan 2020 forecasts less residential development (City of San Diego, 2011). A comparison of the 2003 SANDAG and 2030 SANDAG Land Use Plans indicates the largest increase in residential developed land will occur in the middle portion of the watershed (50%) (City of San Diego, 2011).

Tribal lands make up approximately 5% of the San Dieguito Watershed. The watershed contains two tribal nations: the Santa Ysabel Reservation and the Mesa Grande Reservation (City of San Diego, 2011). The Santa Ysabel reservation was founded in 1893 and consists of 15,270 acres. The Mesa Grande Reservation was founded in 1875 and consists of 1,820 acres (University of San Diego, N.D. and Pritzker, 2000).

Water Quality and Water Quality Impairments

Several water bodies within the San Dieguito Watershed are listed on the Clean Water Act 303(d) list of impaired water bodies. Impaired water bodies include (PCW, N.D.):

- Pacific Shoreline, San Dieguito Lagoon Mouth for total coliform
- San Dieguito River (19 Miles) for *Enterococcus*, fecal coliform, nitrogen, phosphorus, TDS, toxicity
- Cloverdale Creek for phosphorus and TDS
- Felicita Creek for aluminum and TDS
- Green Valley Creek for chloride, manganese, PCP (pentachlorophenol), and sulfates
- Hodges Reservoir for color, manganese, nitrogen, pH, phosphorous, mercury, and turbidity
- Kit Carson Creek for PCP and TDS
- Sutherland Reservoir for color, manganese, iron, nitrogen, and pH
- Santa Ysabel (above Southerland Reservoir) for toxicity

Runoff from residential, commercial, industrial, and transportation land uses generally contribute higher pollutant loading within the San Dieguito Watershed. Pollutants of concern and stressors within the watershed include nutrients, pathogens, salinity, pesticides, metals/metalloids, toxicity, and other organic and inorganic compounds (Copermittees, 2012).

The sources of these impacts are agriculture, dairies, urban runoff/storm sewers, flow regulation/modification, natural sources, and unknown point and non-point sources (SDRWQCB, 2010). Runoff from open space has the ability to contribute sediment to the watershed, and agricultural uses may impart nutrients and pesticides (City of Del Mar, et al 2008). Further, increased development and agricultural and turf related activities have been identified as the main threats to water quality in the San Dieguito Watershed (City of San Diego, 2006).

There is also a superfund site in the watershed at the Chatham Brothers Barrel Yard in western Escondido. The toxic plume from this site is moving towards Felicita Creek, with low levels of contamination found in the creek at Felicita Park. Cleanup of the site continues, though levels in the creek are considered to be below that which would harm human health (DTSC, 2017).

Water quality threats from agricultural runoff are of particular concern related to the San Pasqual groundwater basin, which is being considered for development as a drinking water supply. Because of this, the City of San Diego is developing a preliminary SNMP, as described in *Chapter 7, Regional Coordination*.

The City of San Diego has begun work on developing the 2015 Water Quality Improvement Plan for the San Dieguito Watershed through invitations to stakeholders to attend workshops, join the consultation committee, comment on deliverables when they become available, and provide data for use in the plan. The Watershed Urban Runoff Management Program (WURMP) Annual Report described18 water quality activities that were implemented in 2011-2012, such as the drop-off clean-up event held by the City of San Diego where 112,000

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pounds of junk, appliances, mattresses, tires, and other large waste items were collected, and 44,000 pounds recycled (City of Del Mar et al., 2013).

The Basin Plan (SDRWQCB, 2007) establishes specific water quality objectives for all hydrologic areas included within the San Dieguito Watershed. For the five specific HAs included within the San Dieguito Watershed, there are specific water quality objectives established for TDS, nutrients, iron, chlorides, and color. A summary of the TMDLs are provided in *Chapter 3, Region Description*.

Stormwater and Flood Management

Major drainages within the watershed include Hatfield Creek, San Dieguito River, Santa Maria Creek, and Santa Ysabel Creek, which encompass drainage areas of approximately 20.8, 60, and 290 square miles (no information available for San Dieguito River), respectively. The peak discharges during a 100-year event for the above rivers are 13,700, 41,800, 19,000, and 62,000 CFS. Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 9,800 acres, and includes the following: agriculture, 2,352 acres; commercial and services, 953 acres; industrial, 44 acres; open space and recreation, 4,326 acres; residential, 853; and transportation, communications, and utilities, 344 acres (see Appendix 7-B, Integrated Flood Management Planning).

Stormwater and flood management within the San Dieguito Watershed are the responsibility of all of the municipal jurisdictions within the watershed, including the City of San Diego, the City of Poway, the City of Del Mar, Solana Beach, and the City of Escondido, as well as the County of San Diego. The majority of the watershed lies in unincorporated San Diego County, and fall under the jurisdiction of the County, though the cities of San Diego, Solana Beach, Del Mar, Escondido, and Poway are also responsible for implementing provisions included in the San Dieguito Watershed Urban Runoff Management Program. This program focuses on management activities that can be taken to reduce stormwater runoff and associated water quality concerns (City of Del Mar et al, 2008).

The County of San Diego conducts flood management efforts throughout its jurisdiction, including within the San Dieguito Watershed, to reduce and address flood flows associated with FEMA-designated flood areas (County of San Diego, 2007). According to the County of San Diego, localized flooding occurs in several reaches of the San Dieguito River, including:

- San Dieguito River downstream from Hodges Reservoir to Del Mar
- Santa Maria Creek in Ramona (along Rangeland Road)
- Hatfield Creek in Ramona (along Magnolia Avenue)

Despite two surface water reservoirs along the San Dieguito River, flood control issues remain a key concern in the watershed. Hodges Reservoir spilled 13 times during the period 1955-2005, representing a once-in-four-years period of recurrence. In addition to flooding in the lower San Dieguito basin associated with the Hodges Reservoir spills, local flood threats to developed areas exist within the Escondido and Ramona portions of the watershed. The ESP (described above in Water Systems) that connects Hodges Reservoir to the Olivenhain Reservoir is anticipated to reduce spills from occurring at Hodges Reservoir (City of San Diego, 2011).

Natural Resources

Due to relatively undeveloped nature of the San Dieguito Watershed, the watershed contains a diverse array of habitats that range from Volcan Mountain in the east to the San Dieguito Lagoon and Pacific Ocean in the west. There are several natural areas within the watershed, including the 55-mile long, 80,000 acre San Dieguito River Park, the 150 acre San Dieguito Lagoon, and natural areas associated with the watershed's surface water reservoirs (Project Clean Water, N.D.). Currently, the San Dieguito Lagoon Restoration project is restoring 116 acres of coastal tidal wetland to restore aquatic functions of the lagoon through a permanent inlet and expansion of the tidal basin, as well as create sub-tidal and intertidal habitats (San Dieguito River Park, N.D.).

Plant communities within the San Dieguito Watershed include chaparral (27%), coastal sage scrub (10%), oak woodlands (12%), and grasslands (11%) (City of San Diego 2006). Wetland areas including riparian habitats,

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marsh, meadows and seeps, and open water constitute approximately 2.5% of the watershed (City of San Diego, 2006). The San Dieguito Watershed contains numerous protected and special-status species and vegetation communities, and is partially included in the North County Subarea of San Diego County's Multiple Species Conservation Program (MSCP) (City of San Diego 2006). Special status species, including species considered to be of special importance in California, identified in the San Dieguito Watershed include: San Diego horned lizard, orange-throated whiptail, common loon, brown pelican, white-faced ibis, osprey, northern harrier, sharp-shinned hawk, Western snowy plover, long-billed curlew, California gull, elegant tern, California least tern, black skimmer, tricolor blackbird, Belding's Savannah sparrow, and California gnatcatcher (City of Del Mar et al, 2008). Invasive and non-native plants and animals may impact the lower, middle, and upper segments of the San Dieguito Watershed. Such invasive species include but are not limited to bullfrogs, crayfish, sunfish, and bass (City of San Diego, 2006). Tribal nations in the Region have indicated concern that jurisdictional habitat conservation efforts such as those described above may not consider current or future tribal developments, and tend to categorize tribal lands as open space for habitat and conservation planning purposes.
Potential Climate Change Impacts Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the San Dieguito Watershed include but are not limited to: • Decrease in imported water supply • Decrease in groundwater supply • Decrease in surface water availability • Impacts to water quality • Sea level rise • Decrease in availability of necessary habitat • Increased flooding • Exacerbation of wildfires Due to the reliance on imported water supplies within the San Dieguito Watershed, decreases in imported water supply availability could have potentially large impacts within the watershed. However, the ESP will help to alleviate such impacts by facilitating water transport to the San Dieguito River Watershed from other watersheds and water sources within the Region. Flooding within the San Dieguito Watershed could be exacerbated due to climate change if the frequency and intensity of storms overwhelm the ability of local reservoirs to capture runoff. Historically there have been spills over Hodges Reservoir due to excessive runoff, and although this issue will be alleviated due to the ESP, it is possible that flood impacts could increase due to climate change. Further, due to the San Dieguito Watershed's proximity to the coast, sea level rise has the potential to impact several municipalities and resources within the watershed. Lastly, wildfires are an identified issue within the San Dieguito Watershed, and several recent wildfires have occurred within the watershed (RWMG, 2009). If the frequency of wildfires increases due to climate change, local water quality and habitat within the watershed could be adversely impacted.
Management Issues and Conflicts Due to the diverse nature of the San Dieguito Watershed, management issues and conflicts are also diverse. Stakeholders within the San Dieguito Watershed have identified a number of major issues and concerns,

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including physical and hydrologic modifications, water quality, invasive species, and flooding associated with local surface waters (City of San Diego, 2006). The San Dieguito River Park's Concept Plan notes that one of the common planning themes among groups associated with the San Dieguito River Park is to preserve and enhance the rich resources and qualities that make the San Dieguito River Park Focused Planning Area (FPA) unique. One of the purposes of creating the FPA boundary is to identify areas where improper development could significantly impact the existing character of the river valley (San Dieguito River Park JPA, 2002). These statements indicate that one of the key management issues within the San Dieguito Watershed is how to reconcile potentially conflicting land uses and ensure that development does not negatively impact the river. Fires are a threat to the biological resources in the San Dieguito Watershed because they are a source of surface water contamination and habitat disturbances. In 2003, fires burned approximately 13% of the San Dieguito Watershed impacting the native vegetated communities. Post-fire concerns in the watershed include loss of habitat, increased erosion/sedimentation, and the establishment of non-native plant species (City of San Diego, 2006). Over-grazing has also been a concern in the San Dieguito Watershed. Over-grazing has reduced tree regeneration, reduced vegetative cover, caused streambank destabilization, water quality degradation, and spread non-native weeds. With proper management and timed grazing, exotic species can be reduced in the Watershed (City of San Diego, 2006). Stormwater runoff containing pesticides, herbicides, fertilizers, and sediment have been an issue in the San Dieguito Watershed (City of del Mar et al 2008). High nutrient levels in runoff have been impacting surface water quality of several water bodies in the watershed, including Hodges Reservoir (City of del Mar et al 2008). Impacts to Hodges Reservoir from urban and agricultural runoff as well as permitted upstream wastewater discharges and rural development have resulted in poor quality water requiring downstream water agencies to incur additional treatment costs. The agencies involved in managing Hodges Reservoir are committed to finding cost-effective and science-based solutions to addressing water quality concerns for the reservoir. A Water Quality Improvement Plan will be developed for the entire San Dieguito Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into water bodies such as Hodges Reservoir and determine actions that can be taken to improve water quality. In addition, several IRWM-funded projects have been directed toward watershed-based solutions and in-reservoir remedies for water quality concerns in Hodges Reservoir. Efforts associated with the 2013 MS4 Permit and the IRWM-funded projects will be coordinated to ensure that the efforts are integrated to achieve maximum benefits.

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5.6 Peñasquitos Watershed

The Peñasquitos Watershed (Peñasquitos Hydrologic Unit or Peñasquitos HU (906)) is a 162 square mile watershed that is comprised of five Hydrologic Areas (HAs): Miramar Reservoir (906.1), Poway (906.2), Scripps (906.3), Miramar (906.4), and Tecolote (906.5). The 2013 NPDES permit (Regional Board) divides this watershed into two Watershed Management Areas (WMAs). The northern Peñasquitos WMA (Miramar Reservoir and Poway) drains to the Peñasquitos Lagoon and ultimately to the Pacific Ocean, while the southern Mission Bay WMA (Scripps, Miramar, and Tecolote) drains to Mission Bay. A map of the major features of the watershed is presented in Figure 5-7.

The Peñasquitos WMA has a drainage area of 94 square miles. There are several water features in the WMA including Carmel Canyon Creek, Los Peñasquitos Creek and Carroll Canyon Creek. It also contains one water storage facility, Lake Miramar, located in the Poway HA. The WMA has a population of 258,331 people. The Peñasquitos Watershed encompasses portions of three cities (San Diego, Poway and Del Mar) and the County of San Diego. The Peñasquitos Watershed has a total population of 490,433 people (2010 Census).

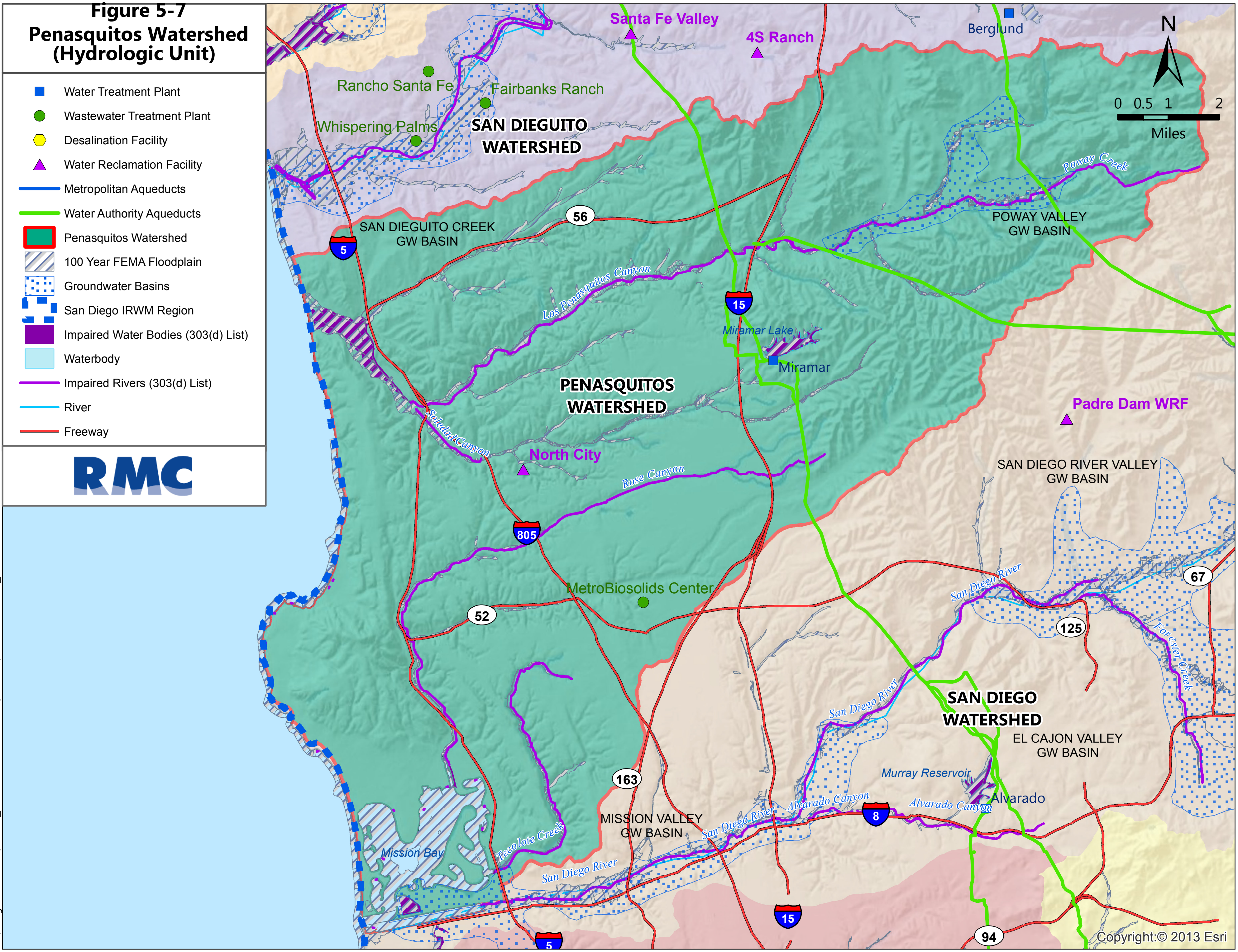
The Mission Bay WMA has a drainage area of 68 square miles. There are several water features in the WMA including Rose Creek and Tecolote Creek. The Scripps HA is included in the Mission Bay WMA although it technically drains to both WMAs and to the Pacific Ocean as well. The WMA has a population of 232,102 people, and is entirely within the jurisdiction of the City of San Diego.

Two small groundwater basins exist within the Peñasquitos Watershed. Except for a small amount of local runoff that enters Miramar Reservoir (a small reservoir used to store imported supply), no water supply is developed within the Peñasquitos Watershed.

The Sustainable Landscapes Program – funded by Proposition 84-Round 1 – aims to increase water efficiency in urban landscapes and improve water quality by reducing runoff associated with excessive irrigation.

Photo credit: Kyrsten Burr-Rosenthal, City of San Diego

Figure 5-7 Penasquitos Watershed (Hydrologic Unit)



Peñasquitos Watershed

Hydrology

The Peñasquitos Watershed is comprised of five HAs: Miramar Reservoir (906.1), Poway (906.2), Scripps (906.3), Miramar (906.4), and Tecolote (906.5). Within the Peñasquitos Watershed are two WMAs: Los Peñasquitos Creek/Lagoon and Mission Bay. Both drain highly urbanized areas with a combined drainage area of 162 square miles. The major water bodies (receiving waters) within the Peñasquitos Watershed are Carmel Valley Creek, Los Peñasquitos Creek, Carroll Canyon Creek, Los Peñasquitos Lagoon, Rose Creek, Tecolote Creek, Mission Bay, and Miramar Reservoir, and the Pacific Ocean (PCW (a), N.D.).

Los Peñasquitos Lagoon receives fresh water flows from the Los Peñasquitos Canyon, and during periods of high rainfall from the Carmel Valley and the Sorrento Valley (Torrey Pines State Natural Reserve (a), 2010). Mission Bay receives fresh water flows from Rose Creek and Tecolote Creek (PCW (b), N.D.).

The watershed discharges into two Areas of Special Biological Significance (ASBS): (1) La Jolla Ecological Reserve (ASBS # 29); and (2) San Diego-Scripps (ASBS #31) (SWRCB (a), 2006). The La Jolla Ecological Reserve ASBS is approximately 1.7 miles of shoreline adjacent to the City of San Diego and contains 453 acres of marine habitat, including the La Jolla State Marine Conservation Area (SWRCB (a), 2006). Just north of the La Jolla Ecological Reserve is the San Diego-Scripps ASBS. This ASBS consists of 0.6 miles of shoreline in the City of San Diego and includes the San Diego-Scripps State Marine Conservation Area (SWRCB (b), 2006).

The two WMAs drain from as far east as the Iron Mountain to Los Peñasquitos Lagoon and into the Pacific Ocean (PCW (a), N.D. and County of San Diego (d), 2008). Due to increasing impervious surface cover, stream channelization, and flows from excess irrigation, the Los Peñasquitos Creek now carries surface water year-round (AMEC, 2005). Due to these excess runoff flows, Carmel Creek and Carroll Creek have changed from seasonal to perennial flow creeks (AMEC, 2005).

Annual precipitation in the Mission Bay WMA within the Peñasquitos Watershed ranges from 10.5 inches near the coast to 13.5 inches in the eastern portion of the watershed (Copermittees 2012).

Water Systems

Imported water is purchased from the San Diego County Water Authority and stored in local reservoirs (CSD (b), 2012). The Peñasquitos Watershed has one drinking water reservoir:

- Miramar Reservoir: in the Scripps Ranch community, 18 miles north of downtown San Diego. Capacity of 2,341 MG (5,700 AF) (2010 Watershed Sanitary Survey, City of San Diego Sanitary Survey). Stores imported water and is self-contained receiving little runoff from the watershed (AMEC, 2005).

Adjacent to the reservoir is the Miramar Water Treatment Plant (MWTP) operated by the City of San Diego. The MWTP produces 140 million gallons of drinking water a day, but has a 215 MGD total capacity (CSD (c), 2010).

The Los Peñasquitos Watershed Management Plan (AMEC, 2005), identifies two small groundwater basins in the watershed: Los Peñasquitos Canyon and Poway Valley. The Poway Valley Groundwater Basin (9-13) has two water bearing formations: the Alluvium and Residuum, and the Poway Group (DWR (a), 2004)). Recharge in the basin is mainly from direct precipitation on the valley flow and infiltration along Poway Creek, which flows into the basin from the east. Other sources of recharge include septic tank effluent and irrigation waters. It is estimated the Poway Valley Groundwater Basin contains 23,000 acre feet (AF) and is mainly used for agriculture and domestic uses (AMEC, 2005). The Poway Valley basin is a medium priority (Tier B) basin for a Salt and Nutrient Management Plan (SNMP); however no SNMP has yet been developed for the basin. It is anticipated that progress towards an SNMP will occur in the future (Regional Board, 2013). For more information on SNMPs and basin prioritization, see *Chapter 7, Regional Coordination*.

Most of the wastewater in the Peñasquitos Watershed is treated at Point Loma Wastewater Treatment Plant (Pt. Loma WWTP) operated by the City of San Diego. Pt. Loma WWTP is located on the bluffs of Point Loma and treats approximately 175 MGD (CSD (a), 2012). Wastewater is also treated at the North City Water Reclamation Plant (NCWRP), operated by the City of San Diego. The NCWRP is located within Peñasquitos Watershed and can treat up to 30 MGD. Reclaimed water produced by NCWRP is distributed to Mira Mesa, Miramar Ranch North, Scripps Ranch, Torrey Pines, Santaluz, Black Mountain Ranch, and the City of Poway (CSD (d), 2012).

Peñasquitos Watershed

Internal Boundaries and Land Uses

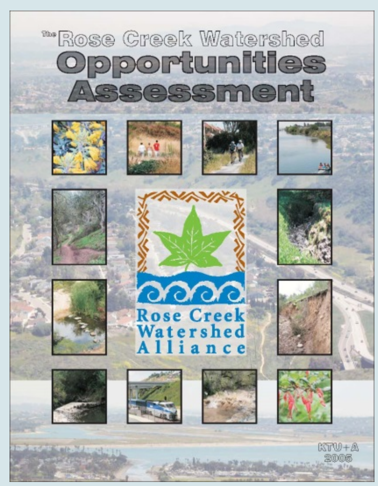
The Peñasquitos Watershed encompasses an area of 94 square miles and covers 60,418 acres (PCW (a), N.D. and County of San Diego (d), 2008). The Peñasquitos Watershed is bordered by the San Dieguito Watershed on the north, San Diego Watershed to the east and south, and the Pacific Ocean to the west. This watershed is centrally located within San Diego County and represents about 4% of the County's land area, making it one of the County's smallest watersheds (KTU+A, 2005).

The Peñasquitos Watershed is mostly within the City of San Diego jurisdiction, with the small remaining areas in the County of San Diego and the cities of Poway and Del Mar (Los Peñasquitos Watershed Copermittees, 2012). Municipal water supply, wastewater collection, and storm drainage are provided to residents by the cities of San Diego, Poway, and Del Mar.

Land use within the Los Peñasquitos Creek WMA is classified as follows: open space/parks and recreation (31%), residential and spaced rural residential (27%), vacant and undeveloped land (12%), transportation (13%), and industrial (7%). Other agriculture, commercial, commercial recreation, military, public facility, under construction, and water uses comprise 3% or less of the total land use (San Diego Association of Governments (SANDAG), 2009).

Land use within the Mission Bay WMA is classified as follows: open space / parks and recreation (26%), residential (26%), and transportation (16%). Other land use classifications include vacant and undeveloped land (6%), water (5%), public facility (5%), military (5%), industrial (4%), commercial (4%), and commercial recreation (3%) (Copermittees, 2012). Less than 1% of the land use acreage is made up by agriculture and under construction uses (SANDAG, 2009). There are no tribal lands located within the Peñasquitos Watershed.

The Rose Creek Watershed is a subset of the Peñasquitos Watershed that includes ten community planning areas, including portions of Scripps Ranch, La Jolla, Mira Mesa, Kearny Mesa, Pacific Beach, Claremont Mesa, and University City. The Rose Creek Watershed Alliance was formed by San Diego Earthworks, and includes members from a variety of business, community, and environmental organizations. The Rose Creek Watershed Alliance has created a vision for the watershed, and working with the California Coastal Conservancy, the County of San Diego, the City of San Diego, and San Diego Earthworks, developed a Rose Creek Watershed Opportunities Assessment. The Rose Creek Watershed Opportunities Assessment is a comprehensive analysis of the needs of the watershed, and provides recommended management solutions to address the issues and achieve the Rose Creek Watershed Vision. The Opportunities Assessment presents a positive example of partnership integration that involves multiple stakeholders from different sectors working together to create a balanced solution to a complex watershed-based issue.



Water Quality and Water Quality Impairments

Eleven water bodies within the Peñasquitos Watershed are listed on the 303(d) list of impaired waters (Los Peñasquitos Watershed Copermittees, 2012 and CSD (e), 2011):

- Los Peñasquitos Creek for *Enterococcus*, fecal coliform, selenium, TDS, nitrogen, and toxicity
- Los Peñasquitos Lagoon for sedimentation/siltation
- Miramar Reservoir for nitrogen
- Mission Bay shoreline for *Enterococcus*, fecal coliform, and total coliform

Peñasquitos Watershed

- Mission Bay mouth of Tecolote Creek for eutrophication and lead
- Mission Bay mouth of Rose Creek for eutrophication and lead
- Pacific Ocean Shoreline (Los Penasquitos River mouth, Scripps hydrologic area at Children's Pool, La Jolla Shores Beach, La Jolla Cove, Pacific Peach, and Ravina for total coliform, *Enterococcus*, or fecal coliform
- Poway Creek for selenium and toxicity
- Rose Creek for selenium, and toxicity
- Soledad Canyon for sediment toxicity and seleniumTecolote Creek for cadmium, copper, indicator bacteria, lead, nitrogen, phosphorus, selenium, toxicity, turbidity, and zinc

Pollutants of concern and stressors impairing water quality within the watershed include eutrophic conditions, nutrients, pathogens, salinity, metals/metalloids, sedimentation/siltation, and toxicity (Copermittees, 2012). The sources of these pollutants in the Peñasquitos WMA are largely unknown point and nonpoint sources, along with urban runoff and storm sewers (SDRWQCB, 2010). Potential sources of these constituents in the Mission Bay WMA may include urban runoff/storm sewers, concentrated animal feeding operations, highway/road/bridge runoff, landfills, nurseries, natural sources, and unknown point and nonpoint sources (SDRWQCB, 2010).T The major impacts from these pollutants/stressors consist of surface water quality degradation, beach closures, sedimentation, eutrophication, and habitat degradation (PCW(a), N.D.). Several of the sources/activities responsible for listed water quality issues consist of urban runoff, sewage spills, dredging, and landfill leachate.

Water quality in the Mission Bay WMA has been impacted through urban runoff diversions, irrigation return flows, cleaning practices, and waste disposal (City of San Diego, 2012). As the receiving water body, Mission Bay and ultimately the Pacific Ocean are also impacted by these water quality issues.

The key pollution threats to La Jolla Ecological Reserve ASBS and San Diego-Scripps ASBS are from urban and stormwater runoff from development, roadways, and parking lots. There are 184 direct discharges of urban runoff into La Jolla Ecological Reserve ASBS. Nine are naturally occurring streams or gullies with the majority of discharges coming from pipes or holes through seawalls, draining bluffs, and landscaped areas. There are 92 direct discharges into San Diego-Scripps ASBS with most discharges coming from pipes and or holes through seawalls, draining bluffs and urban landscaped areas (SWRCB (b), 2006).

There are efforts by groups in the watershed to protect and improve water quality, such as the Rose Canyon Watershed Alliance, which focuses on protecting Rose Creek and its watershed (*see call-out box*). Furthermore, a Water Quality Improvement Plan will be developed for the entire Peñasquitos Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits.

Specific water quality objectives have been established in the Basin Plan for the Peñasquitos Watershed (SDRWQCB, 2007). The inland surface water quality objectives established are for TDS, chlorides, sulfates, sodium, nitrates, nitrogen phosphorous ratios, iron, manganese, methylene blue-activated substances (MBAS), boron, odor, turbidity, color units and fluoride. Ground water quality objectives were only established for the following HAs: Miramar Reservoir, Poway, and Miramar. The groundwater water quality objectives established consists of TDS, nutrients, and turbidity. Several TMDLs have also been developed within the watershed. In 2006, a TMDL for sedimentation/siltation at Los Peñasquitos Lagoon was adopted. Since then, monitoring has been conducted in support of the TMDL in the lagoon as well as the watersheds that drain to the lagoon. An amendment for this TMDL was adopted in 2012 and set a numeric target for sediment loading of 12,360 tons of sediment per wet period or 58.6 tons per day, requiring a 67% sediment load reduction from the watershed. An additional Beaches and Creeks TMDL for indicator bacteria adopted in 2010 and included the Pacific Ocean Shoreline at Torrey Pines State Beach, the Pacific Ocean Shoreline in the Scripps HA, and Tecolote Creek (Copermittees 2012). A summary of TMDLs are provided in *Chapter 3, Region Description*.

Peñasquitos Watershed

Stormwater and Flood Management

Major drainages within the watershed include Carmel Valley Creek, Los Peñasquitos Creek, Poway Creek, Rose Canyon Creek, San Clemente Canyon Creek, Soledad Canyon, and Tecolote Creek, which encompass drainage areas of approximately 15.7, 101, 31.2, 37, 18.4, 95.5, and 9.29 square miles, respectively. The peak discharges during a 100-year event for Carmel Valley Creek, Poway Creek, Rose Canyon Creek, San Clemente Canyon Creek, Soledad Canyon, and Tecolote Creek are 9,800, 14,000, 12,000, 6,900, 23,000, and 4,900 CFS, respectively. The peak discharges during a 100-year event for Los Peñasquitos Creek at two locations are 16,800 and 15,400 CFS. Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 7,300 acres, and includes the following: agriculture, 38 acres; commercial and services, 461 acres; industrial, 356 acres; open space and recreation, 2,953 acres; residential, 637; and transportation, communications, and utilities, 2,309 acres (see Appendix 7-B, Integrated Flood Management Planning).

Stormwater runoff has been a significant source of pollution in local water bodies as a result of urban runoff from rain or excessive irrigation. Storm drains in the Peñasquitos Watershed convey urban runoff and rainwater from streets, driveways, parking lots, and other impervious surfaces ending up directly in the creeks and eventually into the Pacific Ocean (Los Peñasquitos Watershed Copermittees, 2012).

Significant changes in the natural hydrology and geomorphology in the watershed have led to sedimentation issues. Sources of sediment include erosion of canyon banks, exposed soils, bluffs, scouring of stream banks, and tidal influx which have been exacerbated by land development in the watershed. Sedimentation issues in the watershed have affected the Los Peñasquitos Lagoon and Mission Bay. During rain events, impervious surfaces increase the volume and velocity of runoff resulting in scouring of sediment. This sediment is then transported downstream and deposited on the salt flats, lagoon channels, creek beds, and into Mission Bay. For the Los Peñasquitos Lagoon, sediment loading has affected the lagoon functions and salt marsh characteristics (SDRWQCB, 2012). Sediment loading has also created a flooding vulnerability to the surrounding urban and industrial developments.

Stormwater and flood management within the Peñasquitos Watershed falls under the jurisdictions of the City of Poway, the City of San Diego, the City of Del Mar, and the County of San Diego. The three cities and the County share responsibility for implementation of the stormwater programs and flood management identified in the Peñasquitos Watershed Urban Runoff Management Plan.

All of the stormwater copermittees within Peñasquitos Watershed have Jurisdictional Urban Runoff Management Plans (JURMPs) which are used to show compliance with the jurisdictional component of the NPDES Permit. Additionally, Watershed Urban Runoff Management Plans (WURMP) have been written for the Peñasquitos Watershed (one for each WMA) to outline projects and activities that are planned to protect the watershed from storm water pollution (CSD (e), 2012). For example, the City of San Diego has implemented various outdoor water conservation programs. One of these programs is the outdoor water conservation rebate program which provides commercial and residential customers with rebates to promote outdoor water conservation. This program conserves potable water while helping reduce pollutant-laden dry weather urban runoff flows from entering the local water bodies. In FY2011, it's estimated the program help increase water savings by 4,355 gallons per day and it is estimated the program will continue to grow in FY2012 as multiple applications were in process at the end of FY2011 (CSD (f), N.D.). The 2013 MS4 Permit has divided the Peñasquitos Watershed into two distinct watershed management areas (WMA); Peñasquitos and Mission Bay. The Mission Bay WMA includes the La Jolla Ecological Reserve Area of Special Biological Significance (ASBS) and San Diego-Scripps ASBS.

Natural Resources

The Peñasquitos Watershed contains areas of diverse and undeveloped habitat. These habitats consist of maritime succulent and coastal sage scrubs, coastal salt and brackish water marshes, southern maritime, southern mixed and chemise chaparrals, oak woodlands and oak riparian forests, riparian scrubs and woodlands, marshes and wet meadows, grasslands, and vernal pools. A large block of these habitats provides significant habitat connections between open space, coastal, and inland areas (AMEC, 2005).

The Peñasquitos Watershed is home to over 180 sensitive plant and animal species, many of which are listed as state and federally endangered (County of San Diego (d), 2008). Several of these sensitive species include the Salt

Peñasquitos Watershed
marsh daisy, Quino checkerspot butterfly, American peregrine falcon, California gnatcatcher, California least tern, Cooper's hawk, Orange-throated whiptail, Western spadefoot toad, and the San Diego back-tailed jackrabbit. The Peñasquitos Watershed is also home to several invasive vegetation species such as pampas grass, giant reed, salt cedar, and Germany ivy (County of San Diego (d), 2008). The watershed is also home to two ASBS (1) La Jolla Ecological Reserve (ASBS # 29); and (2) San Diego-Scripps (ASBS #31) (SWRC (d)). These ASBS support an unusual variety of aquatic life and are considered the building blocks for a sustainable, resilient coastal environment and economy (SWRCB (c), 2012). Therefore these ocean areas are highly monitored and protected for water quality by the State Water Resources Control Board.
Potential Climate Change Impacts Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the Peñasquitos Watershed include but are not limited to: • Decrease in imported water supply • Decrease in groundwater supply • Decrease in surface water availability • Impacts to water quality • Sea level rise • Decrease in availability of necessary habitat • Increased flooding • Exacerbation of wildfires Due to the reliance on imported water supplies within the Peñasquitos Watershed, decreases in imported water supply availability could have substantially large impacts within the watershed. Flooding within the Peñasquitos Watershed could be exacerbated due to climate change if the frequency and intensity of storms overwhelm the ability of local creek channels to contain runoff. In contrast, climate change also has the potential to create changes in precipitation which can decrease seasonal stream flows. Decreased seasonal stream flows will create stream flows with irrigation/dry weather flows, thus increasing the concentration of constituents and requiring stream flows to receive a greater level of treatment. Further, due to the Peñasquitos Watershed's proximity to the coast, sea level rise has the potential to impact several municipalities and resources within the watershed. The Peñasquitos Watershed has a widespread beach community and sea level rise has the potential to damage coastal infrastructure, recreation, and negatively impact tourism. Lastly, if the frequency of wildfires increases due to climate change, local water quality and habitat within the watershed could be adversely impacted.
Management Issues and Conflicts Most management issues within the Peñasquitos Watershed revolve around urbanization. In the last 50 to 80 years rapid urbanization has affected the natural drainage and hydrologic characteristics of the watershed (AMEC, 2005). These changes have led to increased pollutants loads within the watershed, increased erosion, and subsequent downstream sedimentation. Sedimentation has been an issue in the lower portions of the watershed including Los Peñasquitos Lagoon. In the Los Peñasquitos WMA increased sediment management is needed to minimize sediment loads and aid in meeting the Los Peñasquitos Lagoon water quality objective for sediment. The buildup of sediments in the Los Peñasquitos Lagoon has and is altering the natural exchange of freshwater and seawater leading to destructive changes of the sensitive salt marsh habitat (Torrey Pines State Natural Reserve (a), 2010). Additionally, addressing the effects of past wildfires can also aid in addressing sediment loads in the watershed. During rain events, the frequency of flash floods has increased after wildfires exacerbating the sediment load issue in the downstream

Peñasquitos Watershed
portion of the watershed. A stormwater management plan must be implemented to address the effects of past wildfire events such as sedimentation and associated flood risks. Mission Bay Park is one of San Diego's principal tourism and leisure destinations. However, Mission Bay has had a series of issues with, water quality, and loss of marsh land which need to be addressed to ensure Mission Bay's diversity, quality of recreation, and continued protection and enhancement of the Bay environment (CSD (g), 1994). Sediments enter Mission Bay from various sources, including Rose Creek, which impact water quality. The Kendall-Frost Marsh is located on the northern side of Mission Bay and receives flows containing urban runoff, pollutants, and sediments (Rose Creek Watershed Alliance (a), 2013). Rose Creek flows, among other urban development pressures, have contributed to the loss of marsh land at Mission Bay Park including at Kendall-Frost Marsh (Rose Creek Watershed Alliance (a)). To help expand and create marsh land, stakeholders in the watershed have expressed an interest in converting camp lands at Mission Bay Park to marsh land. The landfill site at Mission Bay, which operated as a municipal landfill from 1952 to 1959, was primarily a site for municipal refuse but was also used for industrial waste some of which is now regulated as hazardous waste. The discovery of detectable concentrations from contaminants of potential concern has led to concerns on the impacts these would have to groundwater, surface water, soil, and sediments. The landfill site at Mission Bay, which operated as a municipal landfill from 1952 to 1959, was primarily a site for municipal refuse, but records indicate some industrial waste may have been deposited there. Trace contaminants of potential concern have been discovered in groundwater, soils, and sediments. The presence of these trace contaminants has led to concerns regarding their impact to the environment and human health. In September 2006, the City of San Diego conducted a human health and ecological risk assessment of the Mission Bay Landfill. The conclusion from this assessment reported, "the total Hazard Index (HI) for each ecological receptor was less than 1, indicating no significant likelihood of adverse terrestrial ecological effects (SCS Engineers 2006)." The City of San Diego continues to assess and perform semi-annual groundwater and surface water monitoring at the site. Despite the City of San Diego's monitoring efforts, stakeholders in the watershed continue to express concerns regarding toxicity and potential groundwater and soil contamination from the landfill site.

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5.7 San Diego River Watershed

The San Diego River Watershed (San Diego Hydrologic Unit or San Diego HU (907)) covers 440 square miles and supports the largest population among the Region's watersheds. This population (approximately 509,000 people), however, is largely confined to the urbanized downstream portion of the watershed in the cities of San Diego, El Cajon, La Mesa, Poway and Santee. Figure 5-8 is a map showing the watershed boundaries and principal features.

Approximately 60% of the San Diego River Watershed is currently undeveloped, with most of this undeveloped land being in the eastern upstream portion of the watershed in unincorporated County lands. Cleveland National Forest, Mission Trails Regional Park, and the river floodplain near the community of Lakeside within unincorporated San Diego County represent important undeveloped areas that support intact habitat and endangered species.

Water rights have governed resource development in this watershed since the region was part of Mexico in the early 19th century. Additional development of water resources will have to take into account issues pertaining to water rights and requires coordination among watershed stakeholders. The Mission Valley basin and the Santee-El Monte basin are part of the San Diego River system. The San Diego River Watershed features two large water supply reservoirs: San Vicente and El Capitan. El Capitan Reservoir is an important feature in the watershed and in the Region; regionally, the reservoir provides a large amount of locally sourced water (runoff), locally the reservoir has a large impact on the San Diego River Watershed because it creates a distinct break in the San Diego River.

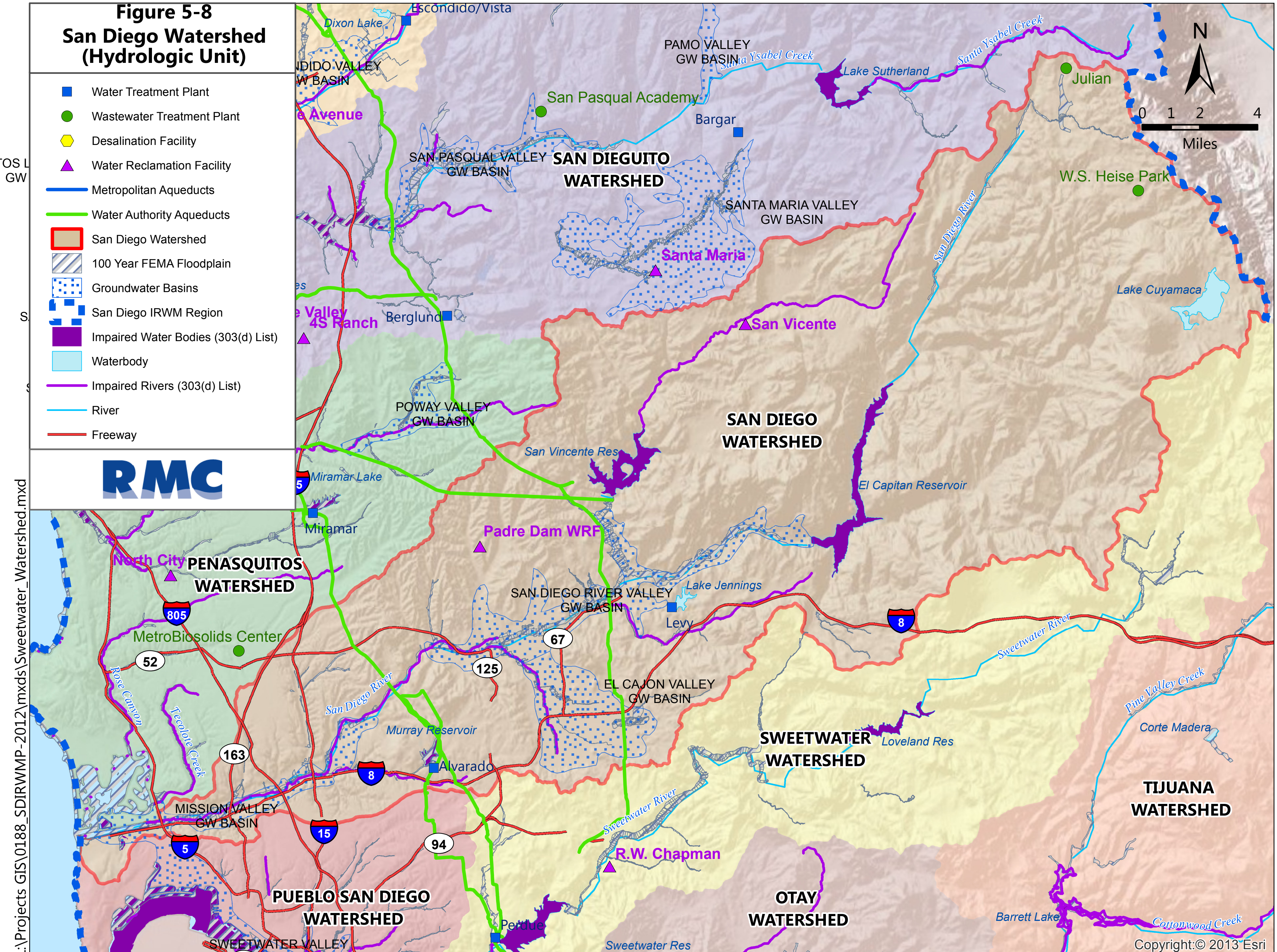
The San Vicente Reservoir is considered to be a key reservoir in the Region because it:

- is a key terminus of the San Diego Aqueduct,
- will be the largest reservoir in the County, totaling 242,000 AF following completion of the ESP,
- can receive diverted supplies from both El Capitan Reservoir and Sutherland Reservoir,
- is connected to one of the Region's largest water filtration plant (the 200 MGD capacity City of San Diego Alvarado Water Treatment Plant), and
- can be used to divert stored supplies to South County water agencies.

Some flood protection within Mission Valley is provided by the First San Diego River Improvement Project (FSDRIP); however, due to the limited nature of the FSDRIP, flooding continues to be an issue in Mission Valley and nearby Grantville. Flooding issues also exist within the middle portions of the watershed (in the communities of Lakeside and Alpine) and in the upper portion of the watershed (in and around the community of Ramona).

Significant groundwater resources exist within the watershed, but groundwater use is limited in downstream portions of the watershed due to high TDS concentrations. Additionally, a petroleum plume underneath Qualcomm Stadium and its parking lot impacts groundwater in Mission Valley.

Figure 5-8
San Diego Watershed (Hydrologic Unit)



San Diego River Watershed

Hydrology

The San Diego River Watershed is comprised of four hydrologic areas (HAs): Lower San Diego (907.1), San Vicente (907.2), El Capitan (907.3), and Boulder Creek (907.4) (PCW (a), N.D.). Major water bodies include the San Diego River, El Capitan Reservoir, San Vicente Reservoir, Lake Murray, Boulder Creek, and Santee Lakes. Surface water in the San Diego River Watershed is primarily governed by precipitation, stream flow, and flow control structures (dams).

The San Diego River flows through the entire San Diego River Watershed originating near the town of Julian and flowing southwest before entering El Capitan Reservoir. Downstream of El Capitan Reservoir, the San Diego River runs westward through the cities of Santee and San Diego, then through to the San Diego River Estuary and finally discharges into the Pacific Ocean (Anchor, 2005). The San Diego River discharges approximately 32,780 AFY of water. Major San Diego River tributaries consist of Boulder Creek, Cedar Creek, Conejos Creek, Chocolate Creek, Los Coches Creek, San Vicente Creek, and Forrester Creek (Anchor, 2005). The Famosa Slough is a tidally influenced area located near the mouth of the San Diego River.

Water Systems

Imported water is purchased from the local wholesaler San Diego County Water Authority. Imported water is brought into the region by massive aqueduct systems from the Colorado River (approximately 240 miles away) and from the State Water Project carrying water from the Sacramento-San Joaquin Bay Delta (approximately 700 miles away) (SWA (a), 2012). The imported water that is applied to the land as irrigation water (for agriculture and domestic irrigation) contributes to the groundwater supply in the form of return flows and may be a resource for agencies that have usable aquifers. The San Diego River Watershed contains five water supply reservoirs:

- El Capitan Reservoir owned by City of San Diego and stores 112,800 AF of primarily local surface water.
- San Vicente Reservoir, owned by the City of San Diego and will store 242,000 AF of both imported and surface water following completion of the ESP
- Cuyamaca Reservoir, owned by Helix Water District and stores 8,200 AF of surface water
- Lake Jennings, owned by Helix Water District and stores 9,800 AF of both imported and surface water
- Lake Murray, owned by the City of San Diego and stores 4,800 AF of both imported and surface water

Most surface runoff from the eastern portion of the watershed is impounded by El Capitan, San Vicente, and Cuyamaca Reservoirs. Most surface water flows from the western portion of the watershed flow into the Pacific Ocean. Surface water flows also enter Lake Jennings and Lake Murray from relatively small drainage areas; however these are mainly supplied with imported water (Anchor, 2005). Adjacent to Lake Murray is the Alvarado Water Treatment Plant which has a capacity to treat up to 120 MGD of drinking water supply (CSD (c), 2012). Adjacent to Lake Jennings is the Helix Water District R.M. Levy Water Filtration Plant which has a capacity to treat up to 106 MGD of drinking water supply. Water stored in Lake Murray and Lake Jennings does not normally flow downstream on the watershed.

The five reservoirs in the San Diego River Watershed supply water to as many as 760,000 residents in the region (PCW (a), N.D.). The El Capitan Dam impounds primarily surface water, while the San Vicente Dam impounds both surface water and imported water. The El Capitan Reservoir has a water storage capacity of 112,800 AF (CSD (a) (b), 2012). The capacity of the El Capitan Reservoir is important, because it allows this reservoir to capture a large amount of local runoff, which is an important source of local water. The reservoir is also an important feature of the San Diego River Watershed, because it essentially creates a break in the San Diego River, separating the lower river from the upper river entirely.

The San Vicente Reservoir is a key reservoir in the region because it:

- is a key terminus of the San Diego Aqueduct,
- will be the largest reservoir in the County following completion of the ESP,
- can receive diverted supplies from both El Capitan Reservoir and Sutherland Reservoir,

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- is connected to the Region's largest water filtration plant (the 120 MGD City of San Diego Alvarado plant), and
- can be used to divert stored supplies to South County water agencies.

Groundwater use in the uppermost portion of the watershed is limited to private wells and small water systems. Recharge is mainly from streamflow infiltration, percolation of precipitation, and applied waters. However, not much characterization of groundwater in the uppermost portion of the watershed has been completed. The lowermost portion of the watershed is characterized by three large groundwater basins: Mission Valley (9-14), San Diego River Valley (9-15), and El Cajon (9-16). The Santee-El Monte Basin is a subset of the San Diego River Valley groundwater basin.

The Mission Valley groundwater basin (9-14) underlies an east-west trending valley which is drained by the San Diego River. The principle water bearing formation is the Quaternary age alluvium with an average well production of 1,000 gpm (DWR (a), 2004)). Recharge in the groundwater basin is primarily from stream flow infiltration from the San Diego River. In an effort to reduce imported water demands, the City of San Diego plans to develop a potable groundwater supply from the Mission Valley groundwater basin. However, due to petroleum contamination in the Mission Valley aquifer, the City of San Diego's ability to implement these plans has stalled. The proposed project (Brackish Groundwater Desalination project) would extract and desalinate native groundwater using reverse osmosis. The approximate sustainable yield and storage capacity of the basin would be 2,000 to 4,000 acre-feet per year (AFY) and 42,000 AF respectively (CSD (d), 2009). The Mission Valley groundwater basin is a low priority (Tier D-1) basin for Salt and Nutrient Management Plans (SNMP), and is not anticipated to require a SNMP in the near future. For more information on SNMPs and basin prioritization, see *Chapter 7, Regional Coordination*.

The San Diego River Valley groundwater basin's (9-15) principle water bearing formation is the Quaternary alluvium. The most productive portions of the groundwater basin have wells that can yield up to 2,000 gpm (DWR (b), 2004). Before the El Capitan and San Vicente Dams were built, the San Diego River and San Vicente Creek used to be the primary recharge sources. Groundwater recharge sources for the San Diego River Valley groundwater basin consist of flows from Forrester Creek and other smaller creeks, precipitation, discharge from municipal wastewater treatment plants, underflow below the dam, and return flow from applied imported water and recycled water. The Santee-El Monte Basin is an unconfined groundwater basin located in the eastern portion of the San Diego River watershed near the cities of Santee, La Mesa, El Cajon, and Lemon Grove. The groundwater basin is comprised of commingling alluvial valleys of the San Diego River, San Vicente Creek, Forrester Creek, Los Coches Creek, and Sycamore Canyon Creek. The alluvial aquifer ranges in thickness up to 230 feet or more and is thickest in the eastern portion of the basin. In Santee, the alluvium thickness ranges from less than 10 feet to approximately 150 feet (USBR, 2012).

Various agencies have evaluated the potential for groundwater recharge with advance treated recycled water, including Helix Water District that previously conducted a study in the upper Santee-El Monte Basin and Padre Dam Municipal Water District that is currently studying the lower Santee-El Monte Basin. Lakeside Water District is the largest municipal pumper of groundwater in the basin and currently uses approximately 700 AFY from the mid-Santee-El Monte Basin. The Lakeside Water District's wells in Lakeside are treated to remove iron and manganese (Lakeside Water District, 2011). Further development of the basin will require addressing water rights issues that may impede beneficial uses. The Santee-El Monte Basin is a high priority for a Salt and Nutrient Management Plan (SNMP). The Padre Dam Municipal Water District is developing an SNMP for the Santee portion of the basin, and to date has collected water quality data, coordinated a project approach with the Regional Board, and met with stakeholders. More information can be found in *Chapter 7, Regional Coordination*.

The El Cajon groundwater basin (9-16) is located in the south central part of San Diego County. The groundwater basin has three water bearing formations: Pleistocene alluvium, Poway conglomerate, and Sandy siltstone. Recharge in the groundwater basin is primarily from precipitation. Other sources of recharge consist of underflow from underlying crystalline rocks, return of applied irrigation water, and percolation of septic tank effluent (DWR (c), 2004). The El Cajon groundwater basin is a low priority (Tier D-2) basin for a SNMP, and is not anticipated to require a SNMP in the near future.

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The Regional Board's Basin Plan includes the San Vicente/Gower groundwater basin as a subbasin the San Diego Watershed. This basin is considered a lower priority SNMP basin. Ramona Municipal Water District is developing an SNMP for this groundwater basin, as described in *Chapter 7, Regional Coordination*. In January 2004, the San Diego City Council authorized a comprehensive evaluation of all viable options to maximize the usage of recycled water (to reduce the City's dependence on imported water) (CSD (g), 2013). The effort resulted in the City recognizing Indirect Potable Reuse/Reservoir Augmentation (IPR/RA) as the preferred alternative. The City is currently pursuing the Water Purification Demonstration Project, which would determine the feasibility of a full-scale reservoir augmentation project (CSD (h), 2013). As part of this Project, the 1 MG of purified water produced by the Advanced Water Purification Facility would be tested; in parallel, a study of the San Vicente Reservoir would test the key functions of reservoir augmentation and to determine the viability of a full-scale project (no purified water has been sent to the reservoir during the demonstration phase). If the Demonstration Project is successful, the City would construct a full-scale advanced water treatment plant that treats recycled water from the NCWRP and conveys the advanced-treated recycled water through a new transmission pipeline to San Vicente Reservoir where it would blend with imported, untreated water and reside for several months prior to being sent to water treatment plants for additional treatment and distribution as potable water (CSD (i), 2013)
Internal Boundaries and Land Uses The San Diego River Watershed encompasses an area of 440 square miles, making it the second largest watershed in San Diego County (PCW (a), N.D.). The watershed contains the highest population of the Region's watersheds at approximately 509,000 (Anchor, 2005). The San Diego River Watershed ranges from sea level at the mouth of the San Diego River to 6,512 ft at the eastern edge of the watershed (Anchor, 2005). The San Diego River Watershed is within the jurisdiction of the cities of San Diego, El Cajon, La Mesa, Poway, and Santee as well as several unincorporated jurisdictions. Water supply agencies within the watershed include: City of San Diego, Helix Water District, Padre Dam Municipal Water District, Lakeside Water District, and Ramona Municipal Water District. Wastewater agencies include: City of San Diego, Padre Dam Municipal Water District, City of La Mesa, and City of El Cajon. The tribal nations of the Barona Band of Mission Indians, the Capitan Grande Group of Mission Indians, and the Inaja-Cosmit Band of Indians are located within the upper San Diego River Watershed. The upper portion of the watershed also contains several small mutual water agencies that provide water services to rural areas. In total, approximately 9% of the San Diego River Watershed contains tribal lands. Within the San Diego River WMA, undeveloped land makes up the primary use (44%). Open space / parks and recreation (23%), residential and spaced rural residential (19%), and transportation (6%) uses are also represented. Agriculture, commercial, commercial recreation, industrial, military, public facility, and water land uses each make up less than 2% of the land use acreage (San Diego Association of Governors (SANDAG), 2009). The majority of undeveloped land is located in the upper and eastern portion of the watershed, while the lower reaches of the San Diego River Watershed are highly urbanized with residential, freeways and roads, and commercial/industrial land uses predominating (Anchor, 2005 and PCW (a), N.D.). The undeveloped lands mainly include Cleveland National Forest and Mission Trails Regional Park.
Water Quality and Water Quality Impairments Ten water bodies within the San Diego Watershed are listed on the Clean Water Act 303(d) list of impaired water bodies: • Alvarado Creek for selenium • El Capitan Lake for color, manganese, pH, phosphorus, and nitrogen • Famosa Slough and Channel for eutrophication • Forester Creek for fecal coliform, pH, selenium, and TDS • Murray Reservoir for nitrogen and pH • Pacific Ocean Shoreline, San Diego River at Dog Beach for and total coliform

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- San Diego River (lower) for *Enterococcus*, fecal coliform, dissolved oxygen (DO), nitrogen, phosphorus, TDS, manganese, and toxicity
- Los Coches Creek for selenium
- San Vicente Creek for ammonia as nitrogen, benthic community effects, nitrogen, and toxicity
- San Vicente Reservoir for chloride, color, sulfates, total nitrogen, and pH.

The pollutants/stressors of concern in the watershed are color, manganese, pH, eutrophication, fecal coliform, DO, phosphorus, TDS, chloride, color, and sulfates. The major impacts from these pollutants/stressors consist of surface water quality degradation, sedimentation, eutrophication, and habitat degradation. However, some of the 303(d) listings may be due to natural lake conditions. Further study is needed to determine if the existing basin plan objectives can be met or if they need to be changed to reflect natural lake conditions. Several of the sources/activities responsible for the listed water quality issues consist of urban runoff, agricultural runoff, mining operations, sewage spills, and sand mining (PCW (a), N.D.). Surface water quality in the undeveloped upper portion is of higher quality than the developed lower portion of the watershed due to human development (Anchor, 2005). In terms of river water quality, the lower San Diego River system has the highest water quality in the winter months with greatest streamflow and lowest water quality during the summer with minimum flows (SDRPF (a), 2011). A Water Quality Improvement Plan will be developed for the entire San Diego River Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits.

Water quality in the lower San Diego River is considered poor by the San Diego River Park Foundation. Low summer and fall river flows in ponded sections, combined with excess nutrients, can accelerate the growth of the aquatic plant water primrose and in other ways decrease DO levels. Trash removal activities by the Foundation are concentrated in areas which receive water from storm drains and which have high concentrations of encampments (SDRPF (b), 2011). Despite the water quality issues in the lower San Diego River, the waters in the upper San Diego Watershed, such as those upstream of El Capitan Reservoir, are considered healthy as indicated by their cold water that is an important habitat for trout and other species. Given the high quality of headwaters in the San Diego River Watershed and their connectivity to regional reservoirs such as El Capitan, development of projects to provide for the continued protection of these waters and their high water quality is of regional importance.

Groundwater quality in the uppermost portion of the watershed is generally of good quality. Only one site near Julian is known to have contaminated groundwater by gasoline from leakage of an underground tank. Groundwater quality in the lowermost region of the watershed varies by groundwater basin. The San Diego River Valley groundwater basin is of bicarbonate character in the east and chloride character in the west (DWR (b), 2004). TDS content in the San Diego River Valley groundwater water basin is high on the western portion of the watershed. The El Cajon groundwater basin is generally of sodium chloride character and is known to have high nitrate, chloride, and TDS content (DWR (c), 2004). The Mission Valley groundwater basin is known to have high magnesium and sulfates for domestic use. Chloride and TDS concentrations are also high for irrigation and domestic use. Seawater intrusion is also a possible impairment. (DWR (a), 2004).

Portions of the Santee-El Monte Basin are contaminated with nitrates, TDS and methyl tertiary butyl ether (MTBE). Lakeside Water District at one time provided treatment for removal of MTBE and blending for nitrate compliance in the groundwater supply, but has not used this supply since 2007 (Lakeside Water District, 2011). The SNMPs under development by Padre Dam MWD and Ramona MWD will identify salt and nutrient sources, loading estimates, and establish goals, objectives, and mitigation measures to protect and improve water quality in the basin (see *Chapter 7, Regional Coordination*).

Since 1986, petroleum products have been discharged from an above storage tank facility resulting in a groundwater contamination plume in the Mission Valley groundwater basin (SDRWQCB, 2012). The groundwater contamination plume extends approximately 2,000 feet to the south and southwest beneath Friars Road and the Qualcomm Stadium parking lot. In 1992, the California Regional Water Quality Control Board-San Diego Region

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(SDRWQCB) issued a clean-up order to the discharger Kinder Morgan Energy Partners, L.P. The City of San Diego intends to develop a potable water supply from the Mission Valley groundwater basin to reduce demands from imported water once clean-up has been completed. Currently the cleanup is focused on two gasoline constituents in groundwater, MTBE, and tertiary butyl alcohol (TBA) and cleanup of contaminated soil (SDRWQCB, 2012). Specific water quality objectives have been established in the Basin Plan for the Lower San Diego, San Vicente, El Capitan, and Boulder Creek HAs (SDRWQCB, 2007). The Inland surface water quality objectives established are for TDS, chlorides, sulfates, nutrients, manganese, turbidity, and color. In 2010, the development of a nutrient TMDL for Famosa Slough was initiated by SDRWQCB Order No R9-2006-0076. Additionally, Forrester Creek and the lower San Diego River were included in the Beaches and Creeks TMDL for indicator bacteria, adopted in 2010 (Copermittees 2012). A summary of TMDLs that have been adopted or are in progress are provided in *Chapter 3, Region Description.*
Stormwater and Flood Management Major drainages within the watershed include Forrester Creek, Murphy Canyon, San Diego River, and San Vicente Creek, which encompass drainage areas of 22.7, 12.1, 710, and 83 square miles, respectively. The peak discharges during a 100-year event for Forrester Creek, Murphy Canyon, and San Vicente Creek are 12,450, 3,500, and 16,000 CFS, respectively. The peak discharges during a 100-year event for San Diego River at two locations are 36,000 and 31,000 CFS. Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 8,300 acres, and includes the following: agriculture, 508 acres; commercial and services, 1,414 acres; industrial, 600 acres; open space and recreation, 2,576 acres; residential 1,577; and transportation, communications, and utilities, 1,272 acres (see Appendix 7-B, Integrated Flood Management Planning). Stormwater and flood management within the San Diego Watershed falls under the jurisdiction of the County of San Diego, and the Cities of San Diego, El Cajon, La Mesa, Poway, and Santee. Each of whom share responsibility for flood control and drainage system facilities as well as maintaining storm drains, channels and debris basins, with the exception of the City of Poway, whose portion of the watershed is protected open space and is not expected to produce urban runoff (City of El Cajon et al., 2008). Stormwater management within the San Diego River Watershed also involves stormwater transfers from other watersheds (namely the Pueblo Watershed) to the San Diego River Watershed. Particularly in the western portion of the watershed near Morena Boulevard (just north of the San Diego River Watershed), stormwater flows are diverted from the Pueblo Watershed to the San Diego River Flood Control Channel, where they are ultimately conveyed to the Pacific Ocean. Flood protection within the Mission Valley area is primarily provided by the San Diego River Flood Control Channel near Mission Bay that was built by the Army Corps of Engineers beginning in 1850. Due to the complexity of flood flows and flood control protection along the San Diego River, it took approximately 100 years of work to configure the flood control channel to its present day configuration. Since the 1940s the San Diego River Flood Control Channel has redirected flows from the San Diego River to the San Diego Bay. In addition, the First San Diego River Improvement Project (FSDRIP) is located in the San Diego River Watershed and provides additional flood control protection. The FSDRIP is a 45-acre flood control and mitigation project along a 7,000 linear flood section of the San Diego River developed by the City of San Diego. The mitigation site was developed as a 100-year flood control project, but due to the limited nature of the FSDRIP (covering only a short portion of the San Diego River), flooding continues to be an issue in Mission Valley and nearby Grantville (CSD (f), 2004). Flooding is a larger issue in the lowermost portion of the watershed due to its highly urbanized landscape. An increase in impervious surfaces has increased urban runoff, pollutant loading, and poor natural pollutant assimilation, which has led to poor water quality. Impervious surfaces have also made stormwater flows larger and more frequent, with high sediment loads degrading the stability of the watershed channels. Further, stakeholders have reported that pollution from trash causes flooding issues as trash may impede natural hydrologic flows. Since the uppermost portion of the watershed is undeveloped, the flood potential is generally considered insignificant. Flood hazards and water quality problems associated to urbanized landscapes are not primary issues of concern in the uppermost portion of the watershed (Anchor, 2004). However, repetitive flood losses have been reported in

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the community of Ramona, which is located in the upper portion of the watershed (County of San Diego 2007). Recent fire events (namely the Cedar Fire of 2003) have resulted in sedimentation; subsequent storms have resulted in sediment-laden runoff flooding numerous homes and causing deposition in and around the community of Ramona (County of San Diego 2007).
Natural Resources The San Diego Watershed supports a diversity of biological resources. The San Diego River supports habitats essential for species dispersal and providing species access to adjacent habitats and resources along the watercourse. Though the riparian vegetation along the River is fragmented, it still provides essential habitat for reproduction, nesting, roosting and foraging (Anchor, 2004). Important undeveloped lands in the San Diego Watershed are the Cleveland National Forest, Mission Trails Regional Park and the river floodplain near Lakeside. These undeveloped lands are home to a variety of habitats and endangered species (PCW (a), N.D.). Since 2002 there has been a formal vision and plan (*San Diego River Park Conceptual Plan*) to establish a connected river park along the length of the San Diego River from El Capitan Reservoir to the Pacific Ocean (San Diego River Park Foundation 2002). The overall goal of this planning effort, which has involved many stakeholders, jurisdictions, and interested parties throughout the Region, is to preserve and celebrate the San Diego River's historic resources, to support the natural stream processes, to preserve and enhance riparian habitat, and to provide recreation access and activities (San Diego River Park Foundation 2002). The easternmost portion of the watershed has notable vegetation communities such as meadows and montane forests of coniferous and Jeffrey pine trees which are rare and localized vegetation in the watershed (Anchor, 2004). These are communities are home to species such as the Mountain Lion, Long-legged Myotis, Fringed Myotis as well as threatened and endangered species such as the Red-legged frog (which is believed no longer survives in the upper most portion of the watershed), Beldings Savannah Sparrow, Southwestern Willow Flycatcher, California Gnatcatcher, and Bald Eagle (Anchor, 2004). The eastern portion of the watershed also contains wild rainbow trout, which is an important species due to its status as a sensitive species; this species is also considered an indicator species, indicating that water bodies in the eastern watershed contain healthy cold water habitat. The central portion of the watershed is dominated by chaparral and sage scrub with a few isolated patches of Oak woodlands and extensive areas of rock outcrops. Important species that occur in this portion of the watershed include the Western Spadefoot Toad, San Diego Banded Gecko, San Diego Ringneck, Prairie Falcon, Ferragunous Hawk, Golden Eagle, Northwestern San Diego Pocket Mouse, Stephen's Kangaroo Rat, Ringtail and Mountain Lion (Anchor, 2004). The lower portion of the watershed is limited to native and semi-native habitats as it consists of mostly developed lands. The most extensive vegetation type in this portion of the watershed consists of coastal sage scrub. Patches of disturbed wetland, native riparian forest and scrub can also be found in the lower watershed. Also of importance is the Famosa Slough, a 37-acre wetland located near the mouth of the San Diego River, which is home to productive wetland habitats and contains detention basins and other features that help with stormwater and flood control. The slough is flushed with salt water from the river channel and collects rainwater from the surrounding urbanized area (Friends of Famosa Slough (a), 2012). The San Diego River Estuary, also located within the lower portion of the watershed is over 300 acres in size and provides important estuarine habitat in the watershed. Species unique to this portion of the watershed include Western Snowy Plover, California Least Tern, Light-footed Clapper Rail, California Brown Pelican, Silvery Legless lizard, two-striped Garter Snake (Anchor, 2004). Threatened and endangered species within the San Diego Watershed include San Diego ambrosia, San Diego thorn-mint, San Diego button celery, arroyo toad, southwestern willow flycatcher, least bell's vireo, Encinitas baccharis, California gnatcatcher, bald eagle, San Diego fairy shrimp, quino checkerspot butterfly, California brown pelican, peregrine falcon, western snowy plover, California least tern, Belding's savannah sparrow, and the light-footed clapper rail. The San Diego watershed also supports non-native fishes such as green sunfish, largemouth bass, black bullhead and mosquito fish. The San Diego Estuary supports native fish species such as the killifish

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and striped mullet (Anchor, 2005). Despite its importance, the San Diego Estuary is highly susceptible to flooding; the estuary was severely impacted by storm events that took place in 2005 and caused over $120 million of damage in the Mission Valley area (County of San Diego 2007).

Invasive species, particularly *Arundo donax* are considered an issue throughout the watershed, and can cause threats to native species and may also exacerbate flood-related issues.

Tribal nations in the Region have indicated concern that jurisdictional habitat conservation efforts such as those described above may not consider current or future tribal developments, and tend to categorize tribal lands as open space for habitat and conservation planning purposes.

Potential Climate Change Impacts

Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the San Diego Watershed include but are not limited to:

- Decrease in imported water supply
- Decrease in groundwater supply
- Decrease in surface water availability
- Impacts to water quality
- Sea level rise
- Decrease in availability of necessary habitat
- Increased flooding
- Exacerbation of wildfires

Due to the reliance on imported water supplies within the San Diego Watershed, decreases in imported water supply availability could have substantially large impacts within the watershed. Flooding within the San Diego Watershed could be exacerbated due to climate change if the frequency and intensity of storms overwhelm the ability of local reservoirs to capture runoff.

Further, due to the San Diego Watershed's proximity to the coast, sea level rise has the potential to impact several municipalities and resources within the watershed. Wildfires in the San Diego Watershed are a common occurrence, particularly in the undeveloped regions of the watershed such as in Cleveland National Forest. If the frequency of wildfires increases due to climate change, local water quality and habitat within the watershed could be adversely impacted. Rain events after wildfires are also known to create flash floods in the San Diego Watershed. Increased frequency of wildfires will increase the frequency of flash floods which current stormwater infrastructure in the San Diego Watershed may not have the capacity to withstand.

Post-fire rain events in the watershed cause erosion, mudslides, and sedimentation which create negative water quality issues. Stormwater runoff from post-fire rain events in the watershed have shown to carry high levels of turbidity, nutrients, and TDS. An increased wildfire season can increase erosion and sedimentation process in the watershed, negatively impacting water quality in streams and local reservoirs. The potential effects on El Capitan, San Vicente, Cuyamaca reservoirs include increased sedimentation with loss of storage, temporary increase in turbidity, and increased water treatment needs and costs.

Climate change also has the potential to add stress on ecological systems in the San Diego Watershed. The rapid rate of climate change can pose a problem to many of the watersheds sensitive species, such as endangered and threatened species, that will be unable to adapt fast enough to habitat shifts and increasing temperatures. Species that are unable to adapt fast enough can face potential extinction. Additionally, changes in climate can make conditions much more favorable for invasive species in the watershed reducing available habitat space for native species.

Management Issues and Conflicts

Major issues in the San Diego Watershed consist of urbanization and its effects on water quality, hydromodification, loss of habitat, and the presence of non-native species. Increased urban development has increased the impervious surface area in the watershed leading to increased urban runoff impacting surface water quality. Urbanization has and will likely continue to affect the watershed hydrology and sediment transport patterns without proper management. Also at risk are the loss of native habitat in the watershed due to increased development and the presence of non-native invasive species (Anchor, 2005). Ongoing efforts in the watershed such as efforts to establish a river park from the El Capitan Reservoir to the Pacific Ocean along the length of the San Diego River can potentially reduce urbanization and its impacts on the watershed. Conservation efforts such as the San Diego River Park present additional issues associated with private land ownership in the watershed; conservation efforts are therefore complex due to multiple conflicting interests within the watershed.

Invasive non-native plant species has been a significant problem of concern in the San Diego Watershed for many years. Many of the invasive non-native plants contribute to flooding, are a fire risk, and degrade native habitats (San Diego River Conservancy (a), N.D.). Therefore, projects and programs have been created by various private, non-profit, and government agencies to remove invasive non-natives throughout the watershed and along the San Diego River (San Diego River Conservancy (a), N.D.).

The City of San Diego Public Utilities Department and Helix Water District are required to conduct a watershed sanitary surveys for their surface water sources within the watershed to identify actual or potential sources of contamination and any other watershed related factors that are capable of producing adverse effects on the quality of water used for domestic water supply (CSD (j), 2011). Within the San Diego Watershed, the City of San Diego and Helix Water District monitor local water supply reservoirs consistent with the requirements of the Safe Drinking Water Act. Though no significant major water quality issues were detected water quality monitoring will continue and expand to include long-term watershed monitoring for water quality, land use, and land conditions. Centralizing and strengthening relationships among all agencies and jurisdictions within the watershed will be essential to establishing successful inter-jurisdictional coordination for drinking water quality monitoring.

The need to reduce imported water demands in the San Diego Watershed has led water managers to consider using previously unused local groundwater supplies. However, the Mission Valley groundwater basin has a documented contamination plume (see discussion in Water Quality above) and most of the San Diego coastal plain is underlain with brackish (2,000 parts per million dissolved solids) groundwater as coastal aquifers are subject to recurring intrusion of saline water from the Pacific Ocean. The challenge for water managers in the San Diego Watershed will consist of capturing fresh groundwater flowing towards the ocean and extracting brackish groundwater for treatment using reverse osmosis (USGS (a), N.D.). This will require further characterization of the coastal plains geologic, hydrologic, and geochemical systems as well as monitoring of seawater intrusion, land deformation, and effects on the coastal riparian system.

Padre Dam Municipal Water District is interested in using the lower Santee-El Monte Basin for groundwater recharge with advanced treated recycled water. Padre Dam Municipal Water District also has interest in recovering return flows from application of imported water and recycled water by its customers. The City of San Diego also maintains an interest in the basin due to their Pueblo rights in the San Diego River and associated groundwater basins. These agencies will need to coordinate to ensure full use of the groundwater basin, while at the same time balancing protection of historical water rights with the maximization of beneficial uses.

Conflicts between resource protection and flood control in the lower watershed often prevent vegetation control in floodplains. Delayed removal of vegetation that blocks flood flows can then result in channel overflows and flood damage. Conversely, removal of vegetation within flood control channels can fragment habitat, especially riparian habitat that can contain important protected species.

To diversify the water portfolio, water managers are considering maximizing water reuse. The City is currently running a water purification demonstration project that examines the use of advanced water purification technology to provide safe and reliable water (CSD (g) (h) (i), 2013). If the demonstration project is successful, the full-scale reservoir augmentation, which would involve advance treatment of existing recycled water supply and conveyance into the San Vicente Reservoir for storage and later potable use, would be implemented. The viability of this strategy to produce safe and reliable water that meets all regulations has yet to be determined.

San Diego River Watershed
Portions of the San Diego River have been altered and constrained due to heavy mining operations. Sand mining has impacted portions of the San Diego River from accumulated sand in the River which creates ponding of water (SDRPF (b), 2001). Ponded water rapidly decreases its DO levels negatively impacting aquatic life. Mining operations along the River have limited the communities' ability to access and enjoy walking, biking or kayaking/canoeing along the river – particularly the community surrounding Lakeside. Many mining operations in the San Diego River valley, however, are currently being phased out and restoration projects are currently underway. Continued restoration and habitat preservation efforts will be needed to restore and enhance the impacted San Diego River areas (Lakeside River Park Conservancy (b), N.D.).

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5.8 Pueblo Watershed

The Pueblo Watershed (Pueblo Hydrologic Unit or Pueblo HU (908)) is contained within the San Diego Bay WMA, and covers 60 square miles of urbanized land along San Diego Bay within the cities of San Diego, La Mesa, Lemon Grove and National City. Figure 5-9 is a map showing the boundaries and principal features of the watershed.

With a population of approximately 520,300, the Pueblo Watershed is the most densely populated watershed in the County (SDBC, 2008). While the primary land use within the watershed is residential, a relatively large percentage of the Pueblo Watershed land is used for transportation corridors and highways. Due to the high level of existing urbanization in the watershed, only small amounts of additional land are projected for development over the next 15 years.

No water supply is currently developed within the Pueblo Watershed, but portions of the San Diego Formation (a deep confined groundwater aquifer) underlie portions of the Pueblo Watershed. Chollas Creek is the largest of several drainage courses within the Pueblo Watershed.

The Chollas Creek Integration Project – funded by Proposition 84-Round 1 – will reduce flooding and improve water quality along Chollas Creek.

Photo credit: Charles Davis, Jacobs Center for Neighborhood Innovation

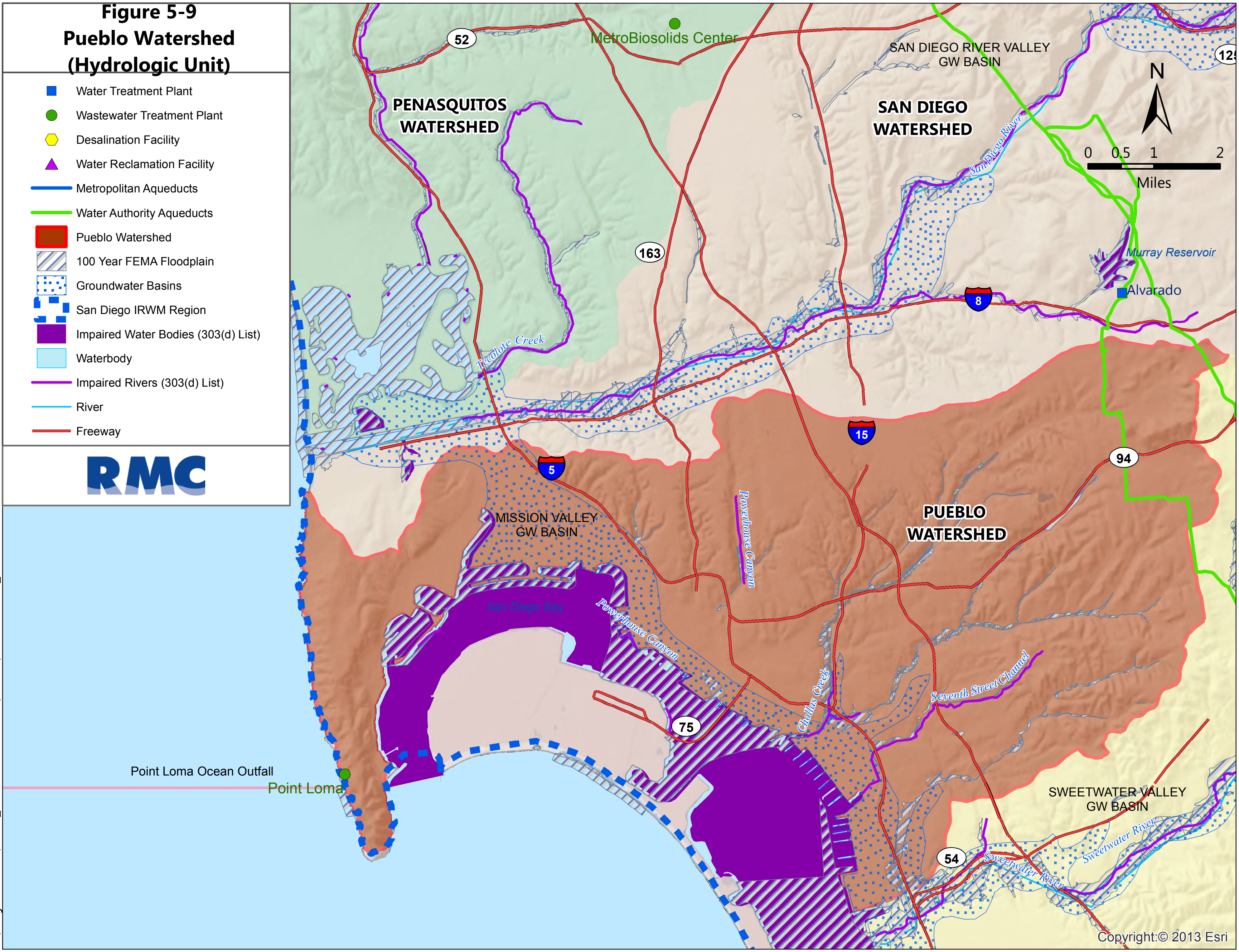

Figure 5-9
Pueblo Watershed
(Hydrologic Unit)

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Pueblo Watershed

Hydrology

The Pueblo Watershed is comprised of three Hydrologic Areas (HAs): Point Loma HA (908.1), San Diego Mesa HA (908.2), and National City HA (908.3) (SDBC, 2008). The major water bodies within the three HAs include Switzer Creek, Paleta Creek, and Chollas Creek.

The Pueblo Watershed's major water feature is San Diego Bay. The Pueblo Watershed is one of three watersheds that drain into San Diego Bay. The majority of the surface water from the Pueblo HAs drains to San Diego Bay, except for a small portion of the Point Loma HA which drains directly to the Pacific Ocean (CSD (a), 2012). The major waterway in this watershed that drains into San Diego Bay is Chollas Creek; other waterways of importance include Paleta and Switzer Creeks.

Water Systems

Imported water is the largest source (~80%) of water supplied throughout the San Diego Region (SDCWA (a), N.D.). Imported water is currently purchased from the local wholesaler San Diego County Water Authority (SDCWA) (CSD (b), 2012). Imported water is brought into the region by massive aqueduct systems from the Colorado River (240 miles away) and from the State Water Project carrying water from the Sacramento-San Joaquin Bay Delta (700 miles away). Local supplies make up the remaining 20% of water supply for San Diego County (SDCWA (a), N.D.). Surface water is collected as runoff and stored in reservoirs outside the Pueblo Watershed. Surface water is used to maximize local water supplies in conjunction with imported water.

Groundwater production in the Pueblo Watershed is limited due to lack of storage capacity in the basin, availability of groundwater recharge, and degraded water quality (SDCWA (b), N.D.). The Sweetwater Valley Groundwater Basin (9-17) is a large groundwater basin that empties into the San Diego Bay underlying the Pueblo Watershed. The Sweetwater Valley Groundwater Basin consists of two water bearing formations, the Sweetwater Alluvium and the San Diego Groundwater Formation. Recharge of the basin is derived from runoff of seasonal precipitation from the Sweetwater River Valley, Sweetwater Reservoir discharge and underflow, and possible subsurface flows (DWR (a), 2004). A portion of the Mission Valley Groundwater Basin (9-14) also underlies the Pueblo Watershed.

The Metropolitan (Metro) Sewerage System, owned by the City of San Diego and operated by the San Diego Metro Wastewater Joint Powers Authority [JPA]), serves the majority of the Pueblo Watershed (SDCWA (a), N.D. and San Diego Metro Wastewater JPA, 2012). National City has its own wastewater division that maintains the City's sanitary sewer main and lines, closed storm collection systems, and pump stations. The Metro Sewerage System is responsible for treating wastewater from cities located in the Pueblo Watershed. The Wastewater Collection division is responsible for the collection and conveyance of wastewater. Major wastewater infrastructures within the Pueblo Watershed consist of Pump Stations 1 and 2, Pt. Loma Ocean Outfall, and the Pt. Loma WWTP. The Pt. Loma WWTP is located on the bluffs of Point Loma and treats approximately 175 million gallons of wastewater per day (CSD (a), 2012).

Internal Boundaries and Land Uses

The Pueblo watershed is within the jurisdictions of the Cities of San Diego, La Mesa, Lemon Grove, National City, the Port of San Diego, the Regional Airport Authority and a small portion of the County of San Diego (0.3%).The Pueblo Watershed is primarily within the jurisdiction of the City of San Diego. Other jurisdictions in the Pueblo Watershed include National City, Lemon Grove, La Mesa, Port of San Diego, the Regional Airport Authority, and a small portion of the County of San Diego (0.3%) (SDBC, 2008).

The dominant land use within the Pueblo Watershed is residential uses followed by transportation, commercial business/public facilities/schools/parks, military uses, and open spaces/preserves (SDBC, 2008). The Pueblo Watershed is highly developed and one of the most densely populated watersheds in the San Diego Bay Watershed. There are no tribal lands located within the Pueblo Watershed.

Pueblo Watershed

Water Quality and Water Quality Impairments

The Pueblo Watershed is highly impacted by pollutants carried by urban runoff from residential areas, streets and roadways, commercial and industrial areas, and construction. Such pollutants include metals, bacteria, oil and grease, pesticides, sediment, and trash. The 303(d) list includes the three creeks, a section of San Diego Bay shoreline, and the Point Loma Hydrologic Area within the Pueblo watershed (PCW (a), N.D. and SDBW, N.D.):

- Chollas Creek for copper, lead, zinc, indicator bacteria, phosphorus, nitrogen, diazinon, and trash.
- Switzer Creek for copper, lead, and zinc
- Paleta Creek for copper and lead
- Shelter Island Yacht Basin for dissolved copper
- San Diego Bay shoreline for benthic community effects, sediment toxicity, Enterococcus, fecal coliform, total coliform, copper, chlordane, PAHs
- Pacific Ocean Shoreline, Point Loma hydrologic area at Bermuda Avenue for total coliform

Additionally, there are 303(d) listing for areas of San Diego Bay for copper, benthic community effects, sediment toxicity, bacteria, chlordane, and PAHs. The sources of pollutants are primarily from stormwater discharges, shipyard operations, and dry weather nuisance flows. The bay bottom provides habitat for many aquatic organisms and functions as an important component of aquatic ecosystems. However, the bay bottom sediment serves as a repository for persistent and toxic chemicals causing toxicity to marine life and benthic community impairments.

The major pollutant sources are from residential and street/roadway runoff, followed by runoff from businesses, parks, and construction. All major water bodies, including the San Diego Bay, in the Pueblo Watershed are highly impacted by urban runoff which causes surface water degradation, habitat degradation, and sediment toxicity. The heavily urbanized nature of the watershed contributes to its poor water quality, though neighborhood groups, such as the Jacobs Center for Neighborhood Innovation, are pursuing projects to improve water quality in Pueblo Watershed creeks (*see call-out box*). Furthermore, a Water Quality Improvement Plan will be developed for the entire Pueblo Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits.

Bulletin 118 reports that groundwater quality of the San Diego Formation (Sweetwater Valley Groundwater Basin (9-17)) has been historically brackish, with TDS, chloride, and sodium content at concentration levels that exceed the recommended limits for drinking (DWR (a), 2004). Treatment of the groundwater is necessary for use as potable supply. High TDS concentrations in the groundwater basin are a characteristic of the groundwater when it was deposited in the formation, not from over-pumping (SWA (a), 2012).

Specific water quality objectives have been established in the Basin Plan for the Point Loma, San Diego Mesa, and National City HAs (SDRWQCB (c), 2007). The inland surface water quality objectives established are for odor, turbidity, and color units. The groundwater water quality objectives established are only for National City HA which consists of TDS, chlorides, sulfates, sodium, nitrates, iron, manganese, methylene blue-activated substances (MBAS), boron, odor, turbidity, color units and fluoride.

TMDL projects have been put in place to assess the impacts of pollutants/toxics at each of the sites for implementation of the most appropriate Best Management Practices (BMPs) for reduction of these pollutants/toxics. TMDLs have been developed and are in the process of being developed to minimize current water quality issues within the Pueblo Watershed as discussed in *Chapter 3, Region Description*. For example, a TMDL has been developed for the Shelter Island Yacht Basin (SIYB) to address dissolved Copper water quality impairments that can have toxic effects on aquatic organisms (SDRWQCB (a),). Other TMDLs that have been adopted that fall within the Pueblo Watershed jurisdiction are Chollas Creek Diazinon, Chollas Creek dissolved metals, Chollas Creek indicator bacteria, and Shelter Island indicator bacteria (UCSD (a), N.D.).

Stormwater and Flood Management

Several major drainages within the watershed include Chollas Creek, Paleta Creek, South Chollas Creek, and Switzer Creek, which encompass drainage areas of approximately 54.4, 2.8, 10.9, and 4.3 square miles, respectively. The peak discharges during a 100-year storm event for Chollas Creek range from 7,100-10,000 CFS at three different locations. The peak discharges during a 100-year storm event for Paleta Creek, South Chollas Creek, and Switzer Creek are 1,400, 5,300, and 2,600 CFS, respectively. Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 1,500 acres, and includes the following: commercial and services, 217 acres; industrial, 165 acres; open space and recreation, 330 acres; residential, 306 acres; and transportation, communications, and utilities, 555 acres (see Appendix 7-B, Integrated Flood Management Planning).

Stormwater and flood management within the Pueblo Watershed falls under the jurisdiction of the City of San Diego, the City of La Mesa, the City of Lemon Grove, the City of National City, the San Diego County Regional Airport Authority, the San Diego Unified Port District, and the County of San Diego (County). These jurisdictions are responsible for flood control and drainage system facilities as well as maintaining storm drains, channels and debris basins, though the County has minimal lands in the watershed, and is therefore only minimally involved in stormwater management in the Pueblo Watershed. Chollas Creek is one of the natural waterways and drainage systems that runs through the Pueblo Watershed that is used for flood control maintenance activities. Portions of the Chollas Creek are equipped with flood walls and flood dividers to protect the watershed from flood risk (CSD (c), ND). Most natural drainages, such as Chollas Creek, have been channelized for flood control however there have been efforts to restore natural flows in the watershed (CSD (d), 2009).

Stormwater runoff is a significant source of pollutants entering San Diego Bay. Pollutants entering San Diego Bay from urban runoff include trash, litter, sand, sediment, petroleum products leaking from motor vehicles, heavy metals from motor vehicle brake pads and diesel exhaust, animal feces, excess fertilizers and pesticides, among other pollutants (Port (b), N.D.). As one of the most developed and populated watersheds, Pueblo Watershed is a significant contributor of urban runoff entering the San Diego Bay. Some of the major inputs of stormwater into San Diego Bay within the Pueblo Watershed are Chollas Creek, Switzer Creek, and all surface runoff from downtown San Diego and surrounding urbanized areas (Port (a), N.D.).

The County, the Unified Port of San Diego (Port), the San Diego County Regional Airport Authority, the Cities of San Diego, La Mesa, Lemon Grove, and National City, the California Department of Transportation, and the United States Navy have implemented programs to reduce pollutants in urban runoff and stormwater. As part of this effort, the County, two cities, and Port have developed Jurisdictional Urban Runoff Management Plans (JURMP) to reduce stormwater pollution and improve the water quality of rivers/creeks, the San Diego Bay, and ocean.

In Chollas Creek, Groundworks San Diego-Chollas Creek has led recent efforts to organize watershed stakeholders in integrating watershed management activities and funding proposals. Stakeholder coordination activities have included the City of San Diego, Jacobs Center for Neighborhood Innovation, San Diego CoastKeeper, Urban Corps of San Diego, EPA, National Parks Service, UCSD, and IRWM Program representatives. From this coordination, the Chollas Creek Integration Project was established as a multi-phased community-driven effort to restore Chollas Creek and provide a safe community recreation space in the neighborhood near Euclid Avenue and Market Street. Continuing the theme of community involvement, the Chollas Creek project aims to conduct outreach to community members about the value of creek water quality and habitats.

Habitat restoration activities along Chollas Creek

Photo Credit: Jacobs Center for Neighborhood Innovation

Pueblo Watershed

Natural Resources

Only small pockets of riparian and wetland communities are present in the Pueblo Watershed due to heavy development, such as that along Chollas Creek. Some of these riparian and wetland communities include riparian scrub, freshwater marsh, disturbed wetlands, ornamental riparian woodlands, upland communities, and rural communities. Several non-native species located within these communities include giant cane, Spiny cocklebur, white sweet clover, Bermuda grass, castor bean, and sweet fennel (County of San Diego (a) 1998).

The San Diego Bay is an ecosystem of concern within the highly developed Pueblo Watershed. San Diego Bay is characterized by salt marshes, tidal flats, bird nesting and foraging sites, essential fish habitats such as eelgrass beds, and diverse wildlife. Several plant and animal species of San Diego Bay are federally protected under the ESA, such as the Salt Marsh Bird's Beak, California Least Tern, Western Snowy Plover, and Eastern Pacific Green Sea Turtle (Port (c)(d), N.D. and Portand NAVFAC, 2011).

Invasive species in the San Diego Bay's ecosystem poses a series threat to native species. The following invasive species are present in the San Diego Bay: one species of marine algae, one marine protozoan, 47 marine invertebrates, five marine fish, and 28 species of invasive coastal plants (Port (c), N.D.). There at least 82 non-native species that can be found along the San Diego Bay (Port (c)), N.D.

Potential Climate Change Impacts

Climate change has the potential to impact the Pueblo Watershed via potential decrease in freshwater supplies, sea level rise, and changes to the vital San Diego Bay habitats (Port (d), N.D. and CCCC, 2009).The Pueblo Watershed is highly dependent on imported water supplies from the State Water Project and the Colorado River. Climate change is expected to pose challenges to imported water sources to the region as snowmelt is expected to decrease with increasing temperatures. Climate change can have potential effects on water demands; increases in temperature can increase industrial and residential water demands, impacting companies' decisions to locate business within the Pueblo Watershed.

Sea level rise along the San Diego Bay and the Pacific Ocean coast will have a significant impact on shoreline structures and for the intertidal and subtidal habitats. Sea level rise has the potential to damage coastal infrastructure, minimize existing intertidal habitat, and negatively impact tourism and recreation in the Pueblo Watershed. Tidal habitats in the San Diego Bay are home to a large diversity of wildlife that is strongly influenced by climate regime shifts (CCCC, 2009). Increases in temperature could shift vital eelgrass beds due to changing water clarity, depth and temperatures. Increased high tides and storm surges may deplete and/or destroy vital tidal habitat for avian species that live and feed in the area. Marginal bay habitats would be at risk as these require special salinity conditions, intermittent inundation, and light penetration. Changes in sea temperature could affect coastal ecosystems dynamics sensitive to temperature changes. With the predicted rapid changes in climate, it is expected the list of species at risk in the Pueblo Watershed region will increase.

Management Issues and Conflicts

Major issues in the Pueblo Watershed consist of surface water quality degradation, habitat degradation, sediment toxicity in San Diego Bay (SDBW, N.D.). Potential management related issues within the Pueblo Watershed include coordination amongst the multiple jurisdictions to reduce pollutants currently found in the watershed and successfully removing water bodies from the 303(d) list. Anthropogenic pollution has created various surface water quality issues in the Pueblo Watershed and successful implementation of TMDLs is essential to meeting water quality standards. TMDLs are issued on a watershed basis and could be assigned to various government agencies. Coordination with all agencies involved needs occur to ensure TMDLs within the Pueblo Watershed are met (Port (a), N.D.).

The high costs of remediating contaminated sediment sites in San Diego Bay has been an issue for the watershed. Eight remediated sites have been completed to-date resulting in the removal of 230,000 cubic yards of contaminated sediment at a cost of $25 million (SWRCB (a), 2009). At the moment there are 21 additional contaminated sediment sites that need to be remediated. Presently, the estimated total cost of cleanup at the Shipyard sediment site would be approximately $96 million (SWRCB (a), 2009).

Pueblo Watershed
Sea level rise due to climate change has also been identified as a potential threat to San Diego Bay. It is projected that in this century the average high tide could increase in elevation by as much as five feet (ICLEI, 2012). Though the timing and severity of sea level rise is highly uncertain, it is recommended local jurisdictions implement climate mitigation and adaptation plans.

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5.9 Sweetwater Watershed

The Sweetwater Watershed (Sweetwater Hydrologic Unit or Sweetwater HU (909)) is contained within the San Diego Bay WMA, and covers 230 square miles in an area extending from the Laguna Mountains in the east to San Diego Bay. Figure 5-10 is a map showing the watershed boundaries and principal features. The Sweetwater River is the primary watercourse within the watershed, and two major reservoirs (Loveland and Sweetwater, both operated by Sweetwater Authority) exist along the river.

The downstream portion of the watershed below Sweetwater Reservoir is urbanized, approximately 20% of the watershed is dedicated open space or used for agriculture, and an additional 50% is undeveloped. Much of the undeveloped land is in the upper one-third of the watershed and is within the unincorporated county, the Cleveland National Forest, and Cuyamaca Rancho State Park. The middle portion of the watershed (between Loveland and Sweetwater Reservoirs) includes the unincorporated communities of Jamul, Dehesa, and Harbison Canyon.

Significant groundwater resources exist in the Middle Sweetwater River Basin (between Loveland and Sweetwater Reservoirs) and the Lower Sweetwater River Basin (downstream from Sweetwater Reservoir). Sweetwater Authority develops potable supply from brackish groundwater from the Lower Sweetwater River Basin.

Sweetwater Reservoir, owned by the Sweetwater Authority, stores natural runoff.

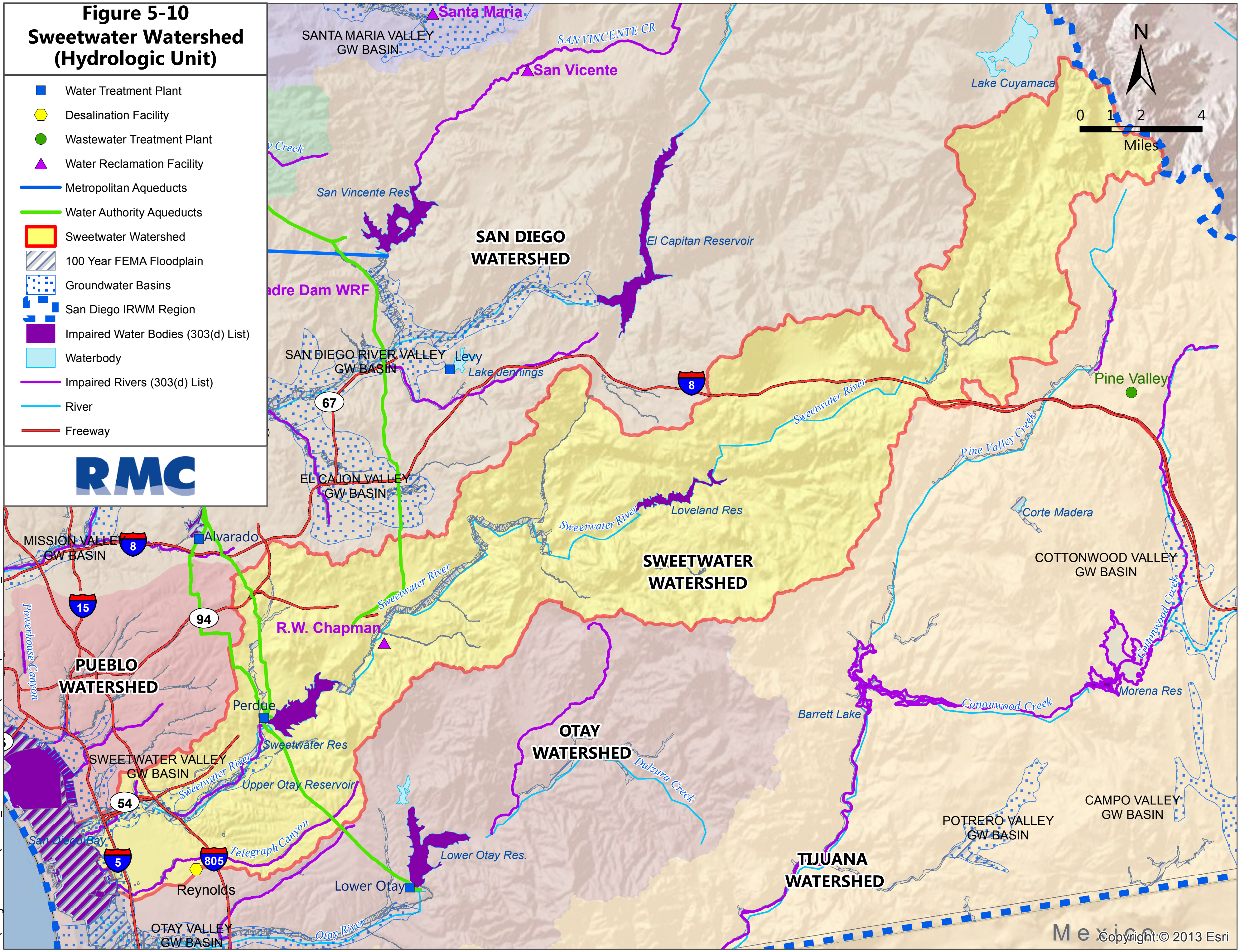

Figure 5-10
Sweetwater Watershed (Hydrologic Unit)

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Sweetwater Watershed

Hydrology

The Sweetwater Watershed is comprised of three Hydrologic Areas (HAs): Lower Sweetwater HA (909.1), Middle Sweetwater HA (909.2), and Upper Sweetwater HA (909.3) (SDBC, 2008). The major water bodies within the three HAs include the Sweetwater River, Sweetwater Reservoir, Loveland Reservoir, and San Diego Bay.

The Sweetwater Watershed's major water feature is the San Diego Bay. The Sweetwater Watershed is one of three watersheds that drain into the San Diego Bay, along with the Pueblo and Otay watersheds. All surface water from Sweetwater Watershed drain into the San Diego Bay (SDBC, 2008). The major waterway that drains into the San Diego Bay is the Sweetwater River which traverses the watershed and enters the bay between the City of National City and the City of Chula Vista.

Water Systems

Two major water supply reservoirs reside in the Sweetwater Watershed:

- Loveland Reservoir: owned by the Sweetwater Authority, stores natural runoff.
- Sweetwater Reservoir: owned by the Sweetwater Authority, stores natural runoff.

Both reservoirs trap rainfall and melting snow from the surrounding mountains. Reservoir water is used to maximize local water supplies in conjunction with imported water. Combined, both reservoirs can store approximately 52,200 AF of water (SWA (b), 2012).

The Sweetwater Valley Groundwater Basin (9-17) is a large groundwater basin that empties into the San Diego Bay underlying the Sweetwater Watershed. The Sweetwater Valley Groundwater Basin consists of two water bearing formations, the Sweetwater Alluvium and the San Diego groundwater formation. Recharge of the basin is derived from runoff of seasonal precipitation from the Sweetwater River Valley, Sweetwater Reservoir discharge and underflow, and possible subsurface flows (DWR (a), 2004). Groundwater in the Sweetwater Watershed is pumped from both the Sweetwater alluvium and the San Diego groundwater formation by the Sweetwater Authority. The Sweetwater Authority pumps fresh water from the San Diego Formation in its National City Wells. Brackish water is extracted from the alluvium of the Sweetwater River and the San Diego Formation and then treated at the Richard A. Reynolds Groundwater Desalination Facility (SWA (c), 2012). It is anticipated that a Salt and Nutrient Management Plan will be developed for the middle portion of the Sweetwater basin, though this effort is not yet underway (Regional Board, 2013).

The Richard A. Reynolds Groundwater Desalination Facility uses reverse osmosis treatment to remove dissolved solids and microscopic particles (such as bacteria and other contaminants) that could be found in alluvial groundwater to produce drinking water (SWA (d) 2012). Four alluvial wells and six deep formation wells along the north side of the Sweetwater River provide source water to the Richard A. Reynolds Groundwater Desalination Facility. The facility can produce 4.0 MG of drinking water per day (MET, 2007). The Robert A. Perdue Treatment Plant at Sweetwater Reservoir treats surface water supplies to produce drinking water. The Robert A. Perdue Treatment Plant processes approximately 30 MG of water each day (SWA (e), 2012).

The Sweetwater Authority also manages the Urban Runoff Diversion System which captures first flush storm flows and low flow runoff before entering the Sweetwater Reservoir. Water containing high salt loads (TDS) is diverted downstream into the Sweetwater River to join the underground alluvium to become a source supply for the Richard A. Reynolds Groundwater Desalination Facility. Water with acceptable TDS concentrations is routed to the Sweetwater Reservoir where water is then treated at the Robert A. Perdue Water Treatment Plant. The urban runoff diversion system reduces the need to add costly treatment to the water treatment plant (SWA (f), 2012).

Sweetwater Authority currently purchases 30% of its water supply as imported water from the Water Authority (CSD (b), 2012; SWA (g), 2012). Imported water is brought into the region by massive aqueduct systems from the Colorado River (approximately 240 miles away) and the State Water Project carrying water from the Sacramento-San Joaquin Bay Delta (approximately 700 miles away) (SWA (a), 2012). During wet years, Sweetwater Authority may not have to purchase imported water to supplement local supplies; however, during dry years imported water is purchased and stored in the reservoirs in the fall/winter months (SWA (g), 2012).

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The Viejas Reservation and Sycuan Reservation located within the Sweetwater Watershed both operate onsite water systems. The Viejas Reservation operates a municipal water system to American Water Works Association water standards, including domestic water supply and wastewater compliance with Title 22 of the California Code of Regulations. The Sycuan Reservation receives basic water resources from onsite resources, although the tribe has investigated the possibility of connecting to the Otay Water District and Padre Dam Municipal Water District water systems.

Internal Boundaries and Land Uses

The Sweetwater Watershed is the largest of the three San Diego Bay watersheds encompassing 230 square miles and covering over 148,000 acres (SDBC, 2008). The Sweetwater Watershed stretches from Cleveland National Forest to the San Diego Bay as an elongated northeasterly trending strip. The Sweetwater Watershed is bordered on the north by Pueblo Watershed and on the south by the Otay Watershed.

The Sweetwater Watershed is largely (86%) within unincorporated jurisdictions. Other jurisdictions include: Port of San Diego, City of Chula Vista, La Mesa, Lemon Grove, National City and San Diego.. The most urbanized parts in Sweetwater Watershed include portions of the City of Chula Vista, City of Lemon Grove, National City, and the unincorporated communities of Spring Valley and Rancho San Diego. Unincorporated communities include Jamul, Pine Valley, Descanso, Alpine, the Cleveland National Forest, Cuyamaca Rancho State Park, and the Viejas Indian Reservation. Most of the unincorporated communities consist of undeveloped land, with 41% of the land administered by state and federal agencies or controlled by Indian Tribes (SDBC, 2008). There are 2 tribal reservations located within the Sweetwater Watershed: Viejas and Sycuan; in total, tribal lands account for approximately 2% of the total area within the watershed.

The dominant land uses in the Sweetwater Watershed vary by the three HAs (SDBC, 2008). The Lower Sweetwater HA's dominant land use consists of residential followed by transportation, open spaces/preserves, and undeveloped/vacant land. The Middle Sweetwater HA’s dominant land use consists of undeveloped/vacant land followed by residential, open spaces/preserves, and transportation. The Upper Sweetwater HA’s dominant land use consists of undeveloped/vacant land followed by open space/preserve, residential, and agriculture.

Water Quality and Water Quality Impairments

Six water bodies within the Sweetwater Watershed are listed on the 303(d) list (SDBW (b), N.D.e and PCW (c), N.D.e):

- Telegraph Canyon for selenium
- Sweetwater River for *Enterococcus*, fecal coliform, phosphorus, selenium, TDS, nitrogen, and toxicity
- Sweetwater Reservoir for dissolved oxygen (DO)
- San Diego Bay Shoreline near Bayside Park (J Street) for *Enterococcus and total coliform*
- San Diego Bay Shoreline near Chula Vista Marina for copper
- Loveland Reservoir for aluminum, DO, manganese, and pH

Impacts on water quality within the Sweetwater Watershed include surface and groundwater quality degradation, habitat degradation, and invasive species (Copermittees, 2012). The main pollutants/stressors of concern in the watershed are DO, copper, indicator bacteria, aluminum, and manganese. Water quality in the Sweetwater Watershed is mainly impacted by agricultural and urban runoff. In particular, pesticides have been identified as a high priority water quality problem in the Middle Sweetwater HA.

Though the lower portion of the watershed is heavily developed, and suffers from poor water quality, particularly where it drains to the San Diego Bay, the upper portion of the watershed is largely undeveloped or parkland, and relatively healthy. The San Diego Bay Watershed Urban Runoff Management Program (WURMP) provides an assessment of water quality and presents implementation actions designed to address the identified issues for watersheds draining to the San Diego Bay. This includes the Sweetwater Watershed, whose urbanized lower section is addressed by the San Diego Bay WURMP. Furthermore, a Water Quality Improvement Plan will be developed for the entire Sweetwater Watershed in accordance with the 2013 MS4 Permit, which will address some

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of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits. Based on DWR's Bulletin 118, groundwater quality of the San Diego Formation (Sweetwater Valley Groundwater Basin (9-17)) is brackish, with TDS, chloride, and sodium content at concentration levels that exceed the recommended limits for drinking (DWR (a), 2004). Treatment of the groundwater is necessary for use as potable supply. Specific water quality objectives have been established in the Basin Plan for the Sweetwater Watershed (SDRWQCB, 2007). The inland surface water quality objectives established are for TDS, chlorides, sulfates, sodium, nitrates, nitrogen phosphorous ratios, iron, manganese, methylene blue-activated substances (MBAS), boron, odor, turbidity, color units and fluoride. The groundwater water quality objectives established consists of TDS, chlorides, sulfates, sodium, nitrates, iron, manganese, MBAS, boron, odor, turbidity, color units and fluoride.
Stormwater and Flood Management Major drainages within the watershed include Spring Valley Creek and Sweetwater River, which encompass drainage areas of 7.1, and 434 square miles, respectively. The peak discharge during a 100-year event for Spring Valley Creek is 3,600 CFS. The peak discharges during a 100-year event for Sweetwater River at three locations are 29,500, 35,000, and 20,300 CFS, respectively. Within the watershed, the acreage of land uses within mapped flood hazard zones total more than 5,000 acres, and includes the following: agriculture, 273 acres; commercial and services, 1,204 acres; industrial, 371 acres; open space and recreation, 1,815 acres; residential, 825; and transportation, communications, and utilities, 751 acres (see Appendix 7-B, Integrated Flood Management Planning). Stormwater and flood management within the Sweetwater Watershed falls primarily under the jurisdiction of the County of San Diego (County). The County is responsible for maintaining the flood control and drainage system facilities as well as maintaining storm drains, channels and debris basins. Specifically, the County is responsible for removing trash and debris and other maintenance activities within the engineered section of the Sweetwater River; several other municipalities are responsible for storm drain maintenance within other portions of the watershed. In general, stormwater and flood management is limited to developed regions in the County due to most lands within the Sweetwater Watershed consisting of undeveloped and agricultural lands, and State and Federal parks. The major input of stormwater to San Diego Bay is via the Sweetwater River. The San Diego Bay Watershed Urban Runoff Management Program (WURMP) includes portions of the Sweetwater Watershed, along with portions of the Pueblo and Otay watersheds. The San Diego Bay WURMP guides efforts to decrease sources and reduce discharge of pollutants to the San Diego Bay from the separate storm sewer system (MS4). Loveland Dam (which forms the Loveland Reservoir) and Sweetwater Dam (which forms the Sweetwater Reservoir) are both used to capture rainfall for flood protection purposes as well as for water supply purposes (SWA (a), 2012). Post-wildfire rain events in the Sweetwater Watershed can impact the quality of flows in the Sweetwater River and the local reservoirs. Total organic carbon (TOC) levels in the Sweetwater River normally increase significantly during rain events after a wildfire (Placencia and Starr, 2007).

Sweetwater Watershed

Natural Resources

The Sweetwater River, Sweetwater Reservoir, Loveland Reservoir, and San Diego Bay support important wildlife habitat in the Sweetwater River Watershed. Between the headwaters and the outlet to San Diego Bay, the watershed contains a variety of habitat types including oak and pine woodlands, riparian forest, chaparral, coastal sage scrub, and coastal salt marsh (PCW (c), N.D.e). The upper watershed contains large sections of the Cleveland National Forest and Cuyamaca Rancho State Park.

The Sweetwater River estuary, located on the border of National City and the City of Chula Vista, is a broad, straight, deep channel that forms that mouth of the Sweetwater River. The mouth of the Sweetwater River is the Estuary's primary source of fresh water subject to tidal influences. The outer portion of the Estuary is surrounded by commercial and industrial lands uses to the north, whereas the southern side is bordered by the Sweetwater Marsh Unit of the National Wildlife Refuge (SDBW (b). N.D.e). The Sweetwater Marsh National Wildlife Refuge is 316 acres of diverse marshland that supports populations of light-footed clapper rail, California least terns, Belding's savannah sparrows, salt marsh bird's beak, and Palmer's frankenia (USFWS (a), 2011). The Sweetwater Marsh Unit is part of the San Diego National Wildlife Refuge Complex, a series of national wildlife refuges that were established to preserve and protect coastal habitat marshes, as is the San Diego National Wildlife Refuge which lies inland along the middle portion of the Sweetwater Watershed (USFWS (b), 2012). This inland Refuge protects riparian habitat for the endangered least Bell's vireo, southwestern willow flycatcher, and arroyo toad along the Sweetwater River (USFWS 1997). Adjacent uplands support coastal sage scrub, chaparral, vernal pools, and oak woodlands that support rare species such as California gnatcatcher, quino checkerspot butterfly, San Diego fairy shrimp, San Diego ambrosia, and San Diego thorn-mint.

The San Diego Bay is characterized with salt marshes, tidal flats, bird nesting, foraging sites, essential fish habitats such as eelgrass beds and home to a diverse wildlife and important species of plants and animals. Several plant and animal species of the San Diego Bay are federally protected under the ESA, including the Salt Marsh Bird's Beak, California Least Tern, Western Snowy Plover, and Eastern Pacific Green Sea Turtle (Port (a), N.D.e and Port (b), 2008). Invasive species in the San Diego Bay's ecosystem poses a serious threat to native species. The following invasive species are present in the San Diego Bay: one species of marine algae, one marine protozoan, 47 marine invertebrates, five marine fish, and 28 species of invasive coastal plants (Port (a), N.D.e). There at least 82 non-native species that can be found along the San Diego Bay (Port (a), N.D.e).

Tribal nations in the Region have indicated concern that jurisdictional habitat conservation efforts such as those described above may not consider current or future tribal developments, and tend to categorize tribal lands as open space for habitat and conservation planning purposes.

Potential Climate Change Impacts

Climate change has the potential to impact the Sweetwater Watershed via potential decrease in freshwater supplies, sea level rise, changes to the vital San Diego Bay habitats, and increased wildfire frequency (Port (a), N.D.e and CCCC, 2009).The Sweetwater Watershed is highly dependent on imported water supplies from the State Water Project and the Colorado River. Climate change is expected to pose challenges to imported water sources to the region as snowmelt is an important contributor to the region's imported supplies; snowmelt is expected to decrease with increasing temperatures. Climate change can have potential effects on the watersheds water demands; increases in temperature can increase industrial and residential water demands, impacting companies' decisions to locate business within the Sweetwater watershed.

Sea level rise in the Sweetwater Watershed along the San Diego Bay will have a significant impact on shoreline structures and intertidal and subtidal habitats. The Sweetwater Watershed has a widespread beach community and sea level rise has the potential to damage coastal infrastructure, recreation, and negatively impact tourism. Tidal habitats in the San Diego Bay are home to a large diversity of wildlife that is strongly influenced by climate regime shifts (CCCC, 2009). Increases in temperature could shift vital eelgrass beds due to changing water clarity, depth and temperatures. Increased high tides and storm surges may deplete and/or destroy vital tidal habitat for avian species that live and feed in the area. Marginal bay habitats would be at risk as these require special salinity

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conditions, intermittent inundation, and light penetration. Changes in sea temperature could affect coastal ecosystems dynamics sensitive to temperature changes. The rapid rate of climate change can pose a problem to many of the watershed's endangered and threatened species, which may be unable to adapt fast enough to habitat shifts and increasing temperatures. With the predicted rapid changes in climate, it is expected the list of species at risk in the Sweetwater Marsh National Wildlife Refuge will only increase. Additionally, changes in climate can make conditions much more favorable for invasive species in the watershed reducing available habitat space for native species. Climate change also has the potential to create changes in precipitation patterns, which can decrease seasonal stream flows in the Sweetwater River Watershed. Decreased seasonal stream flows will create stream flows with irrigation/dry weather flows, thus increasing the concentration of constituents and requiring stream flows to receive a greater level of treatment. Wildfires in the Sweetwater Watershed are a common occurrence, particularly in the undeveloped regions of the watershed. Climate change has the potential to impact the wildfire season in the watershed. Research suggests Santa Ana conditions, dry hot winds which blow from the mountains to the deserts in the east, may increase earlier in the fire season (September) and decrease later in the season (December). A shift to earlier Santa Ana wind occurrences could mean an increase frequency in Santa Ana related wildfires (CCCC, 2009). Longer wildfire seasons can create large scale damage to many residential homes particularly with the increased level of ongoing urbanization in the Sweetwater River Watershed. Post-wildfire rain events in the watershed cause erosion, mudslides, and sedimentation which create negative water quality issues. Stormwater runoff from post-wildfire rain events have been shown to carry high levels of turbidity, nutrients, and TDS. The potential effects on the Loveland and Sweetwater reservoirs include increased sedimentation with loss of storage, temporary increase in turbidity, and increased water treatment needs and costs. Rain events after wildfires are also known to create flash floods in the Sweetwater Watershed. Increased frequency of wildfires will increase the frequency of flash floods which current stormwater infrastructure in the Sweetwater Watershed may not have the capacity to withstand.
Management Issues and Conflicts The Sweetwater Watershed's management issues are mainly related to the protection of municipal water supplies and the protection and restoration of sensitive wetland and wildlife habitats. Because a portion of the watershed's water supply is locally-captured water, it is important to protect the quality of water entering local creeks, Sweetwater River, and the reservoirs. At the mouth of the Sweetwater River is the Sweetwater Marsh, a sensitive marshland that is currently under the management of the San Diego National Wildlife Refuge Complex (USFWS (a), 2011). Continued management of the Sweetwater Marsh is necessary to ensure it remains protected and preserved. Additionally, habitat degradation and loss due to increased development is a growing issue within the Sweetwater River Watershed. Given water quality concerns in this watershed, it is also a notable issue that there are no adopted TMDLs in this watershed; resource limitations such as funding to implement water quality protection and improvement programs are considered a barrier to implementation of such measures. The Sweetwater River is now nearly dry most of the year except during the winter when releases are made from the Loveland Reservoir. The changes to the Sweetwater River flows have had an impact on the arroyo toad, a federally listed endangered species and a state species of special concern. Releases from the Loveland reservoir have been timed by the Sweetwater Authority (SWA) to minimize the impact on the arroyo toad as they use the Sweetwater River and stream habitats for reproduction (Placencia and Starr, 2007).

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There is also high demand for recreational spaces such as parks and trails within the Sweetwater Watershed. Projects such as the Sweetwater River Trail System by the County of San Diego are helping create more accessible recreation trails for resident of Bonita, Spring Valley, Chula Vista, National City and unincorporated San Diego County (California State Coastal Conservancy, 2011). Existing trails do not reliably support all-season and multiple-use access that is compatible with the surrounding sensitive habitat and species (California State Coastal Conservancy, 2011). Current trail conditions create access interruptions for cyclists and other trail users due to areas of loose sand. The Sweetwater Watershed was historically an inland seabed therefore many of the soils contain naturally occurring salts. From the Loveland Reservoir to the Sweetwater River influent and reservoir, the salt (mineral) concentrations increase significantly which could be caused by the Jamacha landfill, urban runoff, groundwater upwelling, erosion of natural sources, and/or the sand mines located near the reservoir (Placencia and Starr, 2007). These water quality issues at the Sweetwater Reservoir are being addressed by the SWA and will need continued management of the source water quality to the reservoir.

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5.10 Otay Watershed

The Otay Watershed (Otay Hydrologic Unit or Otay HU (910)) is contained within the San Diego Bay WMA, and covers 160 square miles. Figure 5-11 presents a map showing the boundaries and principal features of the Otay River Watershed.

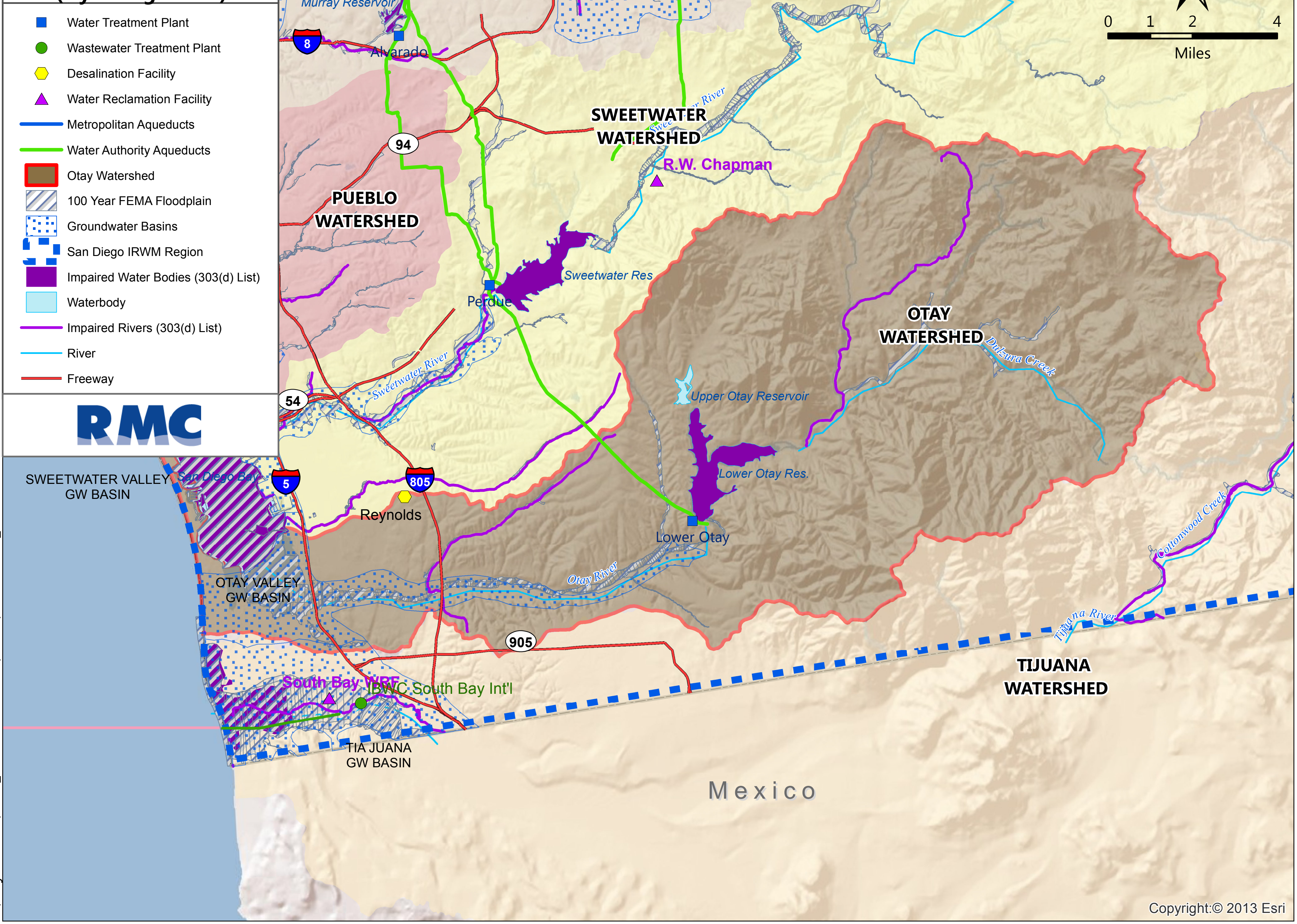
The Otay River (which flows to San Diego Bay) is the primary watercourse in the watershed. Upper and Lower Otay Reservoirs (owned and operated by the City of San Diego), are the other major water bodies of the watershed and represent the southernmost terminus of the San Diego Aqueduct. Lower Otay Reservoir impounds imported water and local runoff diverted from the Otay River Watershed. Upper Otay Reservoir impounds only local runoff. Approximately two-thirds of the watershed is currently preserved as open space. The downstream portion of the watershed within the City of Chula Vista is rapidly developing. Urban and residential land use comprises approximately 20% of the watershed. The watershed has a population of approximately 150,000 people.

Thirty-six square miles of the watershed is within the MSCP Plan area. Other important conservation areas within the watershed include the San Diego National Wildlife Refuge, the Rancho Jamul Ecological Reserve, and vernal pool lands.

Lower Otay Reservoir stores raw water from the Water Authority aqueducts.

Photo credit: Jeff Pasek, City of San Diego

Figure 5-11
Otay Watershed (Hydrologic Unit)



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Otay Watershed

Hydrology

The Otay Watershed is comprised of three HAs: Coronado (910.1), Otay (910.2), and Dulzura (910.3) (SDBC, 2008). The major water bodies include the Upper and Lower Otay Reservoirs, Otay River, and San Diego Bay.

The Otay Watershed is one of the three watersheds that discharge into San Diego Bay. Otay Watershed's major water features are the San Diego Bay and the Upper and Lower Otay Lakes. The Otay River is the central drainage system and major stream system traversing the Otay Watershed. The Otay River flows east to west from its headwaters near the Cleveland National Forest, through the valley, and emptying into the San Diego Bay. Significant tributaries on the Otay River include Poggi Canyon Creek, Salt Creek, O'Neal Canyon, Johnson Canyon, Wolf Canyon, and Dennery Canyon (Aspen, 2006). The principal aquifer in the watershed is the San Diego Formation.

Rainfall in this watershed is typically light with an average rainfall ranging from 8.25 inches in coastal areas to 19.5 inches in the eastern portion of the watershed (Copermittees, 2012).

Water Systems

The Otay Watershed contains two major water supply reservoirs, which are part of the City of San Diego municipal drinking water supply system and serve the San Diego Region including the City of Chula Vista:

- Upper Otay Reservoir: Formed by the Upper Otay Dam and is one of the smallest impounding reservoirs in the City of San Diego (CSD (g), 2012).
- Lower Otay Reservoir: Formed by Savage Dam, and has a storage capacity of approximately 49,800 AF. Receives raw water from the San Diego Aqueduct, as well as from the Morena and Barrett reservoirs in the Tijuana Watershed (CSD (h), 2012).

The lower reaches of the Otay River have habitat areas that have been preserved, but most of the riparian habitat along the Otay River in the upper reaches has been altered. The natural flow of the Otay River has been altered since the early part of the twentieth century to accommodate development and for flood control purposes (i.e. constriction of the Otay River into a channel). The Upper and Lower Otay Reservoirs now control 69% of the Otay River flows and have reduced the frequency of flows in the river (USFWS, 2006). Additionally, the Otay River has been subject to past and current sand and gravel mining operations that have altered the characteristics of the river. The mining operations that involved open pit mining in the streambed created a series of ponds that now act as sediment traps which now capture sediments that should be carried downstream by the river.

Otay Water Treatment Plant is located near Savage Dam and is the only water treatment plant in the Otay Watershed. The Otay Water Treatment Plant is a conventional water treatment plant with a capacity to treat up to 40 MGD, though it currently produces approximately 34 MGD (CSD (i), 2012; CSD(j) , 2011). The Otay Water Treatment Plant receives local water (runoff) from the Barrett Reservoir and the Morena Reservoir, which are located in the Tijuana Watershed (Aspen 2006).

Developed cities within the Otay Watershed, including portions of Chula Vista, San Diego, and Imperial Beach, are connected to the sewer system (Aspen, 2006). The few developments in the unincorporated areas in the north, south, and east portion of the Otay Reservoir are all connected to septic systems (Aspen, 2006).

Sweetwater Authority currently purchases 30% of its water supply as imported water from the Water Authority (SWA (g), 2012). Imported water is brought into the region by massive aqueduct systems from the Colorado River (approximately 240 miles away) and the State Water Project carrying water from the Sacramento-San Joaquin Bay Delta (approximately 700 miles away) (SWA (a), 2012).

The Otay Valley Groundwater Basin (9-18) is bounded on the east by the San Ysidro Mountains, on the north and south by semi-permeable marine deposits, and on the west by the Pacific Ocean (DWR (b), 2004). The Otay Valley Groundwater Basin consists of three water bearing formations: the Otay alluvium, the San Diego formation, and the Otay formation. Though groundwater is from private wells in the eastern portion of the watershed, the Otay Valley Groundwater Basin is characterized as a groundwater basin that is presently unused. Groundwater production in the Otay Watershed is mostly all from private wells for domestic use and irrigation in the

Otay Watershed
unincorporated eastern portions of the watershed. Groundwater production on the western portion of the watershed is mainly derived from the San Diego Formation. Recharge in the basin is derived from percolation of precipitation, stream-flow originating in the valley highlands, return of applied water, and from the rare releases from the Lower Otay Reservoir during flood conditions (DWR (b), 2004). The Otay Valley groundwater basin is a low priority basin for Salt and Nutrient Management Planning (SNMP), and it is not anticipated that it will require a SNMP. For more information on SNMPs and basin prioritization, see *Chapter 7, Regional Coordination*.
Internal Boundaries and Land Uses The Otay Watershed encompasses an area of 180 square miles and covers 98,500 acres (SDBW (a), N.D.). The Otay Watershed is bordered by the Sweetwater Watershed on the north and the Tijuana Watershed to the south. The Otay Watershed elevation ranges from sea level at the western extent to approximately 3,740 feet at Lyons Peak (HDR, 2006). The Otay Watershed is primarily unincorporated area (70%) (SDBW (a), N.D.). The rest of the Otay Watershed is divided between the following jurisdictions: Port of San Diego and the Cities of Chula Vista, Coronado, Imperial Beach, National City, and San Diego. The major population centers in the watershed include the Cities of Chula Vista, Imperial Beach, and San Diego. Most of the land ownership in the Otay Watershed is private with a small percentage of local, state, and federally owned lands. The Jamul Indian Village (approximately 6 acres) lies within the Otay Watershed; tribal lands account for less than 1% of the total area of the Otay Watershed. Land use within the three HAs comprising the Otay Watershed varies significantly (Copermittees 2012). In the Coronado HA, land use is predominantly military (52%), residential (15%), and transportation (12%). The Dulzura HA land uses are characterized as predominantly open space/parks and recreation (47%) and vacant and undeveloped land (36%). The Otay Valley HA land use is categorized as 26% open space/parks and recreation, 23% vacant and undeveloped land, and 18% residential (Copermittees ,2012).
Water Quality and Water Quality Impairments Eight water bodies within the Otay Watershed are listed on the 303(d) list (SDBW (c), N.D. and PCW (a), N.D.): • Lower Otay Reservoir for ammonia, color, iron, manganese, nitrogen, and pH • Pacific Ocean Shoreline (at Imperial Beach Pier) for fecal coliform, PCBs, and total coliform • Pacific Ocean Shoreline, Coronado Hydrologic Area (Silver Strand) for *Enterococcus* • Poggi Canyon Creek for toxicity • Pacific Ocean Shoreline, Otay hydrologic unit at Carnation Avenue and Surf Jetty for total coliform • Jamul Creek for toxicity • San Diego Bay for PCBs • San Diego Bay Shoreline for copper, total coliform, or *Enterococcus*. Pollutants of concern and stressors within the watershed include nutrients, pathogens, metals/metalloids, toxicity, and other organics (Copermittees, 2012). Potential sources of these contaminants are largely unknown point and non-point sources, along with urban runoff/storm sewers and natural sources (SDRWQCB, 2010).The major impacts from these pollutants/stressors consist of surface water quality degradation, reduced ground water recharge, sedimentation, and habitat degradation. Several of the sources/activities responsible for the listed water quality issues consist of urban runoff, agricultural runoff, resource extraction, septic systems, marinas and boating activities. Though water quality in the urbanized portion of the watershed is impaired, waters upstream of the Otay Reservoir, which are located in undeveloped or protected areas, are generally of good quality (Aspen, 2006). The 2006 Otay River Watershed Management Plan, which was prepared by the County of San Diego, the City of Chula Vista, the City of San Diego, the City of Imperial Beach, and the San Diego Unified Port District, is a programmatic document that recommends implementation strategies for meeting various water quality and water management goals within the watershed. The recommended programs include water quality monitoring and other efforts that aim at addressing some of the aforementioned water quality issues and impairments in the watershed.

Otay Watershed
Furthermore, a Water Quality Improvement Plan will be developed for the entire Otay Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits. The Otay Valley Groundwater Basin's costal region contains high concentrations of sodium chloride and TDS (DWR (b), 2004). The coastal plain of the groundwater basin is rated marginal to inferior for domestic use due to the high TDS content. The groundwater in the eastern portion of the watershed is of sodium-calcium and chloride-bicarbonate character. Groundwater for most of the watershed is rated marginal to inferior for irrigation use due to the high chloride concentrations. The San Diego formation water quality can be highly variable with high TDS concentration of marine origin in the western portion of the watershed and decreasing TDS concentrations in the eastern portion of the basin. Specific water quality objectives have been established in the Basin Plan for only the Otay and Dulzura HAs (SDRWQCB, 2007). The inland surface water quality objectives established are TDS, nutrients, iron, manganese, turbidity, and color. A summary of the TMDLs that have been adopted or are in progress for this watershed are provided in *Chapter 3, Region Description.*
Stormwater and Flood Management Major drainages within the watershed include the Otay River and Telegraph Canyon Creek, which encompass drainage areas of approximately 123 and 7 square miles, respectively. The peak discharges during a 100-year event for Otay River and Telegraph Canyon Creek are 22,000 and 2,800 CFS, respectively. Within the watershed, the acreage of land uses within mapped flood hazard zones total nearly 4,400 acres, and includes the following: agriculture, 18 acres; commercial and services, 170 acres; industrial, 1,238 acres; open space and recreation, 2,318 acres; residential, 267acres; and transportation, communications, and utilities, 317 acres (see Appendix 7-B, Integrated Flood Management Planning Study). Stormwater and flood management within the Otay Watershed falls under the jurisdiction of the County of San Diego Flood Control District Zone IV, the City of Chula Vista, the City of Coronado, the City of Imperial Beach, and the City of San Diego. These agencies and municipalities are responsible for flood control and drainage system facilities as well as maintaining storm drains, channels and debris basins. Stormwater and flood management is limited to developed regions in the County because much of the lands within the Otay Watershed consist of undeveloped, agricultural, and State and Federal lands and parks. There are approximately 80 miles of storm drains and drainage channel on the Otay Watershed, with the majority of this infrastructure located in the lower part of the watershed, below the Otay Reservoirs (Aspen, 2006). The Otay Reservoirs were designed primarily for municipal water supply and therefore has limited capacity for flood control. Nevertheless, the reservoirs effectively control most flows from small storms in the upstream watershed and for the most part have eliminated flooding on the main stem of the Otay River. The reservoirs impound most upstream runoff effectively leaving the mainstream of the Otay River downstream dry except during extreme rain events. The primary flood risk in the Otay Watershed is in older urbanized areas in the lower part of the watershed. Flooding issues in this area of the watershed are due to the inherent difficulty in draining low lying coastal areas, as well as from older drainage facilities that are under-sized (Aspen, 2006). Flood risks are less upstream of the Otay Reservoirs due to less development in that part of the watershed. While increased development in these areas could create more impervious areas increasing peak flow and thus flood potential, erosion potential, and modification of the overall hydrologic regime, implementation of best management practices and hydromodification mitigation measures will help to lessen these effects.

Otay Watershed

Natural Resources

The Otay Watershed supports 14 aggregated natural communities/land cover types. Within these communities reside native vegetation such as coast live oak woodland, Engelmann oak woodland, southern willow scrub, cotton-wood willow riparian forest, southern sycamore alder riparian woodlands, amongst many others.

The Otay Watershed contains important conservation areas such as the San Diego National Wildlife Refuge, Rancho Jamul Ecological Reserve and vernal pool lands. Approximately 36 square miles of the Otay Watershed is part of the MSCP effort to preserve habitat for a wide range of endangered plant and animal species. The Otay Watershed has 61 sensitive plant species, seven of which are federally endangered. The seven federally endangered plants consist of the San Diego thorn-mint, San Diego ambrosia, salt marsh birds-beak, San Diego button celery, Mexican flannelbush, willowy monardella, California orcutt grass, and Otay Mesa mint. The Otay Watershed has 57 sensitive animals, nine of which are federally endangered. The nine federally endangered animals consist of the San Diego fairy shrimp, quino checkerspot butterfly, Riverside fairy shrimp, arroyo toad, southwestern willow flycatcher, California brown pelican, light-footed clapper rail, California least tern, and Least Bell's vireo (Aspen, 2006).

The Otay Watershed also contains a significant portion of the Otay Mountain Wilderness. Since 1999, BLM has been managing 18,500 acres of the Otay Mountain Wilderness and has been one of the active participants in the MSCP (BLM (a) and Public Lands Information Center (a), 2012). The Otay Watershed also contains several sensitive habitats which have been impacted by urban and rural development, livestock, grazing, and recreational use. Vernal pools are a highly specialized habitat within the Otay Watershed that supports a unique flora and fauna (Aspen, 2006). Oak woodlands are considered a sensitive habitat as they are scarce, with high wildlife value and the ability to provide watershed protection.

Invasive species have been an issue in the Otay Watershed. In an effort to remove invasive non-natives, the *Habitat Restoration Plan and Non-Native Plant Removal Guidelines* were drafted in 2006 by the City of San Diego, County of San Diego, and the City of Chula Vista for the Otay Valley Regional Park (OVRP). The Guidelines provide information on how to manage and minimize the expansion of invasive non-native species within the OVRP. The OVRP is a 11-mile long park of over 8,500 acres that extends from the southeastern end of the salt ponds through the river valley up to the area surrounding both the upper and lower Otay Reservoirs (HDR, 2006). The OVRP represents one of the largest open space areas within the San Diego County linking the South San Diego Bay with the Upper and Lower Otay Lakes (BLM (a)).

The Otay Watershed landscape and vegetation is also heavily impacted by wildfire, most of which is human-caused (BLM (a)). Wildfires take out a lot of the native vegetation providing an opportunity for invasive species such as arundo and tamarisk to overrun the land, and fragmenting native habitat. Weed control projects have been put in place to help ensure native plants continue to grow in recently fire burned lands. Non-native vegetation in the Otay Watershed includes eucalyptus woodland, arundo, giant reed, salt cedar, and castor bean. The giant reed is estimated to use three times the volume of water used by native vegetation and its presence in the watershed deters the growth of native vegetation. The giant reed affects various riparian native species, alters the hydrologic regimes, reduces groundwater availability, alters channel morphology, and increase fire hazards (River Partners (a), 2012).

The San Diego Bay is an ecosystem of concern associated with the Otay Watershed; while the San Diego Bay is not technically within the watershed, there is hydrologic connectivity between the watershed and the bay. The San Diego Bay is characterized with salt marshes, tidal flats, bird nesting, foraging sites, essential fish habitats such as eelgrass beds and home to a diverse wildlife and important species of plants and animals. Several plant and animal species of the San Diego Bay are federally protected under the ESA act, such as the Salt Marsh Bird's Beak, California Least Tern, Western Snowy Plover, and Eastern Pacific Green Sea Turtle (Port (b), N.D., Port (d), 2008, and Port and NAVFAC, 2011). Invasive species in the San Diego Bay's ecosystem poses a series threat to native species. The following invasive species are present in the San Diego Bay: one species of marine algae, one marine protozoan, 47 marine invertebrates, five marine fish, and 28 species of invasive coastal plants. There at least 82 non-native species that can be found along the San Diego Bay (Port (b), N.D.).

Otay Watershed

Potential Climate Change Impacts

Climate change has the potential to impact the Otay Watershed via potential decrease in freshwater supplies, sea level rise, changes to the vital San Diego Bay habitats, and increased wildfire frequency (Port (d), 2008 and CCCC, 2009).The Otay Watershed is highly dependent on imported water supplies from the State Water Project and the Colorado River. Climate change is expected to pose challenges to imported water sources to the region as snowmelt is an important contributor to the region's imported supplies; snowmelt is expected to decrease with increasing temperatures. Climate change can have potential effects on the watersheds water demands; increases in temperature can increase industrial and residential water demands, impacting companies' decisions to locate business within the Otay Watershed.

Sea level rise in the Otay Watershed along the San Diego Bay and Pacific Ocean will have a potentially significant impact on shoreline structures and intertidal and subtidal habitats. The Otay Watershed has a widespread beach community and sea level rise has the potential to damage coastal infrastructure, recreation, and negatively impact tourism. Tidal habitats in the San Diego Bay are home to a large diversity of wildlife that is strongly influenced by climate regime shifts (CCCC, 2009). Increases in temperature could shift vital eelgrass beds due to changing water clarity, depth and temperatures. Increased high tides and storm surges may deplete and/or destroy vital tidal habitat for avian species that live and feed in the area. Marginal bay habitats would be at risk as these require special salinity conditions, intermittent inundation, and light penetration. Changes in sea temperature could affect coastal ecosystems dynamics sensitive to temperature changes.

The rapid rate of climate change can pose a problem to many of the watershed's endangered and threatened species, which may be unable to adapt fast enough to habitat shifts and increasing temperatures. With the predicted rapid changes in climate, it is expected the list of species at risk in the Otay Watershed will only increase. Additionally, changes in climate can make conditions much more favorable for invasive species in the watershed reducing available habitat space for native species.

Wildfires in the Otay Watershed are a common occurrence, particularly in the undeveloped regions of the watershed. Climate change has the potential to impact the wildfire season in the watershed. Research suggests Santa Ana conditions, dry hot winds which blow from the mountains to the deserts in the east, may increase earlier in the fire season (September) and decrease later in the season (December). A shift to earlier Santa Ana wind occurrences could mean an increase frequency in Santa Ana related wildfires (CCCC, 2009). A longer wildfire season can create large scale damage to many residential homes particularly with the increased level of ongoing urbanization in the Otay Watershed.

Post-wildfire rain events in the watershed cause erosion, mudslides, and sedimentation which create negative water quality issues. Stormwater runoff from post-wildfire rain events in the watershed have shown to carry high levels of turbidity, nutrients, and TDS. An increased wildfire season can increase erosion and sedimentation process in the watershed, negatively impacting water quality in streams and local reservoirs. The potential effects on the Upper and Lower Otay Reservoirs include increased sedimentation with loss of storage, temporary increases in turbidity, and increased water treatment needs and costs. Rain events after wildfires are also known to create flash floods in the Otay Watershed. Increased frequency of wildfires will increase the frequency of flash floods which current stormwater infrastructure in the Otay Watershed may not have the capacity to withstand.

Climate change also has the potential to create changes in precipitation which can decrease seasonal stream flows in the Otay Watershed. Decreased seasonal stream flows will create stream flows with irrigation/dry weather flows, thus increasing the concentration of constituents and requiring stream flows to receive a greater level of treatment.

Otay Watershed
Management Issues and Conflicts Population in the Otay Watershed is expected to double by 2031. An increase in population increases developments, impervious surfaces, and urban runoff which could impact water quality and add additional strain on the dynamic ecosystem of the watershed (Aspen, 2006). Without effective watershed based management in the Otay Watershed, increased developments, impervious surfaces, and population growth could lead to a degrading of the watersheds natural resources. Under the City of Chula Vista General Plan, the land planned for residential use will increase from 3,089 acres to 5,676 acres (84% increase). Land for open space/vacant and water use is expected to decline from 9,624 acres to 5,141 acres representing a 47% loss (Aspen, 2006). In the eastern territories of the Otay Watershed, approximately 10,800 acres have been proposed for residential land use while the proposed open space use would decrease from 34,796 acres to 20,607 acres (Aspen, 2006). Development in the overall Otay Watershed is expected to increase which is likely to create new or increase watershed management issues that need to be addressed before new development commences. Given water quality concerns in this watershed, it is also a notable issue that there are no adopted TMDLs in this watershed; resource limitations such as funding to implement water quality protection and improvement programs are considered a barrier to implementation of such measures. The Otay River flows are significantly controlled (69%) via dams and reservoirs which has significantly altered the river flow regimes. The altered flow regimes have a negative impact on various native plant and wildlife communities that depend on the Otay River flows as a food source, home, and reproduction. The impoundment of water at the reservoirs have reduced natural flows and changed the chemical and physical characteristics of the Otay River. Reduced stream flows can create poor water quality conditions in the lower portion of the Otay River which affect the aquatic communities. Lastly, the reservoirs also distort the sediment equilibrium in the downstream Otay River as nearly all of the bed sediment of the upper watershed is retained by the reservoirs (Aspen, 2006).

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5.11 Tijuana Watershed

The Tijuana Watershed (Tijuana Hydrologic Unit or Tijuana HU (911)) encompasses 1,750 square miles on either side of the U.S./Mexico border. Twenty-seven percent of the watershed area (467 square miles) is within California; a majority of this area is in the upper reaches of the watershed. Figure 5-12 presents a map showing the boundaries and features of the portion of the Tijuana River Watershed that is within the Region.

The lower Tijuana River flows from Mexico across the International Border to the Tijuana Estuary in California. Morena and Barrett Reservoirs are located in the upstream portion of the watershed. Water impounded in these reservoirs is transferred to the Otay River Watershed via the Dulzura Conduit. Urban centers within the watershed include the cities of Imperial Beach and San Diego in the United States, and the cities of Tijuana and Tecate in Mexico. The total population of the watershed is approximately 2.8 million people; according the 2010 U.S. Census data, approximately 83,000 people live within the watershed within the United States.

Urban stormwater runoff pollution from Tijuana, Mexico has created significant impacts within the 8-square mile Tijuana River Valley and Tijuana River Estuary.

Barrett Dam, shown releasing water, stores surface water in the upper portion of the Tijuana Watershed.
Photo credit: Jeff Pasek, City of San Diego

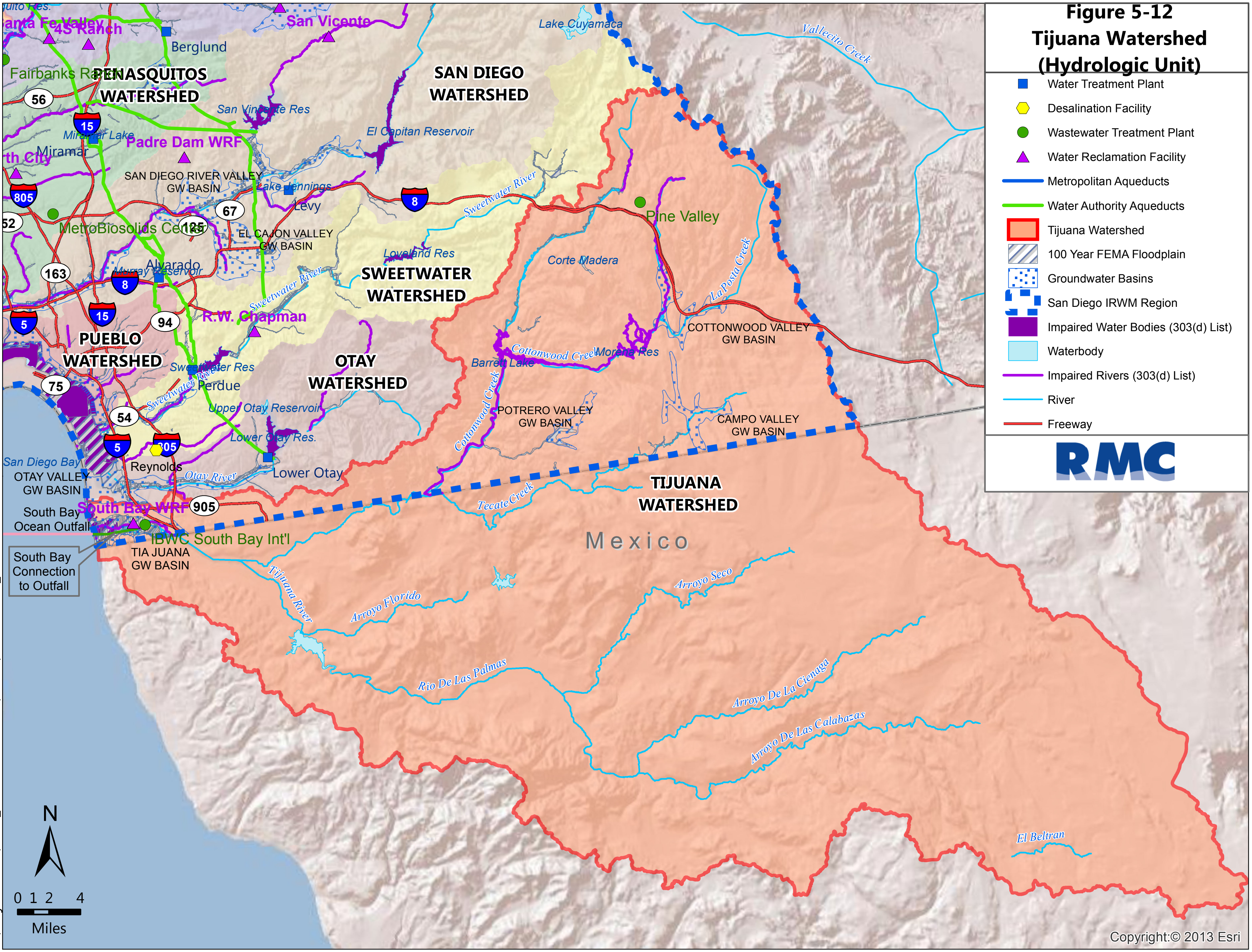

Figure 5-12
Tijuana Watershed (Hydrologic Unit)

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Tijuana Watershed

Hydrology

The Tijuana Watershed is comprised of eight HAs on the U.S. side of the border: Tijuana Valley (911.1), Portrero (911.2), Barrett (911.3), Monument (911.4), Morena (911.5), Cottonwood (911.6), Cameron (911.7), and Campo (911.8) HAs (County of San Diego (a), 2008). HAs are designated by the State of California, which has no jurisdiction outside of California. Therefore, HAs are not defined for the entire Tijuana Watershed. Instead, the Binational Vision for the Tijuana River Watershed (2005) defines twelve subbasins. Two are entirely within the United States: Pine Valley and Upper Cottonwood; three are bi-national: Lower Cottonwood/Río Alamar, Río Tijuana, Campo Creek; and seven are entirely within Mexico: El Florido, Río Seco, Las Palmas, La Ciénega, Las Calabazas, Las Canoas, and El Beltrán.

The major water bodies in the United States include the Tijuana Estuary, Tijuana River, Cottonwood Creek, Pine Valley, Campo Creek, Barrett Reservoir, and Lake Moreno. Major water bodies in Mexico include the Rio Las Palmas system which joins with the Cottonwood-Alamar system (primarily in the U.S.) to form the Tijuana River, the El Carrizo Reservoir, and the Abelardo L. Rodríguez Reservoir,

The Tijuana River is an intermittent river that originates in both the United States and Mexico and then enters the U.S. at San Ysidro about five miles east of the Pacific Ocean. The Tijuana River flows through the Tijuana Slough National Wildlife Reserve, one of the largest in Southern California and into the Pacific Ocean about one mile south of Imperial Beach.

The U.S. Border Fence runs along most of the border with Mexico in the San Diego IRWM Region, which has the potential to affect hydrology in the Tijuana Watershed. Some potential impacts of the border fence include increased risk of flooding due to diverted or obstructed water ways, or otherwise altered natural drainages; reduced infiltration and subsequent reduction in groundwater levels; changes in natural drainages that lead to standing water; deflection of runoff (due to obstruction of waterways) to low-lying, often agricultural, areas; public health problems related to stagnant water such as increase in diseases carried by mosquitos (SEMARNAT et al., 2007). The border fence itself is also considered a significant hydromodification that can impact hydrology and natural hydrologic flows.

Annual precipitation varies from less than 10.5 inches near the coast to more than 22.5 inches in the inland areas (Copermittees, 2012).

Water Systems

Water supply for urban uses in the Tijuana Watershed includes surface runoff, imported water, and groundwater pumping. Imported water in the U.S. portion of the watershed is currently purchased from the San Diego County Water Authority. During wet years no imported water is purchased, however during dry years imported water is purchased and stored in reservoirs in the fall/winter months. The Mexico portion of the watershed imports water from the Colorado River through the Colorado River Aqueduct.

Two water supply reservoirs are located in the Tijuana Watershed on the U.S. side:

- Morena Reservoir, owned by City of San Diego and stores surface water. Morena Reservoir is the highest (3,000 feet above sea level) and the most remote of the City's reservoirs. The reservoir has a water storage capacity of approximately 50,700 AF (CSD (a), 2012).
- Barrett Reservoir, owned by City of San Diego and stores surface water. Barrett Reservoir is located 35 miles east of San Diego and has a water storage capacity of approximately 34,800 AF (CSD (b), 2012).

Two other reservoirs located in Mexico also reside in the Tijuana Watershed (BWAC, 2005):

- Abelardo L. Rodríguez Reservoir (Rodriguez Reservoir) has a storage capacity of 111,067 AF, and is the primary local surface water supply for the city of Tijuana.
- El Carrizo Reservoir has a storage capacity of 32,428 AF, and is supplied by the Colorado River Aqueduct.

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Morena Reservoir is connected to Barrett Reservoir by Cottonwood Creek. Water from both the Morena and Barrett reservoirs is transported to the Otay via the Dulzura Conduit when capacity exists within the Lower Otay Reservoir. Therefore, water levels in both the Morena and Barrett Reservoirs are allowed to fluctuate in order to help maintain minimum water levels in the Lower Otay Reservoir (County of San Diego (a), 2008).

The South Bay International Wastewater Treatment Plant (SBIWTP), located in San Diego County just 2 miles west of the San Ysidro Port of Entry, can treat 25 MGD of sewage (IBWC (a), N.D.). The SBIWTP treats sewage originating in Tijuana, Mexico and discharges it to the Pacific Ocean. The SBIWTP treats wastewater to minimize and prevent the contamination of the Tijuana River from sewage flows originating from Tijuana. Both the U.S. and Mexico share the operation and maintenance expenses of the SBIWTP. The Mexico portion of the watershed has a 25 MGD wastewater treatment plant, San Antonio de los Buenos Wastewater Treatment Plant. Though a 17 MGD expansion was planned for this plant, it was abandoned when the SBIWTP was built (IBWC (b), N.D.).

The South Bay Water Reclamation Plant is a water reclamation plant owned and operated by the City of San Diego, and located in the Tijuana River Valley. This water reclamation plant provides wastewater treatment services to the City's South Bay service area, and also produces recycled water for beneficial reuse purposes. The plant's current capacity is 15 MGD, and in 2010 the plant produced 4.2 MGD of recycled water for beneficial reuse purposes (City of San Diego, 2011).

On the U.S. side of the border, the Tijuana Watershed has four underlying groundwater basins: Tijuana (9-19), Cottonwood Valley (9-27), Campo Valley (9-28), and Portrero Valley (9-29). The Mexican side of the border in the Tijuana Watershed has three geohydrologic zones: the Tijuana Valley, Tecate Valley, and Valle de Las Palmas (BWAC, 2005). The Tijuana Watershed's U.S. groundwater basins are considered low priority basins for Salt and Nutrient Management Plans (SNMPs), and it is not anticipated that SNMPs will be required for these basins in the future. For more information on SNMPs and basin prioritization, see *Chapter 7, Regional Coordination*.

Tijuana groundwater basin underlies the portion of the coastal Tijuana River Valley that lies in California. The Tijuana basin is bordered by the Mexican international border on the south, the Pacific Ocean on the west, and the semi-permeable Pleistocene and Pliocene marine deposits on the east and north. The Tijuana basin consists of two water bearing units, the quaternary age alluvium and San Diego Formation, with the most productive unit in the basin being the quaternary alluvium. Recharge in the Tijuana basin is mainly from the Tijuana River and from controlled releases from the Barrett, Morena, and Rodriguez reservoirs. Some recharge also occurs from irrigation and discharge from septic tanks (DWR (a), 2006).

Cottonwood Valley groundwater basin underlies portions of Cottonwood, Cameron, and La Posta Valley in eastern San Diego County (DWR (b), 2004)). The quaternary alluvium and residuum are the primary water bearing units in Cottonwood Valley basin.

Campo Valley groundwater basin underlies the Campo Valley. The quaternary alluvium is the primary water bearing unit in the Campo Valley basin. Recharge is primarily from direct precipitation and effluent from a small number of septic tanks (DWR (c), 2003).

Portrero Valley groundwater basin underlies a small valley 30 miles inland from San Diego and about 2 miles from the Mexican border (DWR (d), 2004). The quaternary age alluvium and residuum are the principal water bearing units in the Portrero Valley basin. Recharge is primarily from percolation from ephemeral stream flows.

The three groundwater basins in the Mexico portion of the watershed are primarily sandy alluvium, and recharged by creeks and rivers.

Internal Boundaries and Land Uses

The Tijuana Watershed encompasses a region approximately 1,720 square miles and covers approximately 1.12 million acres on both sides of the international border between California and Baja California, Mexico. Only 27% (467 square miles) of the Tijuana Watershed is within California (County of San Diego (a), 2008). The Tijuana Watershed is bounded on the north by the Otay Watershed, the south by the remainder of the

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watershed within Baja California, the west by the Pacific Ocean, and the east by the Anza Borrego Watershed of the Colorado River Basin.

The Tijuana Watershed has several jurisdictions with land use authority which include the cities of Imperial Beach and San Diego, the County of San Diego, and several Mexican municipalities. Within the U.S. portion of the watershed, primary land uses are vacant and undeveloped land (59%) and open space/parks and recreation (25%). Other land uses include residential and spaced rural residential (9%), agriculture (3%), and transportation (2%) (Copermittees, 2012). In the Mexican portion of the WMA, land use is predominately vacant and undeveloped land, which is most commonly used for low-intensity cattle and goat grazing (81.8%) (Copermittees, 2012).

Tribal lands associated with four separate tribal reservations are located within the United States portion of the upper Tijuana Watershed. Those tribal reservations include the Ewiiaapaayp Reservation, Manzanita Reservation, La Posta Reservation, and Campo Reservation. These tribal lands account for approximately 8% of the total area of the Tijuana Watershed that is located within the United States.

The South Bay International Wastewater Treatment Plant is a bi-national water quality improvement project headed by the International Boundary and Water Commission (IBWC). This project is an example of a cooperative solution to a complex watershed-based issue that spans multiple jurisdictions. The shared resource of the Tijuana River, which flows indiscriminately between the United States and Mexico and into the Pacific Ocean through the Tijuana River Estuary, was heavily impacted by sewage discharge largely from the City of Tijuana in Mexico. After decades of failed or inadequate solutions to the issue of wastewater impacts on the Tijuana River and Tijuana River Estuary, the IBWC developed an agreement between the United States and Mexico to pump wastewater from the Mexican side of the border to the United States side of the border to a co-owned and operated wastewater treatment facility that would treat sewage to meet water quality standards established by the United States. Currently, the South Bay International Wastewater Treatment Plant treats 25 MGD of wastewater to secondary standards prior to discharge to the Tijuana River. The treatment plant has the capacity to treat approximately 90% of the sewage produced in the urban areas of the City of Tijuana, Mexico, and has led to increased protection of human and environmental health on both sides of the border.

Water Quality and Water Quality Impairments

The Tijuana Watershed is one of the most severely water quality impacted watersheds in the San Diego County, primarily in the western lower portion of the watershed. The eastern portion of the watershed is known to have higher water quality, but with increasing development water quality issues could arise in the near future. The Tijuana Watershed is classified as a Category I (impaired) watershed by the State Board due to its array of water quality problems (PCW (a), N.D.).

Eight water bodies within the U.S. portion of the Tijuana Watershed are listed on the 303(d) list:

- Tijuana River for indicator bacteria, eutrophication, dissolved oxygen (DO), pesticides, solids, synthetic organics, trace elements, trash, phosphorus, sedimentation/siltation, selenium, surfactants, nitrogen, and toxicity,
- Tijuana River Estuary for indicator bacteria, eutrophication, DO, lead, nickel, pesticides, thallium, trash, and turbidity,
- Pacific Ocean shoreline (0.75 miles north of Tijuana River, Monument Road, Tijuana River Mouth, Seacoast drive, and U.S. Border) for *Enterococcus,* fecal coliform, or total coliform

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- Barrett Reservoir for color, manganese, perchlorate, nitrogen, and pH
- Pine Valley Creek for turbidity
- Tecate Creek for selenium
- Cottonwood Creek for selenium
- Morena Reservoir for ammonia as nitrogen, color, manganese, pH, and phosphorus

Pollutants of concern and stressors within the watershed include eutrophic conditions, nutrients, pathogens, pesticides, metals/metalloids, sedimentation/siltation, salinity, toxicity, trash, and other organics (Copermittees 2012). The sources of the pollutants are varied and include urban runoff/storm sewers, wastewater, agriculture, erosion, streambed modifications and destabilization, natural sources, septic systems, and unknown point and non-point sources (SDRWQCB, 2010).The major impacts from these pollutants/stressors consist of surface water quality degradation, groundwater quality degradation, trash, sedimentation, and eutrophication.

Surface water quality in the Tijuana Watershed, primarily the Tijuana River, has been adversely affected by runoff from across the international border with Mexico. Significant improvements have been made in the City of Tijuana to collect and treat its sewage; however not all households are yet connected to the city's sewer system. Following rain events, sewage and trash from the City of Tijuana flow into the Tijuana River and are transported to the Tijuana River Estuary.

During rain events, surface runoff containing trash and wastewater enter the Tijuana River and flow through the watershed into the Tijuana Estuary and ultimately into the Pacific Ocean. The lower portion of the Tijuana Watershed receives runoff which has been recorded to contain high concentrations of sediment, trace metals, coliform bacteria, polychlorinated biphenyls (PCBs) and other urban, agricultural, and industrial pollutants. Depending on ocean currents, these pollutants impact the beach water quality from Playas de Tijuana to Coronado (Wildcoast (a), 2012).

The Tijuana River Valley Recovery Team (Recovery Team) was created in 2008 in an effort to address water quality issues in the Tijuana River Valley. The Recovery Team completed and released the *Tijuana River Valley Recovery Strategy* in January 2012 (TRVRS, 2012). This document was developed with input from stakeholders on both sides of the border and establishes a strategy for managing sediment and trash in the watershed, as well as, for the protection of natural resources. The upper watershed is primarily open space, with little to no urbanization, while water quality issues are primarily found in the watershed downstream of dams on both sides of the U.S.-Mexico border (TRVRS, 2012).Furthermore, a Water Quality Improvement Plan will be developed for the United States portion of the Tijuana Watershed in accordance with the 2013 MS4 Permit, which will address some of the sources of pollutant loading into the water bodies and determine actions that can be taken to improve water quality. Efforts associated with the 2013 MS4 Permit will present opportunities for coordinated IRWM projects to ensure that the efforts are integrated to achieve maximum benefits.

The Tijuana groundwater basin is sodium chloride in character (DWR 2006). The basin contains chloride and sulfate concentrations that exceed the maximum contaminant level (MCL) at some wells, as well as for aluminum, barium, lead, selenium, and silver concentrations. The Cottonwood Valley groundwater basin and the Campo Valley groundwater basin are calcium bicarbonate in character (DWR 2003 and 2004a). The Campo Valley groundwater basin has been rated suitable for domestic and irrigation uses (DWR 2003). The Portrero Valley groundwater basin's water character is variable with calcium and sodium as the dominant anions and bicarbonate and chloride as the dominate anions (DWR 2004b).

Specific water quality objectives have been established in the Basin Plan for the eight individual HAs. The inland surface water quality objectives established are for TDS, nutrients, iron, manganese, and color. A summary of TMDLs that have been adopted or are in progress are provided in *Chapter 3, Region Description.*

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Stormwater and Flood Management

A major drainage within the watershed is the Tijuana River, which encompasses a drainage area of 1,700 square miles. The peak discharge during a 100-year event at the mouth of the river is 75,000 CFS. Within the watershed, the acreage of land uses within mapped flood hazard zones total over 7,700 acres, and includes the following: agriculture, 800 acres; commercial and services, 188 acres; industrial, 23 acres, open space and recreation, 4,758 acres; residential, 852 acres; and transportation, communications, and utilities, 319 acres (see Appendix 7-B, Integrated Flood Management Planning).

Stormwater management is limited to the County of San Diego for most of the upper watershed due to its undeveloped, park, and agricultural uses on unincorporated lands. The City of Imperial Beach and the County of San Diego are responsible for municipal stormwater runoff in the lower portion of the watershed. Polluted urban runoff during rain events enters the Tijuana River which affects the water quality of the Tijuana River Estuary downstream, potentially impacting sensitive habitat and ecosystems. Erosion and sedimentation issues, even after light rain events, are a serious issue within the Tijuana Estuary. Sediment in the Tijuana River carried by stormwater originating in Mexico has been responsible for the destruction of at least 20 acres of salt marsh (Wildcoast). The municipality of Tijuana is responsible for stormwater management in its urban center, and Mexico has channelized a portion of the Tijuana River to combat flood risks. A binational flood warning system was installed in 2003 (BWAC, 2005).

The Tijuana Watershed is part of the City of San Diego's planned efforts to further protect the streams and ocean from stormwater pollution. A Watershed Urban Runoff Management Plan (WURMP) was written for the Tijuana Watershed in which it details the projects and activities that are planned for the watershed to protect from storm water pollution (CSD (c), 2012).

Natural Resources

The Tijuana River Estuary occupies over 2,000 acres of land and is one of the few intact wetlands in Southern California. The Tijuana River Estuary is among one of the most biologically productive systems on earth and contains sand dunes to coastal sage scrub, including riparian habitat, mudflat/tidal channels, salt marsh, salt panne, brackish-freshwater marsh, transition habitat, and upland habitat. The Tijuana River Estuary is home to more than 370 species of birds, six of which are threatened or endangered, and several endangered plant species (California's Critical Coastal Areas, 2006). One of the most sensitive habitats in the Tijuana River Watershed is the vernal pools which are highly specialized habitats that support unique flora and fauna (California's Critical Coastal Areas, 2006). The Tijuana River Estuary receives flows from the Tijuana River which carry nonpoint source pollution flows from Tijuana, Mexico. Managing the Tijuana River Estuary's cross-border water quality issues adds an extra layer of complexity to how the estuaries resources are managed (NOAA, 2004).

Tijuana River National Estuarine Research Reserve (TRNERR) encompasses approximately 2,293 acres and is designated by the Ramsar Convention as a *Wetland of International Importance*, (Wetlands Recovery Project (a)). The reserve is owned and operated by the California Department of Parks and Recreation (CDPR), U.S. Fish and Wildlife Service, the City of San Diego, the County of San Diego, and the U.S. Navy. It encompasses beach, dune, mudflat, saltmarsh, riparian, and coastal sage and upland habitats.

Marron Valley occupies approximately 2,300 acres of the southeastern portion of the City of San Diego's MSCP. The valley primarily consists of sage scrub and chaparral vegetation with large drainages that support significant stands of riparian habitat functioning as wildlife corridors (County of San Diego *et. al.*, 1997). Marron Valley provides wildlife habitat and protect lands surrounding the San Ysidro Mountains.

The Tijuana River valley floodplain consists of a mixture of agricultural fields, rural housing, and riparian woodland. The mesas and canyon areas in the Tijuana Watershed contain coastal sage, maritime succulent scrub communities, riparian and chaparral habitat. Several species found in the floodplain region of the Tijuana Watershed consist of Shaw's agave, Orcutt's birds-beak, wart-stemmed ceanothus, San Diego barrel cactus, least Bell's vireo, lightfooted clapper rail, Belding's savannah sparrow, California least tern, Western snowy plover, northern harrier, Cooper's hawk, and the California gnatcatcher (County of San Diego (b), 1997).

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Invasive species within the Tijuana Watershed pose series threats to the native species. The following invasive species are present in the Tijuana Watershed: sea fig, tamarisk, giant cane, castor bean, salt cedar, and *arundo donax* (County of San Diego (b), 1997; SMSLRWMA, 2004). Tribal nations in the Region have indicated concern that jurisdictional habitat conservation efforts such as those described above may not consider current or future tribal developments, and tend to categorize tribal lands as open space for habitat and conservation planning purposes.
Potential Climate Change Impacts Climate change vulnerabilities that have been identified for the San Diego IRWM Region and are relevant to the Tijuana Watershed include but are not limited to: • Decrease in imported water supply • Decrease in groundwater supply • Decrease in surface water availability • Water quality concerns related to lower surface water flows • Sea level rise • Decrease in availability of necessary habitat • Exacerbation of wildfires • Due to the importance of imported water supply used within the Tijuana Watershed, decreases in imported water supply are anticipated to be a critical climate change impact. Due to the extensive amount of habitat and open space located within the Tijuana River Estuary, reduced surface water availability and potential water quality concerns could impact or decrease available habitat that is necessary for species survival. The Tijuana River Estuary is a very resilient ecosystem that has remained fairly stable despite its many issues (i.e. pollution and sedimentation) (Tijuana River National Estuarine Research Reserve (a), 2012). However, it is also home to a diverse wildlife that can negatively be potentially affected by significant climate regime shifts. The rapid rate of climate change can pose a problem to many of the sensitive species, such as endangered and threatened species, that will be unable to adapt fast enough to habitat shifts and increasing temperatures. With the predicted rapid changes in climate, it is expected the list of species at risk in the Tijuana Watershed will only increase. Additionally, changes in climate can make conditions much more favorable for invasive species in the watershed reducing available habitat space for native species. Sea level rise in the Tijuana Watershed could have a potentially significant impact on shoreline structures and the Tijuana River Estuary. Sea level rise has the potential to damage coastal infrastructure, recreation, and negatively impact tourism. Wildfires in the Tijuana Watershed are a common occurrence, particularly in the undeveloped regions of the watershed. Climate change has the potential to impact the wildfire season in the watershed. Post-fire rain events in the watershed cause erosion, mudslides, and sedimentation which create negative water quality issues. Stormwater runoff from post-fire rain events in the watershed have shown to carry high levels of turbidity, nutrients, and TDS. An increased wildfire season can increase erosion and sedimentation process in the watershed, negatively impacting water quality in streams, local reservoirs and the Tijuana River Estuary. The potential effects on the Morena and Barrett reservoirs include increased sedimentation with loss of storage, temporary increase in turbidity, and increased water treatment needs and costs. Rain events after wildfires are also known to create flash floods in the Tijuana Watershed.
Management Issues and Conflicts The Tijuana Watershed has various bi-national environmental problems that require developing and implementing a watershed management plan that addresses the many water resource related issues impacting both sides of the international border. Pollution is a multidimensional problem in the Tijuana Watershed that

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has impacts to the public health, the environment, and the economy of San Diego-Tijuana border communities (Wildcoast (a), 2012). Various watershed projects have already been undertaken to tackle several of the pollution and flood control issues on both sides of the international border, such as the Tijuana River Recovery Team, the Border 2012 program, BEACH act monitoring program, the Southwest Center for Environmental Research and Policy, the Tijuana Watershed Advisory Committee, and the Baja California/California Water Task Force (EPA). Though progress has been made, more bi-national work and coordination needs to be done to see a significant marked decrease in pollution and flood control related issues (NOAA, 2004). Unplanned development, industry, and population growth in Tijuana, Mexico has led to an increase in water quality issues. Many new developments in Mexico near the Tijuana River have no sewer infrastructure (Campana *et al*., 2006). No programs equivalent to the US EPA's National Discharge Elimination System (NPDES) currently exists in Mexico to minimize the threat of chemical pollutants entering and contaminating the Tijuana River and the Tijuana River Estuary. Wastewater flows originating from Tijuana and inadequate infrastructure to collect, treat, and dispose of those flows have also been long standing issues within the watershed (Wetlands Recovery Project (a), 2001). These are transboundary and cross-cultural water quality management challenges that need to be addressed (Wetlands Recovery Project (a), 2001). The Tijuana River has a diversion structure that sends flows to be treated at the SBIWTP. During periods of low flow the Tijuana River is diverted to the SBIWTP, whereas the Tijuana River flows freely once the water level rises over the diversion structure. Therefore flows downstream in the Tijuana River are nonexistent during low flow periods (summer) (Weston Solutions *et. al*., 2005). Surface water quality pollution has impacted the underlying aquifer in the Tijuana Watershed. The city of Tijuana, Mexico currently uses only 5% of the available groundwater supplies as the quality is poor from surface pollution and salt-water intrusion. The lack of sewer connections on the Mexico side of the Tijuana Watershed will only continue to degrade surface and groundwater quality. At the moment, the Tijuana Watershed relies heavily on surface water however as the population increases, groundwater will become a much needed water supply source that might not be available to either country due to contamination (Campana *et al*., 2006). Another concern in the Tijuana Watershed are the environmental regulation exemptions that have been allowed for Border Infrastructure System projects. The Department of Homeland Security has allowed for construction projects under this program to be exempt from environmental regulations which could degrade habitat and water quality in the Tijuana Watershed.

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6 Governance and Stakeholder Involvement

This chapter addresses requirements set forth in the Governance and Stakeholder Involvement standards included in the 2016 IRWM Program Guidelines (DWR, 2016). The governance structure described in this chapter pertains to governance of the San Diego IRWM Program only.

6.1 Overview

As discussed in *Chapter 2, Vision and Objectives*, the IRWM Plan Vision emphasizes the need for a consensus-based approach to water resources management within the San Diego IRWM Region (Region), and the Mission emphasizes the need for a stakeholder-driven process to develop solutions to water-related conflicts that are economically and environmentally preferable. Maximizing stakeholder and community involvement is essential to the San Diego IRWM Program.

The long-term success of an integrated regional planning effort ultimately depends on the degree to which agencies and stakeholders can effectively work together to identify common objectives and develop and implement programs and strategies to achieve them. Establishing an inclusive process that incorporates stakeholder input has been and continues to be a critical component of the IRWM Program.

The Region's IRWM planning process has featured early involvement of water management organizations and affected stakeholders, including regulatory agencies, local jurisdictions, utilities, academic institutions, non-governmental organizations, special interest groups, and the interested public. Involving representatives from disadvantaged communities (DACs), Economically Distress Areas, (EDAs), Underrepresented Communities (URCs), including Native American tribes, and Environmental Justice Communities (EJs) has been a priority. Stakeholder involvement in key program decisions will remain an ongoing priority in future IRWM planning stages.

Stakeholder involvement is a cornerstone of IRWM.
Photo credit: Rosalyn Prickett, Woodard & Curran

This chapter discusses how the stakeholder involvement process was developed to ensure that an opportunity was given to all stakeholders to actively participate in the IRWM decision-making process on an on-going basis. This chapter will also address how the IRWM governance structure and procedures were chosen to maximize functionality, participation in IRWM Plan implementation, and IRWM Plan longevity.

Since its inception in 2005, the San Diego IRWM Program has evolved in the six distinct phases shown in Figure 6-1 and detailed in Table 6-1. *Section 6.4* has further information pertaining to outreach efforts as they relate to each of these six phases of the IRWM Program.

Figure 6-1: San Diego IRWM Program Timeline

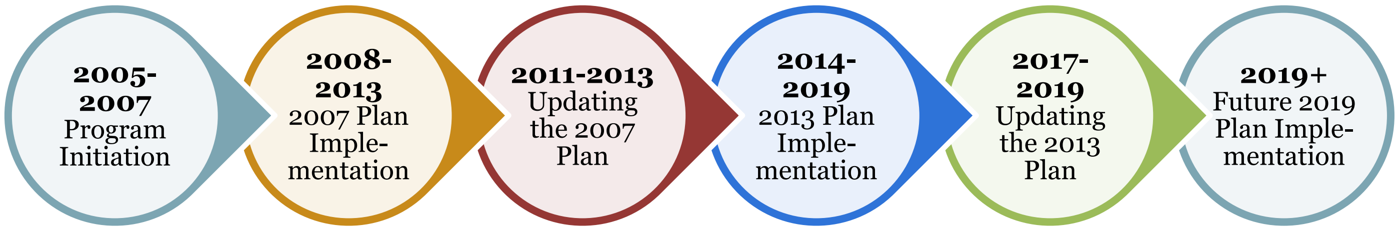


Table 6-1: Evolution of the San Diego IRWM Program

Program Phase	Description and Achievements
Program Initiation (2005-2007)	• Established the Regional Water Management Group (RWMG) as the Program's governing body via Memorandum of Understanding (MOU) • Prepared an unsuccessful Proposition 50-Round 1 implementation grant application • Established the Regional Advisory Committee (RAC) as the Program's stakeholder advisory body • Prepared and adopted the 2007 IRWM Plan • Prepared a successful Proposition 50-Round 2 implementation grant application and was awarded $25 million by the Department of Water Resources (DWR)
2007 IRWM Plan Implementation (2008-2013)	• Established the Tri-County Funding Area Coordinating Committee (Tri-County FACC) for inter-regional coordination via MOU • Maintained active RAC meetings on water management topics of interest to the regional stakeholders • Facilitated Workgroups to address issues identified in IRWM Plan • Held first San Diego IRWM Summit to solicit public input into and raise awareness of the 2013 IRWM Plan • Prepared for and received approval in DWR's Region Acceptance Process • Prepared a successful Proposition 84 planning grant application and was awarded $1 million by DWR • Facilitated public workshops and directed outreach to tribes and disadvantaged communities to solicit participation in grant opportunities • Prepared successful Proposition 84-Round 1 and Round 2 implementation grant applications and was awarded $18 million by DWR ($8 and $10 million, respectively)

Program Phase	Description and Achievements
Updating the 2007 IRWM Plan (2011 to 2013)	• Prepared 4 stand-alone planning studies on key water management topics to support the 2013 IRWM Plan; development of each study included support from a Workgroup • Facilitated two Workgroups to define IRWM governance and planning priorities for the 2013 IRWM Plan • Facilitated joint public workshops/RAC meetings to receive input and direction on 2013 IRWM Plan chapters • Facilitated public workshops in the Region's watersheds that emphasized integration in water management planning • Conducted directed outreach to tribes and disadvantaged communities to solicit participation in grant opportunities • Prepared the 2013 IRWM Plan for adoption in October 2013
2013 IRWM Plan Implementation (2014-2019)	• Maintained regular active RAC meetings on water management topics of interest to the regional stakeholders • Continued periodic outreach to DACs and tribes, primarily coordinated with RAC members • Successfully secured over $46 million in funding from Proposition 84-Round 3 and Round 4 Implementation grants, Proposition 1 Plan Update grant, and Proposition 1 DAC Involvement grant. • Held second San Diego IRWM Summit to solicit public input and identify priorities for the 2019 IRWM Plan • Completed or initiated 27 of the 40 Implementation Actions outlined in the 2013 IRWM Plan, with 5 partially completed through other efforts • Held Second IRWM Program Summit to celebrate the San Diego IRWM Program's 10th anniversary • Completed or neared completion of 33 projects funded under the San Diego IRWM Program (at least 80% complete)
Updating the 2013 IRWM Plan (2017 to 2019)	• Conducting a Water Needs Assessment to more fully address the water-specific needs of DACs, EDAs, URCs, and EJ communities in the Region, to be incorporated into 2019 San Diego IRWM Plan Update – Phase 2. • Completed a Stormwater Capture and Use Feasibility Study to identify potential opportunities and challenges for stormwater capture and use and provide guidance to project sponsors for identifying additional stormwater capture and use potential of their sites • Updated the 2013 IRWM Plan to address Proposition 1 Guidelines and regulatory changes since adoption of the 2013 IRWM Plan • Adjusted IRWM Plan goals and objectives to reflect current regional priorities identified by stakeholders
Future IRWM Plan Implementation (2019+)	• Will facilitate Workgroups as appropriate to address issues identified in 2013 IRWM Plan • Will maintain active RAC meetings on water management topics of interest to the regional stakeholders • Will continue to administer and support implementation of projects funded by IRWM grants • Will update the IRWM Plan in approximately 5 years, which will require corresponding outreach efforts, if funding is available, or a need is identified,

6.2 Stakeholder Identification and Involvement Approach

Stakeholder involvement is a vital part of the IRWM Program as a means to identify and address public interests and perceptions as well as stakeholder questions and issues. Stakeholder involvement ensures that the IRWM Plan and any proposed solutions are in keeping with public interests and provides for public ownership and support of those solutions. Stakeholder involvement is also an essential element in identifying and resolving potential water management conflicts within the Region. The Regional Water Management Group (RWMG) – composed of the City of San Diego, County of San Diego, and San Diego County Water Authority – examined the water management issues and opportunities in the Region's watersheds to identify the stakeholders with a vested interest in local water resources who could assist in articulating regional needs during the planning phase, as well as carry out projects during implementation phases. The agencies and organizations involved in water management within the Region that have been identified and contacted to participate in the IRWM program are listed in Table 6-14 (located in the final pages of this chapter), along with each group's level of actual IRWM participation. As the San Diego IRWM Program has grown and evolved, additional stakeholders have requested to participate by joining the IRWM Stakeholder email list, attending Regional Advisory Committee (RAC) meetings, or submitting projects to the online project database.

During development of the 2007 IRWM Plan, stakeholder participation was initially coordinated through Project Clean Water. The RWMG effectively leveraged the sizeable Project Clean Water database to announce IRWM planning activities to members of the public and related organizations. The Project Clean Water website (www.projectcleanwater.org) also provided a forum for disseminating information on watershed and water quality topics, as well as providing a centralized point of access to water quality information and resources in the San Diego Region. The Project Clean Water website also houses the Stormwater Capture and Use Feasibility Study that is being completed concurrently with the 2019 IRWM Plan Update. While initial coordination of stakeholder activities took place through the existing Project Clean Water forum, the RAC was formally established in December 2006, and has been the primary advisory body for the IRWM Program since that time (refer to *Section 6.3*). The RAC was the advisory body responsible for providing final input into and recommending adoption of the 2007 IRWM Plan, as well as both the 2013 IRWM Plan Update, and the 2019 San Diego IRWM Plan Update – Phase 1.

Stakeholders provided input on watersheds for the 2013 IRWM Plan.
Photo credit: Rosalyn Prickett, Woodard & Curran

In 2008, a Program website was launched (www.sdirwmp.org) to host specific information pertaining to the San Diego IRWM Program and move away from relying on the Project Clean Water website and database. The San Diego IRWM website is regularly updated with RAC meeting materials, grant funding information, and the latest IRWM efforts. Since adoption of the 2007 IRWM Plan, the RWMG has also developed an email distribution list specifically for the IRWM Program (separate from Project Clean Water). The RWMG uses the stakeholder email list to communicate regularly with IRWM stakeholders and interested parties. At key decision points – such as project solicitation for upcoming funding cycles or IRWM Plan updates – announcements are made to ensure that all interested parties are at the table. The IRWM stakeholder list has grown to over 500 contacts since adoption of the 2007 IRWM Plan. Other announcements and items of interest to IRWM stakeholders are also distributed to the email list, including water resource-related funding opportunities outside of the IRWM Program and water resource-related symposiums and forums. Stakeholders included on the IRWM stakeholder list are identified through the ongoing RAC meeting process, various outreach activities, or from referrals from other interested parties. Substantial outreach to new stakeholders, interested parties, and DACs has occurred since adoption of the 2007 IRWM Plan. Implementation of the *Public Outreach and Disadvantaged and Environmental Justice Community Involvement Plan* (2007, updated in 2012) enabled broad public support for the water management projects included in the Proposition 50 and Proposition 84 Implementation Grant Applications, and the ongoing IRWM Program activities.

Through the Water Needs Assessment being completed concurrently with the 2019 IRWM Plan Update, the San Diego IRWM region updated its list of DAC contacts. The RWMG partnered with two non-profit organizations, Rural Community Assistance Corporation (RCAC) and Climate Science Alliance (CSA), to review the DAC contacts on the stakeholder list, update it for current contact information, and identify missing organizations and individuals that might be interested in engaging with the IRWM Program. Potential new DAC contacts (including those for EDAs, URCs, and EJ communities) were sent an email to gauge their interest in learning more about the San Diego IRWM Program. Additional DAC contacts were added to the stakeholder list through their participation in RAC meetings, workshops, targeted outreach, and upon request.

6.2.1 Stakeholder Involvement Approach

The San Diego IRWM Program implements a collaborative stakeholder process that involves all interested parties and individuals. The public was, and continues to be, invited to participate in all stakeholder meetings for the IRWM Program. Public participation is welcomed at RAC and workgroup meetings and workshops. Stakeholder participation was also provided through public review and comment on draft versions of the 2013 and 2019 IRWM Plans and associated deliverables. Stakeholders were also invited to comment on individual sections or elements of the Plan (e.g., revisions to the scoring criteria) at joint RAC meeting and IRWM Plan Update Workshops. When comments are received at RAC meetings or other stakeholder workshops, the RWMG adapts the San Diego IRWM Program and its activities and documents as appropriate.

Flyer from the Watershed Workshops

Meetings and news updates are announced through both the San Diego IRWM website and through the email distribution list. Presentations have been given to agencies, organizations, and community groups, and input received during presentations has been taken back to the RWMG and the RAC for consideration. In addition, directed outreach was completed for DACs and Tribes in the Region to increase involvement and participation from stakeholders that represent these groups. For a complete description of the stakeholder involvement program, including directed outreach to DACs and Tribes, please refer to *Section 6.4*. Additional outreach was conducted for the 2018 Water Needs Assessment targeting DACs, EDAs, and URCs that have traditionally not participated in IRWM, or had limited engagement with the Program.

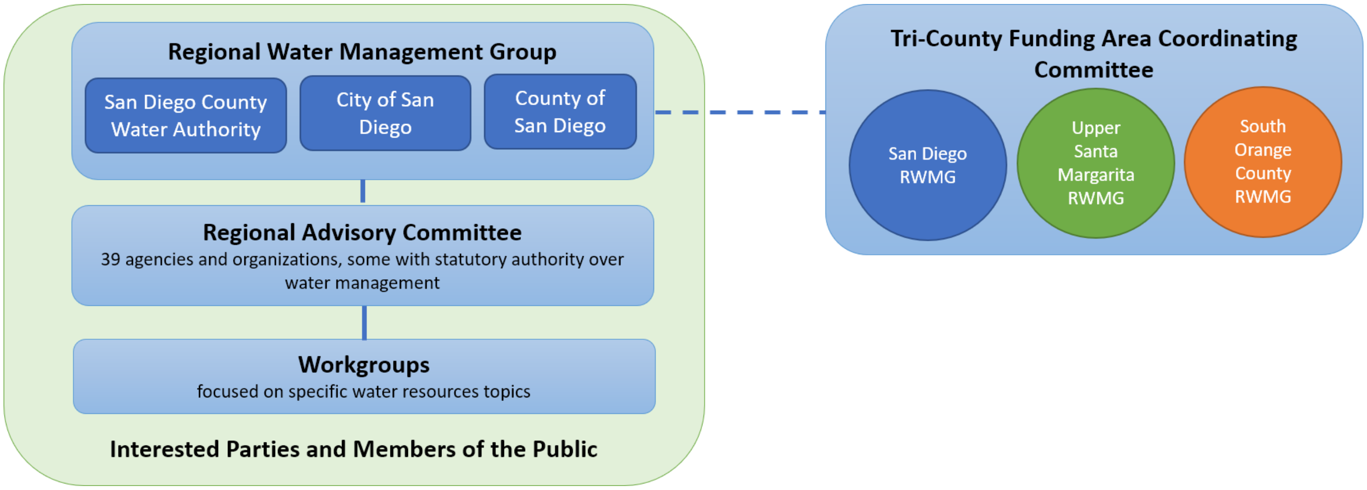
Watershed coordination groups, such as watershed councils, provide an efficient means by which a variety of stakeholders can coordinate their work on water management within a watershed. Watershed coordination groups can provide a manageable way for geographical coordination, such as in the identification of critical needs, objectives, and priorities, and the formulation of integrated projects and their coordinated implementation. The recognition of, linkage to, and promotion of watershed coordination groups will help to advance San Diego's IRWM planning process.

6.3 IRWM Governance Structure

The existing IRWM governance structure, which includes the RWMG as management committee and the RAC as stakeholder advisory committee, has continued since establishment in December 2006. The IRWM governance structure supports balanced access and opportunity for participation in the IRWM Program and ensures diverse stakeholder interests associated with water management in the Region are understood and engaged. In 2007 and again in 2009, the RAC indicated support for the existing institutional structure. The RWMG agencies adopted a Memorandum of Understanding (MOU) in September 2011 that committed funding support for program management and defined their roles and responsibilities. The MOU has since been amended twice to extend the program, and is currently being updated to include RWMG funding support through 2020. A copy of the current MOU is included as Appendix 6-A. The RWMG is responsible for implementing the IRWM Program, with input and guidance from the RAC. Through bi-monthly meetings, the RAC provides review and recommendations to the RWMG governing bodies on topics relevant to the IRWM Program. Interested stakeholders are encouraged to attend RAC meetings and workshops, submit public comments, and engage in one-on-one communication with RWMG and RAC members.

The San Diego IRWM organizational structure includes five major components – the three-party RWMG, the 39-member RAC, ad hoc Workgroups, the Tri-County Funding Area Coordinating Committee (Tri-County FACC), and interested parties and members of the public. All of these stakeholders are essential to the IRWM decision-making process. Information-sharing and decision-making processes in the Region usually funnel up from the Workgroups or down from the Tri-County FACC (if assigned) to the RAC and then proceed to the RWMG governing bodies. Input from the public and interested parties is considered at each level of the process. Figure 6-2 below provides an overview of the San Diego IRWM governance structure. Please note that Figure 6-2 does not necessarily denote the direction of information and input, but rather demonstrates the IRWM governance structure associated with final decision-making. Given that the RWMG agencies have been and are currently financially responsible for the IRWM Program, they are also ultimately responsible for final decision-making.

Figure 6-2: San Diego IRWM Governance Structure



6.3.1 Regional Water Management Group

The combined jurisdiction of the three RWMG agencies encompasses the entire Region, and their combined responsibilities address all facets of water management. The water management responsibilities of the RWMG agencies are summarized in *Chapter 1, Introduction* (see Table 1-1).

The RWMG has invested substantial resources in ensuring a successful IRWM Program.
Photo credit: Rosalyn Prickett, Woodard & Curran

The RWMG was formally established in June 2005 through development and adoption of an MOU (FYs 2005-2009), which has been amended as the Program has continued. The current MOU, signed in 2018, is currently being revised to remain in effect through 2020. The current MOU reinforces the RWMG structure set forth in the previous MOUs that identifies the three RWMG agencies as equal partners in management of the IRWM Program. The three agencies share equally in the costs to administer IRWM planning activities. The RWMG recognizes that cooperation and input from stakeholders throughout the Region is a necessary part of an effective IRWM Program. As such, the RWMG has assumed a leadership role in identifying stakeholders and soliciting stakeholder input for the IRWM Program through a variety of methods. The RWMG currently meets bi-weekly to research, review, discuss, and formulate ideas and concepts for the ongoing IRWM Program. The RWMG includes two primary levels of participation – those levels are described in detail below.

Policy Level: At the policy level, the RWMG consists of the following governing bodies:

- San Diego County Water Authority Board of Directors
- City of San Diego Mayor and City Council
- County of San Diego Board of Supervisors

Through the actions taken by the respective Boards and the San Diego City Council and Mayor, the RWMG management committed to directing staff to actively seek public involvement and stakeholder input; develop and submit Proposition 50, Proposition 84, and Proposition 1 grant applications to the appropriate State agencies; and write and adopt the 2007, 2013, and 2019 San Diego IRWM Plans. RWMG management is involved in key decisions both during and following RAC review and before presentation to the governing bodies for approval.

Staff Level: Staff from the RWMG agencies (including management-level staff), with assistance from consultants, is responsible for day-to-day activities associated with ongoing management of the IRWM Program. Based on the commitments jointly adopted in the MOU, RWMG staff has been responsible for the following activities:

- Developing and maintaining consultant contracts;
- Preparing and submitting Proposition 50, Proposition 84, and Proposition 1 grant applications, as well as the associated Region Acceptance Process application;
- Developing and updating project lists for the grant applications;
- Updating the 2007 and 2013 IRWM Plans in compliance with the *IRWM Grant Program Guidelines* and schedule established by DWR;
- Conducting stakeholder outreach and disseminating information to the public; and
- Supporting the RAC and Workgroups to develop and achieve consensus recommendations on draft documents.

Key decisions made by the RWMG are submitted to the RAC for consideration and input. Topics are generally researched by the RWMG and alternatives are presented for RAC recommendations.

The IRWM memorandum of understanding designates the Water Authority as the lead agency for purposes of applying for grants, signing grant agreements, representing the RWMG to funding agencies and administering all grant funding awarded to the Region. As the grant administrator, the Water Authority's responsibilities include contracting with DWR for grant funding, contracting with local project sponsors to distribute the funding, and managing invoicing and reporting to DWR. Water Authority staff work closely with the local project sponsors to ensure that they meet all grant requirements and complete their projects as planned. The Water Authority also works with other IRWM regions and various statewide workgroups to address common issues and needs, and to promote IRWM as a program and a concept.

6.3.2 Regional Advisory Committee

The RAC was originally formed in December 2006 to assist the RWMG with completion of the 2007 IRWM Plan and prioritization of projects both within the IRWM Plan and for future funding applications as they arose. The first RAC consisted of 28 voting members with expertise in water supply, wastewater, recycled water, stormwater and urban runoff, natural resources, and environmental stewardship. Further, there were four non-voting members who provided perspectives from the resource

agencies and adjacent IRWM regions. Table 6-2 provides a listing of all organizations that have been represented on the RAC, both in the past and currently.

During 2012, a Governance and Financing Workgroup was convened as part of the 2013 IRWM Plan development process to discuss future governance and financing structures for the IRWM Program. This workgroup met three times between January and June of 2012, and ultimately developed recommendations for the IRWM governance structure moving forward. Recommendations from this workgroup that pertain to financing are included in *Chapter 11, Implementation.* The IRWM Governance and Financing Workgroup re-validated the general program structure indicated in Figure 6-2. The workgroup also determined that the structure of the RAC was not formalized in any written format, and that a formal written charter for the RAC would be useful. To formalize the structure and responsibilities of the RAC, the workgroup drafted a RAC charter in 2012 to guide the RAC in its service as an advisory body to the RWMG on key issues related to IRWM planning and funding applications. The draft RAC charter was modified by the RAC and the RWMG, and the final version was approved by the RWMG and the RAC at a joint Public Workshop/RAC meeting on December 5, 2012. The RAC charter was amended in 2018 to include a Climate Change representative. At the same time, the RAC voted to approve the creation of a Tribal Caucus, which includes three Tribal chairs, an increase from the single Tribal representative in the 2012 charter.

RAC members attend bi-monthly meetings to provide input on IRWM planning topics.

Photo credit: Sally Johnson, Woodard & Curran

The RAC charter formalizes the establishment of the RAC; sets forth the RAC member composition, duties, and responsibilities; and outlines the organization and operation of the group. The charter created six membership categories for voting members to maintain diverse representation from the functional areas (three RWMG members, five water supply entities, six water quality entities, five natural resources and watersheds organizations, three tribes, two DACs/environmental justice organizations, and seven "other" members). The RAC consists of 31 voting members and eight non-voting members, which include federal and state regional agencies along with neighboring IRWM regions.

RAC members serve a four-year term, with half of the RAC seats opened up for enrollment every two years. Those who have already served on the RAC are not precluded from reapplying as the charter stipulates that there are no term limits. For more information, please see Appendix 6-B. The RAC strives for consensus (i.e., general agreement among all parties) to the maximum extent possible. If consensus is not achievable, the RAC votes on non-consensus issues by simple majority. For approving all financial matters (e.g., submission of projects for a grant application), a super majority (two-thirds vote) of the RAC is required.

Table 6-2: San Diego RAC Membership

RAC Member Category	Organizations in Past RACs	Organizations in Current RAC
Regional Water Management Group	County of San Diego	County of San Diego
	City of San Diego	City of San Diego
	San Diego County Water Authority	San Diego County Water Authority
Water Supply	Santa Fe Irrigation District	Santa Fe Irrigation District
	Sweetwater Authority	City of Oceanside
	Yuima Municipal Water District	Helix Water District
	City of Oceanside	Sweetwater Authority
	Helix Water District	Olivenhain Municipal Water District
	Olivenhain Municipal Water District	Rincon del Diablo Municipal Water District
Water Quality	Padre Dam Municipal Water District	San Elijo Joint Powers Authority
	San Elijo Joint Powers Authority	City of Chula Vista
	City of Chula Vista	City of Oceanside
	Industrial Environment Association	City of Imperial Beach
	City of Encinitas	San Diego Coastkeeper
	Otay Water District / Metro Joint Powers Authority	San Diego County Office of Education
	San Diego Coastkeeper	-
	University of California Cooperative Extension	-
Natural Resources / Watersheds	San Dieguito River Valley Conservancy	San Diego River Park Foundation
	The Nature Conservancy	Lakeside River Park Conservancy
	San Elijo Lagoon Conservancy	California Trout
	San Diego River Park Foundation	University of California, San Diego Clean Water Utility
	California Coastal Conservancy	Padre Dam Municipal Water District
	Mission Resource Conservation District	-
	Buena Vista Lagoon Foundation	-
	California Landscape Contractors Association	-
	UCSD Clean Water Utility	-
	Padre Dam Municipal Water District	-
Tribal	San Pasqual Band of Mission Indians-	San Pasqual Band of Mission Indians
	La Jolla Band of Luiseno Indians	*Open (Tentative)*
	-	*Open (Tentative)*
DACs / Environmental Justice	Groundwork San Diego-Chollas Creek	Alter Terra
	Rural Community Assistance Corporation	Rural Community Assistance Corporation
Other / At Large	San Pasqual Band of Mission Indians	Floodplain Management Association
	Planning & Engineering for Sustainability	Building Industry Association
	San Diego Coastkeeper	Escondido Creek Conservancy
		Farm Bureau of San Diego County
	Farm Bureau of San Diego County	San Diego Association of Governments
	San Diego Regional Chamber of Commerce	San Diego Zoo Global
	San Diego Association of Governments	Climate Change - *Open*
	SDSU Department of Geography	-
	Floodplain Management Association	-
	SDSU Center for Regional Sustainability	-
	San Diego Zoo Global	-

RAC Member Category	Organizations in Past RACs	Organizations in Current RAC
Regulatory / Tri-County FACC (Non-Voting)	San Diego Regional Water Quality Control Board	San Diego Regional Water Quality Control Board
	U.S. Bureau of Reclamation	U.S. Bureau of Reclamation
	County of Orange	County of Orange
	Rancho California Water District	Rancho California Water District
	USMC Camp Pendleton	USMC Camp Pendleton
	California Coastal Conservancy	California Coastal Conservancy
	-	U.S. Forest Service
	-	U.S. Indian Health Services

To date, the RAC has played a critical role in the following IRWM Program decisions

- Recommending formal adoption of the 2007 IRWM Plan;
- Shaping and developing such key elements of the IRWM Plan as goals and objectives, long-term targets, and resource management strategies;
- Reviewing progress on 2007 IRWM Plan implementation and identifying strategic improvements for the 2013 IRWM Plan;
- Reviewing and recommending a proposed Region boundary for the Region Acceptance Process application;
- Developing and implementing a project prioritization process for the IRWM Plan (i.e., project ranking criteria) and secondary criteria for the Proposition 50, Proposition 84, and Proposition 1 applications;
- Recommending projects for IRWM funding;
- Refining and updating the framework for implementation of the 2013 IRWM Plan;
- Recommending formal adoption of the 2013 IRWM Plan;
- Identifying and directing the formation of Workgroups to facilitate progress toward short-term priorities in the IRWM Plan;
- Approving new RAC members in accordance with the RAC charter;
- Approving the submittal of application packages for Proposition 50, Proposition 84, and Proposition 1 grants;
- Accepting the San Diego County Region Stormwater Resource Plan into the 2013 IRWM Plan; and
- Informing updates for the 2019 IRWM Plan Update – Phase 1.

The RAC currently meets on a bi-monthly basis to provide guidance on upcoming IRWM planning and funding application activities. The RAC may be convened more frequently, as needed. In addition to providing IRWM Program updates, the RAC meetings are used as a forum for educating the group on issues that cut across various aspects of water management (“cross-threading”) to build a knowledge base for ongoing IRWM planning.

6.3.3 Workgroups

Workgroups are formed to enable participants in the IRWM Program to work through particular topics and develop recommendations for the larger group. The RAC receives Workgroup recommendation(s) and subsequently makes its final recommendation(s) to the RWMG governing bodies. Workgroups members are nominated by the RAC but are not required to be RAC members; interested parties and members of the public are welcome as long as they have relevant experience and perspective to actively contribute to Workgroup decisions. Fourteen Workgroups, described in Table 6-3, have been formed to date to support the IRWM Program.

Breakout groups are used at RAC meetings to ensure that all stakeholders have a chance to weigh in.

Photo credit: Sally Johnson, Woodard & Curran

Table 6-3: Workgroups

Workgroup	Purpose/Objectives	Members	Results
Program Initiation (2005-2007)			
Proposition 50 Project Selection	Develop a package of water management projects for inclusion within the Region's 2008 Proposition 50 Implementation Grant Application	3 RWMG; 1 water supplier; 1 water quality; 2 natural resources; 2 at large = 9 total	Package of 20 water management projects totaling $25 million in grant funding (*Note: Proposition 50 grant package was ultimately reduced to 19 projects by project proponents [one dropped] and DWR, in collaboration with the RWMG and RAC.*)
2007 IRWM Plan Implementation (2008-2013)			
Watershed Planning and Outreach	Develop guidance for watershed groups on how to identify competitive multi-benefit projects for the IRWM grant cycle(s); Develop a strategy for outreach/coordination with watershed groups to encourage submittal of multi-benefit projects for the Proposition 84/1E funding cycles; Identify critical water supply and water quality needs for DACs within the Region's watersheds; and Develop a strategy for outreach/ coordination with DACs to encourage submittal of multi-benefit projects for the Props 84/1E funding cycles that address critical needs	RAC member volunteers and representatives from each of Region's 11 watersheds	Developed outreach strategy targeting DACs presented at the February 2009 RAC meeting
Proposition 84-Round 1 Project Selection	Develop a package of water management projects for inclusion in the Region's 2011 Proposition 84-Round 1 Implementation Grant Application	3 RWMG; 1 water supplier; 1 water quality; 2 natural resources; 2 at large = 9 total	Package of 11 water management projects totaling $7.9 million in grant funding

Workgroup	Purpose/Objectives	Members	Results
Updating the 2007 IRWM Plan (2011-2013)			
IRWM Governance and Financing	Examine expansion of funding sources for the San Diego IRWM Program; Develop RAC charter, including membership guidelines, definition of "consensus," and potential voting rules	12 RAC members and volunteers	Developed draft RAC Charter for consideration during multiple 2012 RAC meetings and incorporated into 2013 IRWM Plan
Priorities and Metrics	Refine IRWM Program vision, mission, goals, and objectives; Develop a recommended list of IRWM Plan metrics that describes the Region's targets; Address how the IRWM Program will obtain the data needed to measure progress toward implementation of the IRWM Plan; Develop recommendations for prioritization of program objectives, project-prioritization criteria, and funding application prioritization; and Develop a strategy that will provide planning opportunities for integration of projects prior to future "calls for projects" when funding opportunities arise	15 RAC members and volunteers	Developed revised draft Goals, Objectives, Targets and Metrics presented to RAC at October 2012 meeting and incorporated into 2013 IRWM Plan; Developed revised draft Project Evaluation Process presented to RAC at April 2013 meeting and incorporated into 2013 IRWM Plan
Regulatory	Identify issues affecting the San Diego Regional Water Quality Control Board (San Diego Water Board) regulation and water resources management; Identify IRWM Program needs/activities and how those relate to San Diego Water Board needs/activities; and Identify and prioritize IRWM/San Diego Water Board collaborative opportunities	18 RAC members and volunteers; 2 San Diego Water Board staff members; 1 San Diego Water Board member	Developed Regulatory Workgroup Report presented to RAC at February 2013 meeting and incorporated into 2013 IRWM Plan
Land Use Planning	Define current relationships between land use and water managers in the San Diego Region; Identify issues and opportunities related to water resources and land management; and Identify methods to increase collaboration and coordination between land planners and water managers	All interested RAC members and stakeholders	Developed Land Use Planning Study presented to RAC at February 2013 meeting and incorporated into 2013 IRWM Plan
Integrated Flood Management	Develop inventory and assessment of the flood management programs; Develop guidance framework for regional collaborative planning of watershed and flood risk management; and Develop alternative integrated strategies appropriate for the Region	All interested RAC members and stakeholders	Developed Integrated Flood Management Planning Study presented to RAC at June 2013 meeting and incorporated into 2013 IRWM Plan
Climate Change	Summarize available information on climate change for the Region; Prioritize water-related vulnerabilities to climate change; Develop guidance strategies to mitigate/adapt given climate change impacts; and Clarify climate change in project evaluation/ prioritization process	All interested RAC members and stakeholders	Developed Climate Change Planning Study presented to RAC at February 2013 meeting and incorporated into 2013 IRWM Plan
Proposition 84-Round 2 Project Selection	Develop a package of water management projects for inclusion in the Region's 2012 Proposition 84-Round 2 Implementation Grant Application	3 RWMG; 1 water supplier; 1 water quality; 2 natural resources; 2 at large = 9 total	Package of 7 water management projects totaling $10.3 million in grant funding

Workgroup	Purpose/Objectives	Members	Results
RAC Membership	Review RAC applications and make recommendations to RWMG	8 RAC members whose terms were not expiring	Recommendations for new RAC 2.0 members to serve 4-year terms
2013 IRWM Plan Implementation (2014-2019)			
Proposition 84-Round 3 Project Selection	Develop a package of water management projects for inclusion in the Region's future Proposition 84-Round 3 Implementation Grant Application	3 RWMG; 1 water supplier; 1 water quality; 1 natural resources; 1 DAC/EJ; 1 at large = 8 total	Package of 7 water management projects totaling $14.6 million in grant funding
Proposition 84-Round 4 Project Selection	Develop a package of water management projects for inclusion in the Region's future Proposition 84-Round 4 Implementation Grant Application	3 RWMG; 1 water supplier; 1 water quality; 1 natural resources; 1 DAC/EJ; 1 at large = 8 total	Package of 13 water management projects totaling $30 million in grant funding
Proposition 1 DAC Involvement Project Selection	Develop a package of water management projects for inclusion in the Region's future Proposition 1 DAC Involvement Grant Application	3 RWMG; 3 DAC RAC members;	Package of 10 DAC water management projects totaling $5.5 million in grant funding
RAC Membership	Review RAC applications and make recommendations to RWMG	8 RAC members whose terms were not expiring	Recommendations for new members to serve 4-year terms, starting in 2015 and 2017
Future Plan Implementation and IRWM Planning Efforts (2019+)			
Proposition 1 Project Selection	Develop a package of water management projects for inclusion in the Region's future Proposition 1 – Rounds 1 and 2 Implementation Grant Applications	TBD	TBD
Ad-Hoc to Address Various Issues Identified in 2019 IRWM Plan	As needed	TBD	TBD
DACI Workgroup	Address issues identified in the Water Needs Assessment, as needed	TBD	TBD

6.3.4 Tri-County Funding Area Coordinating Committee

The San Diego Funding Area includes the San Diego, Upper Santa Margarita, and South Orange County IRWM Regions. 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, the San Diego RWMG, Upper Santa Margarita RWMG, and South Orange County RWMG collaborate in an inter-regional body established via MOU and known as the Tri-County Funding Area Coordinating Committee (FACC). These three RWMGs include the following members:

- San Diego RWMG: City of San Diego, County of San Diego, and San Diego County Water Authority.
- Riverside County Upper Santa Margarita RWMG: Riverside County Flood Control and Water Conservation District, County of Riverside, and Rancho California Water District.
- South Orange County RWMG: County of Orange, Municipal Water District of Orange County, and South Orange County Wastewater Authority.

The MOU established an agreement on how to partition IRWM funding under Proposition 84 and Proposition 1 for the funding area and set forth a framework for ongoing collaboration between the three IRWM regions. The Tri-County FACC also ensures close coordination of the three planning regions to improve the quality and reliability of water throughout the span of all three IRWM Regions of 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 is described in more detail in Chapter 3, *Region Description*.

6.4 Stakeholder Involvement Program

Building understanding and support for the IRWM Plan and grant application processes among key stakeholders as well as the general public is critical to the success of the IRWM Program. An active approach to implementing public involvement and information dissemination was developed to assist the RWMG in generating broad-based support for the effort. Methods utilized to improve general awareness of the IRWM Program and provide a means for all interested parties to participate in the planning process are described below. Table 6-4 illustrates whether each outreach method involves one-way vs. two-way communication that is internal or external to the IRWM Region. One-way communication is meant to inform and educate stakeholders and the general public, while two-way communication does that and provides mechanisms for stakeholders and the public to respond with comments, feedback, and ideas. Appendix 6-C provides a summary of the outreach efforts to date. Appendix 6-D contains the comments received on the Public Draft 2019 IRWM Plan, along with how they have been addressed. Comments on the Public Draft 2019 IRWM Plan were solicited through RAC meetings and public workshops, targeted watershed workshops, stakeholder email lists, and the IRWM Program website. Communication methods are described in more detail below.

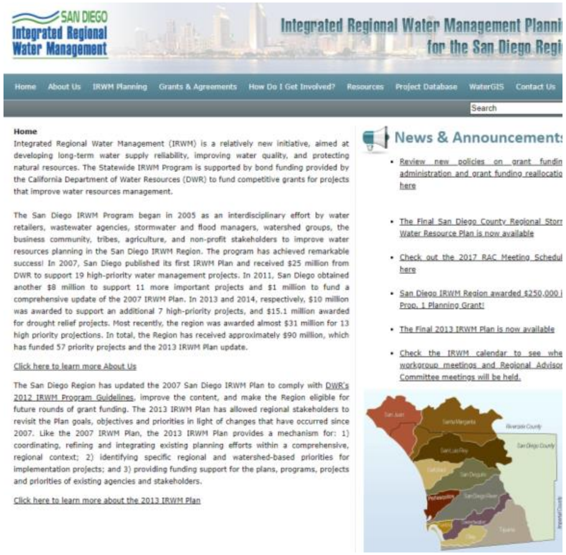
Table 6-4: Outreach Method and Communication Objectives

Outreach Method	Communications		Scale of Focus	
	One-way	Two-way	Internal	External
Website		✓	✓	✓
Emails		✓	✓	
Newsletters	✓		✓	
Public Workshops		✓	✓	✓
Presentations		✓	✓	
Summits		✓	✓	
Partnerships		✓	✓	✓
RAC Meetings		✓	✓	✓

The 2013 IRWM Plan used a collaborative process to develop IRWM-specific planning studies and incorporate information from planning studies, workshops, and workgroups completed since the 2007 Plan. Stakeholder participation was encouraged through several mechanisms, including the 2012 IRWM Summit, RAC meetings and public workshops, and by reviewing draft materials. A similar approach was taken to prepare the 2019 IRWM Plan. The Program held a 2016 IRWM Summit, a multi-day RWMG retreat, and joint RAC and Public Workshop meetings to re-prioritize regional needs. Stakeholders were invited to provide input on key decisions at joint RAC meetings and Plan Workshops and were encouraged to provide comments on the draft Plan.

The San Diego IRWM Program is committed to ensuring the long-term sustainability of San Diego's water supply, water quality, and natural resources, and to continuously working with the community to maintain and implement the IRWM Plan. All interested stakeholders have been and will continue to be invited to participate in the IRWM Plan effort. Stakeholders are essential for achieving a higher level of integration of watershed projects, through which the multiple benefits of water supply, water quality, and natural resources can be achieved concurrently.

Website: A website was established as a means of communication with stakeholders, interested parties, and the general public. The San Diego IRWM website (www.sdirwmp.org) provides detailed and up-to-date information on the IRWM Program, including: the adopted 2007 IRWM Plan, 2013 IRWM Plan, and 2019 IRWM Plan; the full list of submitted IRWM projects and projects selected for inclusion in the Proposition 50, Proposition 84-Round 1, Round 2, Round 3, and Round 4, and Proposition 1 DAC Involvement grant applications; other related planning efforts; information about the RWMG, RAC, and Tri-County FACC; RAC and Workgroup meeting agendas, summaries, and presentations; resources for climate change analysis; information about the State's funding programs; RWMG contacts; and other helpful links. The website also provides a discussion forum for stakeholders to initiate discussions on regional planning topics. Table 6-5 summarizes the development of the San Diego IRWM website throughout the phases of the IRWM Program.



Screenshot of the San Diego IRWM Website: www.sdirwmp.org

Table 6-5: Website

Website	
Phase	**Features**
Program Initiation (2005-2007)	IRWM Program utilized the existing Project Clean Water website to provide IRWM-related information to stakeholders
IRWM Plan Implementation (2008-2013)	IRWM Program website launched; hosted project submittal database and allowed for meeting materials to be downloaded
Updating the 2007 IRWM Plan (2011-2013)	Revamped website; upgraded project application database; added discussion forum
IRWM Plan Implementation (2014-2019)	Added data management capabilities called WaterGIS; updated project database to incorporate Stormwater Resource Plan project list and prioritization.
Updating the 2013 IRWM Plan (2017-2019)	Upgraded project application database to show funded projects
Future Plan Implementation (2020+)	Update website to include Project Completion Reports, Program Completion Reports, and Annual Reports for funded projects

To facilitate communication among planners and local project sponsors, the website hosts an online project database aimed at providing universal access to information about proposed San Diego IRWM projects. The project database allows project sponsors and other interested parties to log-in and add, revise, and submit project information, as well as view all other submitted projects. This tool, coupled with the Integration Workshops, is intended to connect stakeholders with one another to identify and enhance synergies among projects, hopefully leading to better integration and stronger partnerships. The online project database enhances efforts to inform the general public about "what is IRWM" through concrete project examples.

Stakeholder Email Updates and News Updates: The RWMG maintains an electronic distribution list of stakeholders and interested parties to provide IRWM Program updates, announcements, RAC meeting agendas and summaries, water-related workshops and seminars, and updates from DWR, as well as other grant and funding opportunities that may be of interest to stakeholders. As referenced in Table 6-6, the stakeholder distribution list will continue to be updated and maintained, and email updates will be sent out to provide funding updates, information about grant cycles, RAC updates, project updates, legislative updates, and project profiles.

Table 6-6: Stakeholder Email Updates and News Updates

Stakeholder Email Updates/News Updates	
Phase	**Features**
Program Initiation (2005-2007)	Electronic stakeholder distribution list developed; email updates sent to stakeholders
IRWM Plan Implementation (2008-2013)	Stakeholder distribution list updated and maintained; email updates sent to stakeholders
Updating the 2007 IRWM Plan (2011-2013)	Stakeholder distribution list updated and maintained; identified and utilized organizations that were willing to forward email updates to their stakeholder mailing list
IRWM Plan Implementation (2014-2019)	Stakeholder distribution list updated and maintained; email updates sent consistently
Updating the 2013 IRWM Plan (2017-2019)	Stakeholder distribution list updated and maintained; expanded the DAC stakeholder distribution list;
Future Plan Implementation (2020+)	Stakeholder distribution list will continue to be updated and maintained; email updates will be sent consistently

Newsletters and Notices: Newsletters are developed and distributed to the stakeholder email list at significant milestones in the IRWM Planning process to ensure stakeholders are being engaged. The newsletters serve as a means of keeping the stakeholders updated on legislative issues, funding opportunities, status of the IRWM Plan, opportunities for involvement, and information about project submittals, a timeline, and RWMG agency contact information. Table 6-7 explains the use of newsletters and notices throughout the phases of the IRWM Program.

For the 2013 IRWM Plan, a newsletter was prepared and distributed to the stakeholder email list to coincide with the initiation of the public review of the Public Draft 2013 IRWM Plan. The newsletter provided background on the Plan Update and IRWM Program and encouraged public input. A similar process was followed for the 2019 IRWM Plan development.

An information flyer was integrated into the San Diego County Water Authority's existing public outreach materials to provide general information about IRWM, raise the profile of the Program, and acknowledge the benefits of all the agencies cooperating as part of the Program. The flyer will be distributed during community events staffed by the Water Authority.

Table 6-7: Newsletters and Notices

Newsletters and Notices	
Phase	**Features**
Program Initiation (2005-2007)	Newsletters developed and distributed to coincide with initiation of public review of Draft IRWM Plan
IRWM Plan Implementation (2008-2011)	None
Updating the 2007 IRWM Plan (2011-2013)	Newsletter prepared and distributed to coincide with initiation of public review of Draft 2013 IRWM Plan
IRWM Plan Implementation (2014-2019)	An information flyer was added to the San Diego County Water Authority's public outreach material and distributed during community events
Updating the 2013 IRWM Plan (2017-2019)	Newsletter prepared and distributed to coincide with initiation of public review of Draft 2019 IRWM Plan
Future Plan Implementation (2020+)	Continued distribution of Newsletters or Notices to communicate IRWM activities.

Public Workshops: Public workshops have been held to ensure the involvement of a wide range of public agencies, organizations, and individuals in the IRWM Program. Workshops have also been held to meet the needs of specialized stakeholder groups, including DACs and tribal groups. The various workshops that have been held to support the IRWM Program are described in Table 6-8 and in greater detail below.

Flyer from the Strategic Integration Workshop

Public workshops are generally advertised through the website and the stakeholder email list. Workshops are held in varying locations, spread geographically throughout the Region to facilitate participation by different stakeholders. For workshops associated with planning topics, comments are accepted during each of the workshops and via online comment forms. Comments are reviewed and considered for inclusion within the IRWM Plan, for use in the planning process, or for IRWM Plan implementation. For workshops associated with a "Call for Projects" for the IRWM Plan and grant applications, agendas include the IRWM project evaluation process, the proposed approach to funding application prioritization, and the explanation of project submittal forms. Strategic Integration Workshops are also held to gather local project sponsors to discuss preliminary project concepts and encourage integration of concepts and development of partnerships for grant funding. In the past, these workshops have used a "speed networking" format to facilitate the development of relationships between project sponsors and prepare them for the "Call for Projects". Future workshops may use a different format that best suits the needs of the Region and its stakeholders at the time of the solicitation.

Table 6-8: Public Workshops

Dates	Purpose/ Objectives	How Input Was Received
Program Initiation (2005-2007)		
August 2006	Three workshops held to inform and educate public about background of IRWM planning, and to receive public feedback regarding vision, goals, and objectives of 2007 IRWM Plan	Comments accepted during workshops and via an online comment form; each comment was reviewed and considered for inclusion within the IRWM Plan, for use in the planning process, or for IRWM Plan implementation
April, June, and August 2007	Three workshops held to facilitate a "Call for Projects" for the IRWM Plan and Proposition 50 Grant Application, and provide members of local water supply, wastewater, stormwater, environmental, and community organizations with information about the IRWM Plan prioritization process, the proposed approach to funding application prioritization, and explanation of the Project Application Review form	
IRWM Plan Implementation (2008-2013)		
June 2010	Two workshops held to facilitate a "Call for Projects" for the Proposition 84-Round 1 Implementation Grant Application	
Updating the 2007 IRWM Plan (2011-2013)		
August, October, and December 2012; February, April, and June 2013	Six joint Public Workshops/RAC meetings held to receive input and direction on 2013 IRWM Plan chapters	Comments accepted during workshops; each comment was reviewed and considered for inclusion within the IRWM Plan, for use in the planning process, or for IRWM Plan implementation
September 2012	Strategic Integration Workshop held to gather local project sponsors to discuss preliminary project concepts and encourage integration of concepts for Proposition 84-Round 2 funding	Stakeholders submitted project concepts describing preliminary project ideas, and project partners submitted partner forms that described potential services they could provide to support projects; the concept and partner forms were evaluated and discussed by stakeholders to determine potential integration and partnering opportunities
September 2012	Four Watershed Workshops held to solicit information about each watershed for 2013 IRWM Plan, including a characterization of water resources within each watershed, identification of key water management issues and needs, and brainstorming of project concepts to address key issues	Comments accepted during workshops and via feedback forms; each comment was reviewed and considered for inclusion within the IRWM Plan
IRWM Plan Implementation (2014-2019)		
April 2014	Strategic Integration Workshop held to discuss potential integration and coordination opportunities for future IRWM projects	Comments accepted during workshop; each comment was reviewed and considered for future project selection processes
May 2014	Two workshops held to facilitate a "Call for Projects" for the Proposition 84-Round 3 Implementation Grant Application	-
May 2014	Scoring Workshop held to present project scores and tiering, as well as to solicit input on RAC caucus priorities for the Proposition 84-Round 3 project selection process	Comments accepted during workshop; each comment was reviewed and considered for the Proposition 84-Round 3 project selection processes

Dates	Purpose/ Objectives	How Input Was Received
April 2015	Strategic Integration Workshop held to learn about potential projects and resources to facilitate the identification of integration opportunities, such as potential partnerships	Comments accepted during workshop; each comment was reviewed and considered for future project selection processes
April 2015	Proposition 84-Round 4 Technical Workshop to assist project sponsors with using the project database and submitting projects	-
May 2015	Three workshops held to facilitate a "Call for Projects" for the Proposition 84-Round 4 Implementation Grant Application	Comments accepted during workshop; each comment was reviewed and considered for future project selection processes
May 2015	Scoring Workshop held to present project scores and tiering, as well as to solicit input on RAC caucus priorities for the Proposition 84-Round 4 project selection process	Comments accepted during workshop; each comment was reviewed and considered for the Proposition 84-Round 4 project selection processes
April 2016	DAC Project Concept Workshop held to gather local project sponsors to discuss preliminary project concepts for the Proposition 1 DAC Involvement Grant Application	-
July 2016	Two workshops held to facilitate a "Call for Projects" for the Proposition 1 DAC Involvement Grant Application	Comments accepted during workshop; each comment was reviewed and considered for future project selection processes
Updating the 2013 IRWM Plan (2017-2019)		
October and December 2017; February, April, June, August, October, and December 2018; February and April 2019	10 joint Public Workshops/RAC meetings held to receive input and direction on 2019 IRWM Plan chapters and Water Needs Assessment (8 for Phase 1, and 2 anticipated for Phase 2)	Comments accepted during workshops; each comment was reviewed and considered for inclusion within the IRWM Plan, for use in the planning process, or for IRWM Plan implementation
Future Plan Implementation (2020+)		
2020+	Public workshops will be scheduled to maintain engagement in the ongoing IRWM Program	TBD

Speakers Bureau Presentations: The RWMG actively seeks opportunities to attend meetings hosted by local organizations to present information on the IRWM Program and current activities and to solicit input. The primary focus of the individual group presentations has been to provide attendees with background information about the IRWM planning process, the IRWM Program's purpose, the IRWM Plan objectives, and the project solicitation process. Presentations typically last 15-45 minutes and generally include the use of PowerPoint presentations, maps, informational handouts, and forms for submitting comments and/or projects. Input received during presentations is taken back to the RWMG for consideration, and typically, the participants are added to the stakeholder email list. To continue to expand the Region's understanding and support for the IRWM effort, the RWMG will deliver up to six presentations annually to groups in the Region, upon request. Table 6-9 describes the use of presentations throughout the phases of the IRWM Program.

Table 6-9: Speakers Bureau Presentations

Speakers Bureau Presentations	
Phase	**Features**
Program Initiation (2005-2007)	Frequent presentations to groups in the Region; provided an overview of the IRWM Plan
IRWM Plan Implementation (2008-2013)	Increased number of presentations to tribal and DAC representatives
Updating the 2007 IRWM Plan (2011-2013)	Continued presentations to groups in the Region
IRWM Plan Implementation (2014-2019)	Delivered approximately 10 presentations about IRWM Program and current activities since the 2013 IRWM Plan
Updating the 2013 IRWM Plan (2017-2019)	Deliver 25 presentations across the San Diego Funding Area to reach DACs not currently engaged in the IRWM Program, and assist with development of the Water Needs Assessment
Future Plan Implementation (2020+)	Plan to deliver presentations upon request about IRWM Program and current activities

Summits: Summits provide an opportunity to raise awareness among the public and stakeholders about the IRWM Plan and allow for questions and public comment. A focal point of early stakeholder participation was the annual Clean Water Summit. The 2006 Clean Water Summit, held on June 30, 2006, was focused entirely around the San Diego IRWM planning effort. The keynote speaker, Jerry Johns of the State Department of Water Resources, presented the background on the IRWM planning process by providing an overview of the California Water Plan Update 2005. Mr. Johns explained how the 2005 Water Plan Update provided a fundamental change in the way we address water throughout the State, and set the stage for a transition in water resource management.

Opening Remarks at the 2012 Summit made by Jerry Sanders, then Mayor of San Diego.

Photo credit: Crystal Mohr, RMC Water and Environment

On February 29, 2012, the RWMG hosted the first San Diego IRWM Program Summit at the outset of the 2013 IRWM Plan to gain input from regional stakeholders on how to enhance water resources management in the San Diego IRWM Region. The Summit was a success, with over 80 diverse attendees, and notable speakers including Jerry Sanders, then Mayor of San Diego, and State Water Resources Control Board Member Fran Spivy-Weber. Key outcomes from the IRWM Summit included:

- Compiling an overview of various barriers and challenges to water resources management;
- Discussing possible solutions and strategies to overcoming those barriers and challenges; and
- Gathering input on regional planning priorities for San Diego's 2013 IRWM Plan.

Mark Stadler, IRWM Program Manager, welcoming attendees to the 2016 Summit
Photo Credit: Loisa Burton, Water Authority

On February 29, 2016, the RWMG hosted the second San Diego IRWM Program Summit to celebrate the 10-year anniversary of the Program and in preparation for the 2019 IRWM Plan update. The Summit was used to recognize the Program's major accomplishments and to re-focus IRWM priorities. In addition, discussions about the future of the IRWM Program were held. The 2016 Summit guided development of the Technical Development Areas that were prioritized by the RWMG and RAC and was used to inform the updates made to the 2019 IRWM Plan Goals and Objectives (see *Chapter 2, Vision and Objectives*) and project scoring criteria (see Table 9-1 and 9-2 in *Chapter 9, Project Evaluation and Prioritization*).

As described in Table 6-10, summits will continue to be held as needed in response to major milestones of the IRWM Program, such as the updating or amending of the IRWM Plan.

Table 6-10: IRWM Summits

Summits	
Phase	**Features**
Program Initiation (2005-2007)	Clean Water Summit held that was focused entirely around San Diego IRWM planning effort; background on IRWM planning process was presented
IRWM Plan Implementation (2008-2013)	No summit held
Updating the 2007 IRWM Plan (2011-2013)	IRWM Summit held at the outset of the 2013 IRWM Plan to gain input from regional stakeholders on how to enhance water resources management in San Diego IRWM Region
IRWM Plan Implementation (2014-2019)	IRWM Summit held to celebrate the 10-year anniversary of the Program and in preparation for the 2019 IRWM Plan update.
Updating the 2013 IRWM Plan (2017-2019)	No summit held
Future Plan Implementation (2020+)	Summit(s) will be held as needed in response to major milestones of the IRWM Program

Partnerships and Letters of Support: The San Diego IRWM Program benefits from both formal and informal partnerships, summarized in Table 6-11. As previously described, the RWMG formed a formal partnership through the signing of an MOU in 2005, with several revisions and updates since then, as shown in Table 6-11. Aside from the sharing of ideas and funds, the group has found many other ways to collaborate, such as participating on the Water Conservation Action Committee, getting involved with regional groundwater management planning, developing a regional guidance for low-impact development, and developing and implementing a watershed signage program.

The Tri-County FACC is a formal partnership of the three IRWM planning regions in the San Diego Funding Area (described in *Chapter 3, Region Description*). It was established in April 2009 through joint adoption of an MOU outlining measures for inter-regional coordination. This partnership is a unique opportunity to collaborate with neighboring planning regions to address common objectives, issues, and conflicts.

The RAC, an informal partnership, has realized many benefits including opening the lines of communication between various water-related agencies and organizations and providing opportunities to collaborate, maximize benefits, and realize both a cost savings and improvement in project efficiency.

The RAC and interested parties have offered letters of support for the IRWM Program and the Region Acceptance Process Application. The RWMG has sent letters of support on behalf of the Upper Santa Margarita Planning Region's grant applications. Partnerships and letters of support help strengthen the basis for the IRWM Plan, support IRWM Plan implementation, and provide a network for the dissemination of information and for the solicitation of region-wide support. Additionally, letters have been sent in support of state legislation and in response to DWR's IRWM Program materials.

Table 6-11: RWMG Partnerships and Letters of Support

Partnerships and Letters of Support	
Phase	**Features**
Program Initiation (2005-2007)	RWMG formed a formal partnership through signing of 2005 MOU
IRWM Plan Implementation (2008-2013)	RWMG developed revised 2007 and 2009 MOUs and then signed new 2011 MOU; Tri-County FACC established through joint adoption of 2009 MOU outlining measures for inter-regional coordination
Updating the 2007 IRWM Plan (2011-2013)	RWMG and Tri-County FACC continued to enhance collaboration and coordination of water resources planning
IRWM Plan Implementation (2014-2019)	The RWMG extended its IRWM partnership MOU when it expired in 2016 and amended it again in 2018. The three Tri-County FACC members did the same for their MOU when it expired in 2014.
Updating the 20132007 IRWM Plan (2017-2019)	RWMG and Tri-County FACC continued to enhance collaboration and coordination of water resources planning
Future Plan Implementation (2020+)	The RWMG will consider its IRWM partnership MOU when it expires in 2020. The three Tri-County FACC members will do the same for their MOU when it expires in 2020. The three agencies will support each other as appropriate.

6.4.1 Environmental Justice and Disadvantaged Communities

Environmental justice and DAC concerns in the Region include urbanized areas located near or adjacent to current or past industrial areas, as well as rural backcountry areas. *Chapter 3, Region Description*, provides an overview of the physical location and a description of DACs within the Region. As required by DWR, the following sections provide an overview and background of environmental justice and DAC stakeholders in the Region.

Since World War II, the Region has experienced substantial growth, becoming a major port and increasing industrial activities during this time. Such rapid growth and development led to unsustainable land use combinations in portions of the Region. Such areas include those located in the south, southeastern, and border areas of the Region where residential areas and industrial zones were integrated. The location of homes and schools adjacent to industrial facilities has resulted in situations where communities are threatened by the past and present impacts of industrial pollution. Water-related impacts in such areas may include

> *"Infrastructure development in rural disadvantaged communities comes with an extensive and intricate set of challenges, and as such, we appreciate that the Regional Water Management Group has provided us with the flexible support necessary to address a web of issues and details that have arisen over three rounds of funding and eleven rural water resources projects. The collaborative partnership has proven invaluable for the communities that we serve."*
>
> *-Jennifer Hazard, RAC Member Representing Rural Community Assistance Corporation (2015-2018) and Alter Terra (2013-2015), DAC/EJ Caucus 2015-2018*

the deposition of airborne industrial and manufacturing contaminants into surface waters and the degradation of groundwater from land contamination. In addition, following World War II, establishment of a major port led to a boom of the shipbuilding and boating industries; these industries have contributed to pollution issues that continue to affect San Diego Bay.

In rural backcountry areas of the Region, communities primarily face groundwater quantity and quality issues. These communities are generally outside of the Water Authority service area and rely on groundwater as their primary if not sole source of water supply. Backcountry groundwater issues are exacerbated by poor economic conditions and lack of local community expertise that can make it difficult to address public health concerns. Rural DACs in the Region have documented issues with water shortages, as well as high contamination levels of uranium, nitrate, and bacteria in available groundwater supplies.

Environmental justice (EJ) is interpreted in the 2019 IRWM Plan to mean that equal respect and value will be accorded to every individual and community. *Chapter 3, Region Description* includes the full definition of EJ as adopted by the San Diego IRWM Program, as well as how EJ communities can be mapped. In developing the 2013 IRWM Plan, attention was given to ensure that DACs are involved in identifying water management issues and solutions. This effort was expanded during development of the 2019 IRWM Plan through the Water Needs Assessment. DWR defines DACs as communities with an MHI of 80% or less than statewide MHI; this definition is also used in this Plan. The *2016 IRWM Guidelines* also includes consideration for Economically Distressed Areas (EDAs) and Underrepresented Communities (URCs). *Section 3.3* in *Chapter 3, Region Description* presents communities within the Region that are classified as DAC, EDA, and URC, as well as definitions for determining if a community falls under one of these classifications. The results of the mapping exercises for DACs, EDAs, URCs, and EJs presented in *Chapter 3, Region Description*, were vetted at a series of DAC workshops under the Water Needs Assessment, as well as by organizations working closely with DACs, and at RAC meetings.

Engaging DACs directly is always a challenge, and many barriers to participation exist for such communities. Such barriers may include lack of trust, language and cultural differences, and the time that participation requires can take away from earning one's livelihood. The IRWM Program has largely relied on working with groups that already have existing relationships with DACs, including those that participate on the RAC. While organizations such as San Diego Coastkeeper, Groundwork San Diego-Chollas Creek, and Rural Community Assistance Corporation have helped the RAC and RWMG to identify DAC concerns and environmental justice issues, it was recognized that additional effort was required to identify and engage urban and rural DACs and identify and address environmental justice concerns. By providing IRWM grant funding to these non-governmental entities, the San Diego IRWM Program has been able to assist disadvantaged communities. The biggest challenge has been the ability to get through the invoicing process in a timely manner to reimburse these organizations for their efforts. This can be a real impediment to providing assistance to disadvantaged communities.

The Water Needs Assessment, funded under the Proposition 1 DAC Involvement Grant, seeks to increase engagement of DACs, EDAs, URCs, and EJs with the IRWM Program, especially those communities and organizations that had not previously been involved with IRWM. The Water Needs Assessment is being completed by the Tri-County FACC and uses direct outreach and community meeting presentations to identify key water management concerns for the target communities, encourage participation in IRWM, and identify how the IRWM Program can better serve them. Under the Water Needs Assessment, the RWMG first mapped the Region's DACs, EDAs, and EJs using established federal and state data, along with tribal lands, which are considered by the State to be URCs. Other URCs were not mapped because they were generally populations based on non-physical characteristics under the Region's definition (see Chapter 3, *Region Description*). Workshops will be held in DACs to affirm that known DAC-EDA-URC communities are not missing from the maps and to collect information on high priority water-related issues within these communities. The Tri-County FACC's NGO partners, Rural Community Assistance Corporation (RCAC) and the Climate Science Alliance (CSA), helped update a stakeholder list for each identified DAC area, and conducted outreach (phone calls and emails) to inquire about their interests on receiving a Community Meeting presentation. These Community Meeting presentations (currently being help) will solicit input from local organizations and residents regarding their water-related issues and concerns. The community meetings also include discussion of the status of their current systems and opportunities to increase engagement with the IRWM Programs. The information gathered at these workshops and presentations will be used to inform the Water Needs Assessment and to build relationships with stakeholders in new and existing DAC areas. Following completion of the projects funded under the Proposition 1 DAC Involvement Grant, "DAC Water Stories" will be created to highlight DAC involvement in the IRWM program as a form of outreach and education in communities. Through continued relationship building, future long-term IRWM Program engagement will be more likely in DACs.

Engaging Disadvantaged Communities

Highlights

- Representation of DACs on the RAC and workgroups
- Targeted outreach meetings with urban and rural DAC stakeholders and advocacy groups
- Strategic Integration Workshop with "speed dating" format to facilitate the development of relationships between community-based organizations and potential project applicants

Lessons Learned / Barriers to Participation

- Financial constraints can restrict ability to participate
- Public meetings were held in disadvantaged areas to the greatest extent feasible to help lessen financial constraints that may prevent DACs from traveling to public meetings
- One-on-one communication between DAC leaders and RWMG or RAC representatives helped ensure that DACs had access to the planning process and helped to build trust

Directed Outreach Program for DACs and EJ Communities

The goal of outreach to disadvantaged and environmental justice communities is to identify and obtain input from groups that, as defined, have historically been disproportionately impacted with respect to the development, implementation or enforcement of laws, regulations and policies, due to race, culture or income. Through targeted outreach, the RWMG seeks to learn more about the major water-related concerns facing these groups such that long-term implementation of the 2013 IRWM Plan is responsive to those concerns.

Coordination with Water Management Groups and Water Agencies: If organized water management groups existed within the identified DACs (such as Groundwork San Diego-Chollas Creek in the Pueblo Watershed), the RWMG and RAC members reached out to invite participation in the IRWM Program. If no organized group existed, however, outreach was coordinated through the water agencies and municipalities serving those DACs in order to identity water resources projects that provide DAC benefits.

Coordination with San Diego Association of Governments: San Diego Association of Governments (SANDAG) is the regional planning agency responsible for generating the regional growth projections upon which the Water Authority and member agencies base their Urban Water Management Plan demand calculations. SANDAG has been an active participant in the RAC and other IRWM planning activities. Coordination with SANDAG has assisted the RWMG in surveying the Region's DACs, monitoring changes to these communities, and identifying their needs.

Workgroup Efforts to Engage DACs: The Watershed Planning and Outreach Workgroup was established in 2008 to clarify critical water supply and water quality needs in the Region's watersheds, and to identify outreach strategies that would bring DAC leaders to the table to engage in projects and partnerships that help to solve those critical needs. The Workgroup provided suggestions for helping the Region to understand and address the challenges faced by local DACs.

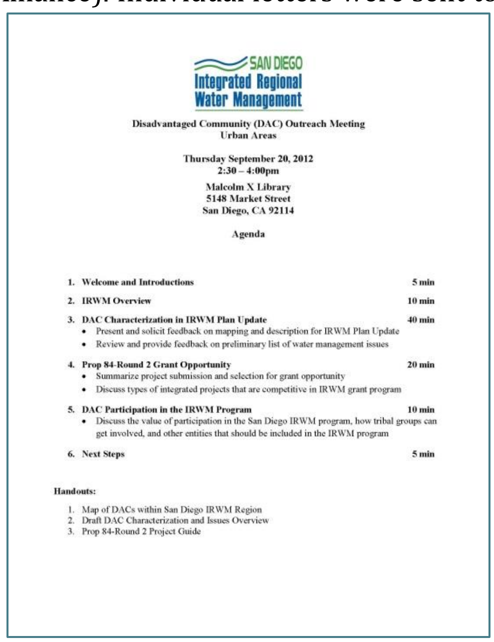
Disadvantaged Community Representation on the RAC: To ensure consideration of diverse views, RAC membership includes two organizations that identify and address DAC and environmental justice issues. Current or past DAC representatives on the RAC include San Diego Coastkeeper, Groundwork-San Diego Chollas Creek, Alter-Terra, and Rural Community Assistance Corporation (RCAC). The RAC charter ensures the RAC will always include both urban and rural DAC representatives.

One-on-one Communication between DAC Leaders and RWMG or RAC Representatives: The RWMG and RAC contacted community leaders within the DACs, as well as organizations that support rural water systems, and asked to work with them to identify the current state of their water-related resources. This one-on-one correspondence ensured that DACs had access to the planning process, allowing their input to be incorporated and their interests to be represented early-on, prior to project implementation. Additionally, critical needs of the DACs which were identified through these discussions were translated into long-term targets for the IRWM Plan and potential projects.

For the 2013 IRWM Plan, the approach of working through groups and contacts that have existing relationships with DACs was continued. The Watershed Workshops that were held provided an avenue for reaching out to DACs. Watershed groups that sponsored or participated in those workshops were asked to identify and encourage the participation of individuals who could represent DACs, and the workshops were designed to make it easier for them to participate.

The Water Needs Assessment initiated outreach to DACs, EDAs, and URCs not previously engaged with the San Diego IRWM Program through leverage of contacts of current IRWM Program participants and NGO Partners (RCAC and Climate Science Alliance). Individual letters were sent to these new DAC, EDA, and URC contacts inviting further dialogue and engagement with these leaders and organizations.

Targeted Outreach Meetings: Targeted outreach has been held both with representatives of DACs and with DAC residents directly. Outreach to DAC representatives generally focused on bigger-picture DAC needs and improving the IRWM Program's understanding of the barriers to participation for DACs. The San Diego IRWM Program has periodically held outreach meetings with urban and rural DAC stakeholders and advocacy groups. The purpose of these meetings was to introduce DAC stakeholders to the IRWM Program, discuss grant opportunities, and discuss key water management issues facing DACs in the Region. As a result, multiple projects aimed at meeting critical water supply and water quality needs of DACs were submitted for consideration of Proposition 84 grant funding. Some of these projects also included other components benefitting DACs, such as



SAN DIEGO Integrated Regional Water Management

Disadvantaged Community (DAC) Outreach Meeting
Urban Areas

Thursday September 20, 2012
2:30 – 4:00pm

Malcolm X Library
5148 Market Street
San Diego, CA 92114

Agenda

1. **Welcome and Introductions** — **5 min**
2. **IRWM Overview** — **10 min**
3. **DAC Characterization in IRWM Plan Update** — **40 min**
   - Present and solicit feedback on mapping and description for IRWM Plan Update
   - Review and provide feedback on preliminary list of water management issues
4. **Prop 84-Round 2 Grant Opportunity** — **20 min**
   - Summarize project submission and selection for grant opportunity
   - Discuss types of integrated projects that are competitive in IRWM grant program
5. **DAC Participation in the IRWM Program** — **10 min**
   - Discuss the value of participation in the San Diego IRWM program, how tribal groups can get involved, and other entities that should be included in the IRWM program
6. **Next Steps** — **5 min**

Handouts:

1. Map of DACs within San Diego IRWM Region
2. Draft DAC Characterization and Issues Overview
3. Prop 84-Round 2 Project Guide

Agenda for DAC outreach meeting

trails near waterways, creek restoration, and flood control measures. As part of the Water Needs Assessment, four Workshops targeting DACs across the San Diego Funding Area and up to 15 Speakers Bureau Presentations to targeted DAC organizations and communities within the San Diego IRWM Region are being held. To the extent feasible, targeted DAC outreach utilizes a "go-to-them" approach with workshops and Speakers Bureaus hosted in DAC areas.

Table 6-12 shows when the various types of outreach to DACs occurred during the four phases of the IRWM Program.

Table 6-12: Outreach to Disadvantaged Communities

Outreach to Disadvantaged Communities						
Phase	Coordination with Water Groups	Coordination with SANDAG	Workgroup Efforts to Engage DACs	RAC	One-on-one Communication	DAC Outreach Meetings
Program Initiation (2005-2007)	RWMG and RAC invited organized water management groups and agencies to participate in the IRWM Program	Coordination with SANDAG assisted in surveying the Region's DACs, monitoring changes to these communities, and identifying their needs	None	None	None	None
IRWM Plan Implementation (2008-2013)	Continued emphasis on inviting water management groups in DACs to participate in the IRWM program	None	Established to clarify critical water supply and quality needs in the Region's watersheds and to identify outreach strategies to encourage DAC leaders to engage in projects and partnerships that help solve those critical needs	DAC representation on the RAC by San Diego Coastkeeper and Rural Community Assistance Corporation	RWMG contacted DAC community leaders and asked them to identify the current state of their water resources; the critical needs identified through these discussions were translated into long-term targets and potential projects	Outreach meetings to introduce DAC stakeholders to the IRWM Program, discuss grant opportunities, and discuss key water management issues facing DACs in the Region
Updating the 2007 IRWM Plan (2011-2013)	Continued emphasis on inviting water management groups in DACs to participate in the IRWM program	None	None	DAC representation on RAC by Groundwork San Diego-Chollas Creek and Rural Communities Assistance Corporation	Watershed groups that sponsored or participated in watershed workshops identified and encouraged the participation DACs	Targeted outreach meetings to gain better understanding of the water supply and water quality needs of the Region's DACs

Outreach to Disadvantaged Communities						
Phase	Coordination with Water Groups	Coordination with SANDAG	Workgroup Efforts to Engage DACs	RAC	One-on-one Communication	DAC Outreach Meetings
IRWM Plan Implementation (2014 - 2019)	Continued emphasis on inviting water management groups in DACs to participate in the IRWM program	None	None	Continued DAC representation on RAC	Continued one-on-one communication with DACs to identify major issues and priorities related to water management	Hold outreach meetings to learn more about the major water-related concerns facing DACs so long-term implementation of the Plan is responsive to those concerns
Updating the 2013 IRWM Plan (2017 - 2019)	Continued emphasis on inviting water management groups in DACs to participate in the IRWM program	None	None	DAC representation on RAC by RCAC and Alter Terra	Water Needs Assessment outreach to new DACs, EDAs, and URCs	Speakers Bureau presentations to targeted DACs, EDAs, and URCs to gain better understanding of the water supply and water quality needs of the Region's DACs
Future IRWM Plan Implementation (2019+)	Continued emphasis on inviting water management groups in DACs to participate in the IRWM program	TBD	TBD	Continued DAC representation on RAC	Watershed groups that sponsored or participated in watershed workshops identified and encouraged the participation DACs	TBD

Projects benefitting DACs have consistently been prioritized during the local project selection process, with a total of 19 projects funding under Proposition 84 that directly benefitted DACs, and a separate funding opportunity under Proposition 1 for DACs:

- Proposition 84-Round 1 Implementation Grant: 11 high-priority projects, 3 with direct benefits to local DACs
- Proposition 84 – Round 2 Implementation Grant:7 high-priority projects, 2 with direct benefits to local DACs
- Proposition 84 – Round 3 Implementation Grant: 7 drought-relief projects, 4 with direct benefits to local DACs
- Proposition 84 – Round 4 Implementation Grant: 13 high-priority projects, 10 with direct benefits to local DACs
- Proposition 1 DAC Involvement Grant: 9 high-priority projects, all with direct benefits to DACs (8 within the San Diego IRWM Region)

6.4.2 Native American Tribes

San Diego County features the largest number of Tribes and Reservations of any county in the United States. There are 18 federally-recognized Tribal Nation Reservations and 17 Tribal Governments (the Barona and Viejas Bands share joint-trust and administrative responsibility for the Capitan Grande Reservation). Additionally, a 19th reservation in the San Luis Rey Valley was denied to the San Luis Rey Band of Luiseño Indians, though the Band remains active in the San Diego region, while the Mt. Laguna Reservation was deeded to private ownership in 1947. A description of each Tribe is provided in *Chapter 4, Tribal Nations of San Diego County*, along with a detailed map showing Tribal lands. Figure 6-3 provides a summary version.

Figure 6-3: Location of Tribal lands in the San Diego IRWM Region

San Diego County features the largest number of Tribes and Reservations of any county in the United States.

Development of the Tribal Nation Reservations has historically been hampered by their remote location and poor proximity to utility services, complexity of Indian law and politics, and dependence on federal programs. For many tribes, gaming is seen as an opportunity to gain economic independence and provide expanded infrastructure, education, health care, and emergency services for their members. Water and sanitation services have been developed by various tribes – including Barona, Campo, Pala, Pauma, Rincon, Sycuan, and Viejas Bands – to service the casinos and adjacent Reservation lands. Targeted outreach to Native American tribes is necessary to overcome potential barriers to participation in the IRWM Program, such as cultural differences, sovereignty issues, and an inconsistent track record of positive interactions between some tribes and some agencies. Increased participation of tribal groups is a goal moving forward in the IRWM Program. Outreach opportunities with tribal groups will continue to be pursued throughout the IRWM Program to identify major issues and priorities of those communities, as well as to encourage submission of grant applications. One-on-one coordination with tribal groups has helped with gauging their interest in identifying water resource issues that could be addressed through the IRWM program.

As part of the 2013 IRWM Plan development process, the RWMG contacted the 17 federally-recognized Tribal Governments in San Diego County through their respective EPA director, water director, or other environmental liaison. Communication was conducted via telephone, email, fax, and/or mail, when requested. Based on feedback from some tribal representatives, the RWMG provided each tribe with a questionnaire that was to be used to describe each tribe's water management issues. Seven tribes provided completed questionnaires. Tribal representatives were generally cautious with regard to the questionnaire, expressing concern about the purpose of the IRWM program and how the information may be used now and in the future. Some of these concerns were explicitly expressed by tribal representatives during meetings or through written correspondence, and other concerns were expressed verbally during follow-up calls and other informal communications.

For example, past experiences dealing with the County and State over water issues have made some tribal representatives and their respective councils reluctant to trust the stated intention of data collection efforts. Several tribes expressed concern over the possibility that information disclosed via the questionnaire could lead to surplus water supplies on reservations being taken away or diverted to urban areas. One representative expressed concern that the information given through the questionnaire would be shared and included in non-IRWM documents or used outside of the IRWM process for different purposes or motivations. While the questionnaire explicitly directed respondents not to divulge any privately held information, these concerns did prevent some tribal governments from responding.

The San Diego IRWM Program has sought to be inclusive of tribes during the planning and project selection processes. A number of tribes participated in the 2013 IRWM Plan, and targeted outreach during that effort has helped the IRWM Program build relationships with some tribes. Additionally, the RAC's dedicated tribal seat (with two additional seats added in 2019), has allowed the IRWM Program better understand tribal concerns and work towards compromises and solutions that allow for additional tribal participation in IRWM.

Another concern explicitly expressed by tribal representatives is whether CEQA documentation would be required for projects funded through the IRWM program. A primary goal of the 2013 IRWM Plan was to document water management issues in the region, establishing a baseline condition to be referenced in State grant applications. All projects funded through State grants must comply with applicable CEQA requirements. However, CEQA is not applicable for projects on reservation lands and any requirement for CEQA compliance would be an unnecessary cost, at best, and an affront to tribal sovereignty, at worst.

Engaging Native American Tribes

Highlights

- Targeted outreach meetings with the Region's tribes and Native American stakeholder groups
- One-on-one communication with tribal representatives helped with gauging their interest in involvement and with identifying issues of concern and priorities for the 2013 IRWM Plan
- Included three Tribal seats on the RAC to increase representation; each Tribe represents a different part of the planning region
- Awarded approximately $5.4 million in grant funding to the Rural Community Assistance Corporation (RCAC) for their Rural Disadvantaged Community Partnership Project, of which approximately $1.67 million has gone to tribal projects

Lessons Learned / Barriers to Participation

- Reluctance from some tribes to share information about water resources, and concern about the purpose of the IRWM Program and how information would be used now and in the future
- Some tribal governments did not want to participate in the DWR grant program because any CEQA requirement is viewed as incompatible with tribal sovereignty
- Concern about how the IRWM Program is incorporating tribal interests. Specific concerns were raised about a single tribal representative on the RAC given that the tribes are separate sovereign entities
- Tribes are concerned about future water supplies for economic development and sustenance, and plan to use local water supplies based on their tribal rights to water
- At targeted outreach meetings, tribes provided some suggestions for ways to expand tribal participation in the 2013 IRWM Plan and DWR grant program; some suggestions were incorporated into the stakeholder outreach effort, such as the tribal characterization template
- Some tribes have been reluctant to participate in the DWR IRWM grant program because DWR's contracts include a "sovereignty" clause that some viewed as impinging on tribal rights. The DWR contracts also require recipients of state grant funds to comply with CEQA requirements, but tribes, as sovereign nations complete the federal NEPA, not CEQA. The Water Authority, as the San Diego IRWM grant administrator, has worked extensively with tribal recipients of IRWM grant funds and DWR to overcome these obstacles and allowing tribal projects to proceed

Directed Outreach Program for Native American Tribes

Increased engagement of tribal groups is a goal moving forward in the IRWM program. Outreach opportunities with tribal groups will continue to be pursued throughout the IRWM program to identify major issues and priorities of those communities and to address water resource needs through submission of grant applications.

Tribal Representation on the RAC: To ensure the consideration of diverse views, RAC membership includes one of the Region's tribes. The La Jolla Band of Luiseno Indians served on the RAC until the composition of the RAC membership was reorganized under the RAC charter. The RAC currently includes a representative from the San Pasqual Band of Mission Indians (and an alternate from the La Jolla Band of Luiseno Indians). The RAC charter ensures the RAC will always reserve three seats for tribal representatives. The Southern California Tribal Chairs Association has been invited to designate two additional tribal representatives to join the RAC (for a total of three tribal representatives), as of this writing, two of the seats remain open.

Tribal Outreach Meetings: The San Diego IRWM Region is home to a large number of tribes. As such, engaging with tribes has been important to the San Diego IRWM Program. To this end, multiple "pushes" for meetings with the tribes have occurred. The RWMG held two outreach meetings for tribal groups in May and June 2010. These meetings provided an overview of the San Diego IRWM Program and discussed grant opportunities and key water management issues facing tribes in the Region. In August 2012, targeted outreach meetings were held with the Region's tribes and Native American stakeholder groups. Representatives from eight of the 17 tribal governments in San Diego County attended. At the meetings the purpose of the 2013 IRWM Plan was introduced, and it was explained that the 2007 IRWM Plan had limited information on existing conditions for tribal lands and that a priority for the 2013 IRWM Plan was to expand this information. Members of the 2013 IRWM Plan team also explained the process by which Tribal governments could apply for capital project grants from DWR. The individual and collective concerns of the various tribes in the Region regarding water management were gathered at the meetings so they could be included and addressed in the 2013 IRWM Plan. To the extent that tribal representatives were willing, they were also encouraged to participate in the watershed workshops being conducted as part of the 2013 IRWM Plan process.

Additional outreach to tribes is being conducted as part of the 2018 Water Needs Assessment, including direct emails and community meetings. The outreach under the Water Needs Assessment is aimed at learning about opportunities for the IRWM Program to improve engagement with tribes, opportunities for tribes to participate in IRWM funding programs, and information about priority water and wastewater resource needs of tribes that could be included in the Region's priority needs.

One-on-one Communication between Tribal Leaders and RWMG or RAC Representatives: One-on-one communication with tribal representatives helped with gauging their interest in being involved in the IRWM effort and identifying issues of concern and priorities to be incorporated into the 2013 IRWM Plan. Tribes' EPA directors, water managers, environmental managers, cultural resource managers, or other liaisons with knowledge of water and/or wastewater issues on reservation lands were contacted for information on how water is managed, distributed, and treated on its reservation. Additionally, any water quality, water infrastructure, or flooding issues on the reservation were solicited for inclusion in the 2013 IRWM Plan.

Tribal Characterization Template: Tribes were given a tribal characterization template that identified the kind of information needed for the 2013 IRWM Plan. The template asked tribes to characterize the water systems, water quality, stormwater and flood management, and natural resources of tribal lands. It was stressed by team members associated with development of the 2013 IRWM Plan that proprietary information was not needed for inclusion in the plan. It was also noted that any information provided would benefit the plan, create a more comprehensive description of how water is managed in the San Diego County, and set a baseline condition that could be referenced by the tribe if it decides to apply for a capital project grant from DWR.

Tribal Water Stories: To capture input from tribal groups in a culturally sensitive manner, tribes were extended the opportunity to share tribal water stories for the Tribal Water Stories Project. Initiated in 2009 at the state level, this Project is a compilation of stories, myths, and legends related to water and water use told by various California tribal groups. The Project also includes position papers and briefing papers describing the importance of water from a tribal perspective. The original 2009 report did not include perspectives from San Diego tribes, however, so an effort was made during the 2013 IRWM Plan process to collect traditional water-related information from the various local tribes. The intent was to employ trusted contacts to interview tribal representatives to produce a document or recording that captured both historical and contemporary tribal perspectives on water supply and quality issues in the Region. Table 6-13 shows when the various types of outreach occurred during the phases of the IRWM Program.

Table 6-13: Outreach to Native American Tribes

Outreach to Native American Tribes					
Phase	**RAC**	**Tribal Outreach Meetings**	**One-on-one Communication**	**Tribal Characterization Template**	**Tribal Water Stories**
Program Initiation (2005-2007)	Tribal representation on the RAC	None	None	None	None
IRWM Plan Implementation (2008-2013)	Tribal representation on the RAC by La Jolla Band of Luiseno Indians	Outreach meetings to provide tribal groups with an overview of IRWM Program and to discuss key water management issues facing tribes in the Region	None	None	None
Updating the 2007 IRWM Plan (2011-2013)	Tribal representation on RAC	Targeted outreach meetings to provide tribal groups with information about the 2013 IRWM Plan and process for applying for grants from DWR	One-on-one communication with tribal groups helped with gauging their interest in involvement and with identifying issues of concern and priorities that were then incorporated into the 2013 IRWM Plan	Provided to tribes to obtain information to include in 2013 IRWM Plan, such as characterization of water systems, water quality and natural resources of tribal lands	Tribes were provided opportunity to share tribal water stories that would help capture historical and contemporary tribal perspectives on water supply and quality issues

Outreach to Native American Tribes					
Phase	**RAC**	**Tribal Outreach Meetings**	**One-on-one Communication**	**Tribal Characterization Template**	**Tribal Water Stories**
IRWM Plan Implementation (2014-2019)	Continued tribal representation on RAC by San Pasqual Band of Mission Indians	Consistently held outreach meetings to encourage tribal involvement in IRWM Program	Continued one-on-one communication with tribal groups to identify major issues and priorities related to water management	None	None
Updating the 2013 IRWM Plan (2017-2019)	Continued tribal representation on RAC with three seats reserved for tribal representatives	Water Needs Assessment Speakers Bureau Presentations	Continued one-on-one communication with tribal groups to identify major issues and priorities related to water management	None	None
Future Plan Implementation (2020+)	Continued tribal representation on RAC, with three seats reserved for tribal representatives	Consistently hold outreach meetings to encourage tribal involvement in IRWM Program	Continued one-on-one communication with tribal groups to identify major issues and priorities related to water management	None	None

6.5 Updating or Amending the IRWM Plan

San Diego's IRWM Plan is a living document that will continue to evolve with time. IRWM Plan proponents realize that it is important to update the IRWM Plan as appropriate, and to revise plan objectives and goals to address evolving regional needs and concerns. At a minimum, the IRWM Plan will be updated approximately every five years, or whenever a funding opportunity arises. Additionally, it is critical that outreach efforts remain ongoing and continue to expand over time. This will enable the successful maintenance, management, and implementation of the IRWM Plan. The 2019 IRWM Plan was prepared and adopted in a phased manner, with Phase 1 including general updates to the Plan along with requirements for compliance with the *2016 IRWM Guidelines*, and Phase 2 incorporating the results of the Stormwater Capture and Use Feasibility Study and Water Needs Assessment, which are being prepared under the Proposition 1 Planning Grant and DAC Involvement Grant, respectively.

Public Notice Requirements: When proposing to prepare or update an IRWM Plan, the RWMG will publish a notice of intent to prepare the IRWM Plan, consistent with §6066 of the Government Code. The notice of intent to prepare this 2019 IRWM Plan Update – Phase I was published in the San Diego Daily Transcript on two consecutive weeks in August 2018. Upon the completion of the IRWM Plan, the RWMG will publish a notice of intent to adopt the IRWM Plan and will adopt the IRWM Plan in a public meeting of the RWMG governing bodies. The notice of intent to adopt this 2019 IRWM Plan will be published in the San Diego Daily Transcript on two consecutive weeks in accordance with the requirements in the *2016 IRWM Guidelines*.

Plan Adoption: The governing bodies of each RWMG agency are responsible for the development and adoption of the IRWM Plan. The Water Authority Board of Directors, City of San Diego City Council, and County of San Diego Board of Supervisors are scheduled to adopt this 2019 IRWM Plan in May 2018 (Phase 1) and in September 2019 (Phase 2). Additionally, each project proponent named in an IRWM grant application must also adopt the IRWM Plan. Proof of adoption is provided to DWR, upon request, via resolutions of adoption with signatory blocks for each governing body adopting the IRWM Plan.

Plan Amendments: The governing bodies of each RWMG agency are responsible for determining their formal approval process for IRWM Plan Amendments. Amendments will likely require further approval by the governing bodies; however, the approval process will be dependent upon the nature and extent of each amendment. This Plan (see below) allows for periodic updates to the IRWM project list prior to new funding opportunities without a formal Plan Amendment.

Project Inclusion: As described in Chapter 9, *Project Evaluation and Prioritization*, projects may be added to the IRWM Plan whenever the online project database is opened for submission. Updating the project list will allow additional projects to be added to address changing conditions and needs in the Region. Database submittal does not require RWMG approval; however, a project may be considered included in the IRWM Plan only if it contributes to at least one of the IRWM objectives. The project database is found on the San Diego IRWM Program website (www.sdirwmp.org).

6.6 Potential Plan Implementation Obstacles

The three RWMG agencies have committed to continue financing San Diego's IRWM effort through 2020 per their most recent MOU. The cost to finance the effort is not immaterial, however, and having sufficient financing for the ongoing implementation of the IRWM Plan, including funds to support administrative responsibilities such as grant applications and grant reporting obligations, will remain critical to the successful implementation of the IRWM Plan and associated projects. The RWMG and RAC continue to discuss potential different funding mechanisms for program management and grant administration that do not place undue burdens on any IRWM participant.

Another hurdle in the path of plan implementation is ensuring that all interested stakeholders are able to participate. For example, the grant application process is quite complex and requires a significant amount of information from entities proposing projects for funding. Some potential sponsors, especially those from DACs, many non-profit organizations, and small public agencies, lack the technical expertise to assemble a proposal that meets all the requirements established by DWR. Moreover, the amount of information required for the actual application can be daunting and quite expensive.

An additional question concerns the future availability of state funding to support IRWM project implementation. The most recent bond to allocate IRWM funding was The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1), which authorizes $510 million in IRWM funding. As of this writing, no bonds currently being considered allocate funding for IRWM. Even if funding for IRWM is included in a future water bond, there is no guarantee that the voters will approve the next water bond. Just as they are discussing potential funding alternatives for program management and grant administration, the RAC and RWMG periodically consider different funding sources to support project implementation.

In order to obtain and maintain regional support for the IRWM Plan, it is critical to continue the ongoing evaluation of regional needs, community issues, and environmental justice issues. This will be achieved through the ongoing education and outreach efforts and regular IRWM Plan updates.

Additional obstacles identified for the Region include water rights concerns, water transfer logistics, international boundary considerations for the Tijuana River Watershed, cross-jurisdictional issues and differing regulations, geographical limitations, and climate change.

Table 6-14: Agencies and Organizations Involved in Water and Watershed Management in the San Diego IRWM Region

Agency / Organization	Authority (●) or Interest (○)					Watershed(s)	Level of Participation		
	Water	Wastewater	Land Use / Planning	Stormwater / Flood	Natural Resources		RAC or Workgroup	Stakeholder List	Contacted [1]
Agua Hedionda Lagoon Foundation					○	Carlsbad	○	○	○
Alpine Sanitation District		●				San Diego, Sweetwater			E
Alter Terra	○		○		○	Tijuana	○	○	○
American Water Company	○					All		○	○
Association of Compost Producers					○	All		○	○
Back Country Land Trust					○	San Diego, Sweetwater			E
Barona Group of Capitan Grande Band of Mission Indians	○	○	○	○	○	San Diego		○	○
Batiquitos Lagoon Foundation					○	Carlsbad			E
Bonsall Conservancy					○	San Luis Rey			E
Buena Sanitation District		●				San Luis Rey, Carlsbad		○	○
Buena Vista Lagoon Foundation					○	Carlsbad	○	○	○
Building Industry Association of San Diego		○	○			All		○	○
Bureau of Indian Affairs	○	○	○	○	○	All		○	○
California Center for Sustainable Energy	○		○	○	○	All		○	○
California Coastal Coalition					○	All	○	○	○
California Coastal Conservancy					○	All			○
California Department of Fish and Wildlife					●	All		○	○
California Department of Water Resources	●					All	○	○	○
California Landscape Contractors Association	○		○	○	○	All	○	○	○
California Rural Water Association	○	○				All		○	○
California Trout					○	All	○	○	○
California Water Resources Control Board	●			●		All		○	○
Campo Band of Diegueno Mission Indians	○	○	○	○	○	Tijuana		○	○
Carlsbad Municipal Water District	●					Carlsbad		○	○
City of Carlsbad		●	●	●		Carlsbad	○	○	○
City of Chula Vista		●	●	●		Sweetwater, Otay	○	○	○
City of Coronado		●	●	●		Otay		○	○
City of Del Mar	●	●	●	●		San Dieguito, Peñasquitos			○
City of El Cajon		●	●	●		San Diego, Sweetwater			○
City of Encinitas			●	●		Carlsbad	○	○	○
City of Escondido	●	●	●	●		San Luis Rey, Carlsbad, San Dieguito	○	○	○
City of Imperial Beach		●	●	●		Otay, Tijuana	○	○	○
City of La Mesa		●	●	●		San Diego, Pueblo, Sweetwater	○	○	○
City of Lemon Grove			●	●		Pueblo, Sweetwater			○
City of National City		●	●	●		Pueblo, Sweetwater, Otay		○	○
City of Oceanside	●	●	●	●		Santa Margarita, San Luis Rey, Carlsbad	○	○	○

Agency / Organization	Authority (●) or Interest (○)					Watershed(s)	Level of Participation		
	Water	Wastewater	Land Use / Planning	Stormwater / Flood	Natural Resources		RAC or Workgroup	Stakeholder List	Contacted [1]
City of Poway	●	●	●	●		San Dieguito, Peñasquitos, San Diego	○	○	○
City of San Diego[3]	●	●	●	●		San Dieguito, Peñasquitos, San Diego, Pueblo, Sweetwater, Otay, Tijuana	○	○	○
City of San Marcos			●	●		Carlsbad	○	○	○
City of Santee			●	●		San Diego		○	○
City of Solana Beach			●	●		Carlsbad, San Dieguito		○	○
City of Vista		●	●	●		San Luis Rey, Carlsbad		○	○
Cottonwood Creek Conservancy				●	○	Carlsbad			E
County of San Diego		●	●	●	●	All	○	○	○
Cuyamaca Water District	●					San Diego			E
Descanso Community Services District	●	●				Sweetwater			E
East Otay Mesa Sewer MD		●				Otay, Tijuana			E
Encina Wastewater Authority[4]		●				Carlsbad		○	○
Environmental Health Coalition	○	○	○	○	○	All	○	○	○
Escondido Creek Conservancy					○	Carlsbad		○	○
Equinox Center	○	○	○	○	○	All		○	○
Fairbanks Ranch Community Services District		●				San Dieguito			E
Fallbrook Land Conservancy					○	Santa Margarita			o
Fallbrook Public Utility District	●	●				San Juan, Santa Margarita, San Luis Rey	○	○	○
Farm Bureau of San Diego County	○					All	○	○	○
Floodplain Management Association				○		All	○	○	○
Friends of Loma Alta Creek					○	Carlsbad		○	○
Friends of Mission Valley Preserve					○	San Diego		○	○
Friends of Rose Canyon					○	Peñasquitos	○	○	○
Friends of Rose Creek					○	Peñasquitos	○	○	○
Friends of Santee's River Park					○	San Diego		○	○
Greater San Diego County Resource Conservation District	○		○		○	All		○	○
Groundwork San Diego-Chollas Creek					○	Pueblo	○	○	○
Helix Water District	●					San Diego, Pueblo, Sweetwater	○	○	○
I Love A Clean San Diego					○	All		○	○
Iipay Nation of Santa Ysabel	○	○	○	○	○	San Luis Rey, San Dieguito		○	○
Inaja Band of Diegueno Mission Indians of the Inaja and Cosmit Reservation	○	○	○	○	○	San Diego		○	○
Industrial Environmental Association	○	○	○	○	○	All	○	○	○
International Boundary and Water Commission	○	○	○	○	○	Tijuana	○	○	○
Iron Mountain Conservancy					○	San Diego, Peñasquitos			○
Jacobs Center for Neighborhood Innovation	○	○	○	○	○	Pueblo	○	○	○
Jamul Indian Village	○	○	○	○	○	Otay	○	○	○
Julian Community Services District	●	●				San Dieguito, San Diego		○	○
Julian Sanitation District		●				San Diego			E
Kumeyaay Diegueno Land Conservancy	○	○	○	○	○	All		○	○
La Jolla Band of Luiseno Indians	○	○	○	○	○	San Luis Rey		○	○
La Posta Band of Diegueno Mission Indians	○	○	○	○	○	Tijuana		○	○

Agency / Organization	Authority (●) or Interest (○)					Watershed(s)	Level of Participation		
	Water	Wastewater	Land Use / Planning	Stormwater / Flood	Natural Resources		RAC or Workgroup	Stakeholder List	Contacted [1]
Lakeside River Park Conservancy					○	San Diego		○	○
Lakeside Water District	●					San Diego			○
Lakeside Sanitation District		●				San Diego			E
Leucadia Wastewater District		●				Carlsbad		○	○
Los Coyotes Band of Cahuilla and Cupeno Indians	○	○	○	○	○	San Luis Rey		○	○
Los Peñasquitos Lagoon Foundation					○	Peñasquitos		○	○
Majestic Pines Community Services District	●					San Diego			E
Manzanita Band of Diegueno Mission Indians	○	○	○	○	○	Tijuana		○	○
Mesa Grande Band of Diegueno Mission Indians	○	○	○	○	○	San Dieguito		○	○
Metropolitan Water District of Southern California	●					All		○	○
Mission Resource Conservation District	○		○		○	Santa Margarita, San Luis Rey	○	○	○
Mission Trails Regional Park Foundation			○		○	San Diego			○
Mootamai Municipal Water District	●					San Luis Rey			E
Morro Hills Community Services District		●				San Luis Rey			E
Oceanside Utilities Commission	●	●				Santa Margarita, San Luis Rey, Carlsbad	○	○	○
Olivenhain Municipal Water District	●					Carlsbad, San Dieguito	○	○	○
Otay Water District	●	●				San Diego, Sweetwater, Otay, Tijuana	○	○	○
Orange County Public Works	●	●				San Juan	○	○	○
Padre Dam Municipal Water District	●	●				San Diego, Sweetwater	○	○	○
Pala Band of Luiseno Mission Indians	○	○	○	○	○	Santa Margarita, San Luis Rey		○	○
Pauma Band of Luiseno Mission Indians	○	○	○	○	○	Santa Margarita, San Luis Rey		○	○
Pauma Valley Community Services District	●	●				San Luis Rey			E
Pine Hills Mutual Water Company	●					San Diego			E
Pine Valley Mutual Water Company	●					Tijuana			E
Pine Valley Sanitation District		●				Tijuana			E
Planning and Engineering for Sustainability	○	○	○	○	○	All	○	○	○
Preserve Calavera					○	Carlsbad			E
Project Wildlife					○	All		○	○
Questhaven Municipal Water District	●					Carlsbad		○	○
Rainbow Municipal Water District	●	●				Santa Margarita, San Luis Rey		○	○
Ramona Municipal Water District	●	●				San Dieguito, San Diego			○
Rancho California Water District	●	●	○	○	○	San Juan, Santa Margarita	○	○	○
Rancho Pauma Mutual Water Company	●					San Luis Rey			E
Rancho Santa Fe Community Services District		●				Carlsbad, San Dieguito			E
Rincon Band of Luiseno Mission Indians	○	○	○	○	○	San Luis Rey		○	○
Rincon Del Diablo Municipal Water District	●	●				Carlsbad, San Dieguito		○	○
Rincon Ranch Community Services District		●				San Luis Rey			E
River Partners					○	All		○	○
Rose Creek Watershed Alliance					○	Peñasquitos	○	○	○
Rural Community Assistance Corporation	○	○				All	○	○	○
San Carlos Area Council, Mission Trails Park			●		●	San Diego	○	○	○

Agency / Organization	Authority (●) or Interest (○)					Watershed(s)	Level of Participation		
	Water	Wastewater	Land Use / Planning	Stormwater / Flood	Natural Resources		RAC or Workgroup	Stakeholder List	Contacted [1]
San Diego Association of Governments (SANDAG)			○			All	○	○	○
San Diego Audubon Society					○	All	○	○	○
San Diego Chamber of Commerce	○	○	○	○	○	All	○	○	○
San Diego CoastKeeper					○	All	○	○	○
San Diego Country Estates			○			San Diego		○	○
San Diego County Air Pollution Control District			●			All		○	○
San Diego County Farm Bureau	○		○			All	○	○	○
San Diego County Flood Control District				●		All	○		○
San Diego County Office of Education	○			○		All	○	○	○
San Diego County Water Authority	●					All	○	○	○
San Diego County Regional Airport Authority				●		All			○
San Diego Earthworks					○	All		○	○
San Diego Gas and Electrict	○		○		○	All		○	○
San Diego Unified Port District			●	●		Pueblo, Sweetwater, Otay	○	○	○
San Diego Regional Chamber of Commerce			○			All	○	○	○
San Diego Regional Water Quality Control Board	○	●		●	○	All	○	○	○
San Diego River Conservancy					○	San Diego			○
San Diego River Park Foundation					○	San Diego	○	○	○
San Diego Zoological Society			○	○	○	San Dieguito, Pueblo	○	○	○
San Dieguito River Valley Land Conservancy					○	San Dieguito	○	○	○
San Dieguito Water District	●					Carlsbad			E
San Elijo Joint Powers Authority		●				Carlsbad, San Dieguito	○	○	○
San Elijo Lagoon Conservancy					○	Carlsbad	○	○	○
San Luis Rey Watershed Council					○	San Luis Rey	○	○	○
San Pasqual Band of Diegueno Mission Indians	○	○	○	○	○	San Luis Rey, Carlsbad		○	○
Santa Fe Irrigation District	●					Carlsbad, San Dieguito	○	○	○
Sierra Club					○	All		○	○
Solana Center					○	Carlsbad, San Dieguito		○	○
South Bay Irrigation District[2]						Sweetwater, Otay			E
Southern California Tribal Chairmen's Association	○	○	○	○	○	All		○	○
Southern California Wetlands Recovery Project					○	All	○	○	○
Spring Valley Sanitation District		●				San Diego, Sweetwater			E
Surfrider Foundation San Diego					○	All		○	○
Sweetwater Authority	●					Sweetwater, Otay	○	○	○
Sycuan Band of the Kumeyaay Nation	○	○	○	○	○	Sweetwater		○	○
The Nature Conservancy					○	All	○	○	○
Tribal Reservation(s)	●	●	●	●	●	San Luis Rey, San Dieguito, San Diego, Sweetwater, Tijuana	○	○	○
Trust for Public Land					○	All			○
UC Cooperative Extension – San Diego County Farm & Home			○		○	All	○	○	○
Universities (UCSD, SDSU, USD, etc.)			●	●		All	○	○	○

Agency / Organization	Authority (●) or Interest (○)					Watershed(s)	Level of Participation		
	Water	Wastewater	Land Use / Planning	Stormwater / Flood	Natural Resources		RAC or Workgroup	Stakeholder List	Contacted [1]
Upper San Luis Rey Resource Conservation District	●		○		○	San Luis Rey			E
U.S. Bureau of Land Management			●			All			E
U.S. Bureau of Reclamation	●	○		●		All	○	○	○
U.S. Fish and Wildlife Service					●	All		○	○
U.S. Forest Service, Cleveland National Forest			●		●	San Juan, Santa Margarita, San Luis Rey, San Dieguito, San Diego, Sweetwater, Tijuana			○
U.S. Geological Survey	○		○			All		○	○
U.S. Indian Health Services	○	○	○	○	○	All	○	○	○
U.S. Marine Corps Camp Pendleton	●	●	●	○	○	San Juan, Santa Margarita, San Luis Rey	○	○	○
Vallecitos County Water District	●	●				San Luis Rey, Carlsbad		○	○
Valley Center Municipal Water District	●	●				San Luis Rey, Carlsbad, San Dieguito		○	E
Valley Center Parks and Recreation District		●				San Luis Rey			E
Viejas Group of Capitan Grande Band of Mission Indians	○	○	○	○	○	San Diego, Sweetwater			
Vista Irrigation District	●					San Luis Rey, Carlsbad		○	○
Whispering Palms Community Services District		●				San Dieguito			E
WildCoast					○	All		○	○
Winter Gardens Sewer MD		●				San Diego			E
Wynola Water District	●					San Dieguito			E
Yuima Municipal Water District	●					San Luis Rey			E
Zoological Society of San Diego					○	All	○	○	○

1. "E" denotes entities that the RWMG sent an email invitation to participate in the IRWM program, even though some may not have opted to register for the stakeholder email list. The San Diego IRWM program strives to be a collaborative process that involves all interested parties and individuals.
2. City of National City and South Bay Irrigation District together form the Sweetwater Authority, which provides water supply to both service areas.
3. In addition to supplying more than 250,000 metered service connections within its own incorporated boundaries, the City of San Diego conveys and sells potable water to the City of Del Mar, the Santa Fe Irrigation District, San Dieguito Water District, and the California American Water Company, which, in turn, serves the Cities of Coronado and Imperial Beach and portions of south San Diego.
4. Encina Wastewater Authority is owned by six public agencies in a unique arrangement called a Joint Powers Agreement. The six owners are: the City of Carlsbad, City of Vista, City of Encinitas, Vallecitos Water District, Buena Sanitation District, and the Leucadia Wastewater District.

6.7 References

California Department of Water Resources. *Integrated Regional Water Management Grant Program Guidelines*. 2016.

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7 Regional Coordination

This chapter addresses requirements set forth in the Relation to Local Water Planning, Relation to Local Land Use Planning, and Coordination standards included in the 2016 IRWM Program Guidelines (DWR, 2016).

7.1 Overview

The intent of this chapter is to document various aspects of coordination between local, regional, State, and federal agencies related to water resource management in the San Diego IRWM Region. This chapter includes general background information about how the IRWM program has encouraged regional coordination, as well as specific information about the planning studies completed for the 2013 IRWM Plan. Specifically, this chapter includes information about:

- How the IRWM Plan relates to planning documents and programs established by local water-related agencies.
- The current relationship between land use planning, regional water issues, and the water management goals included in *Chapter 2, Vision and Objectives*.
- The process used to coordinate various stakeholder groups to avoid conflicts and take advantage of efficiencies.
- Information about coordination with other neighboring IRWM efforts.

7.2 Consistency with Local Plans

As described throughout this 2019 IRWM Plan, the San Diego IRWM Program is an “umbrella” planning process that consolidates and synthesizes information from existing processes throughout the IRWM Region. *Chapter 10, Data and Technical Analysis* provides detailed information about the planning documents that were used as the basis of information within the 2019 IRWM Plan. *Chapter 2, Vision and Objectives* demonstrates the detailed stakeholder outreach and engagement process that was used to develop the planning hierarchy included in the 2019 IRWM Plan. The following sections provide detailed information about coordination with various planning activities, including specific planning studies that were completed for the 2019 IRWM Plan pertaining to regulatory programs, flood control planning, land use planning, and climate change.

7.2.1 Coordination of Water Management Planning Activities

The San Diego IRWM Program is a stakeholder-driven planning process. Through the RAC and other public meetings, stakeholders have the opportunity to bring water management issues and priorities into the IRWM Program. When water management issues or priorities are presented to the RAC by stakeholders, they are then vetted by the group to determine which ones should be included as part of the IRWM Plan. Some chapters of this 2019 IRWM Plan were thoroughly updated with current data, while others were not. As indicated in *Chapter 4, Tribal Nations of San Diego County* and *Chapter*

5, Watershed Characteristics, those chapters were not updated because they had been originally developed in close coordination with the tribes and watershed stakeholders, respectively. As the 2019 IRWM Plan is intended to be an update, these chapters were not included in the planned updates as funded by the Proposition 1 Planning Grant. Chapters that received thorough updates included those with sections related to the changes from the 2012 Guidelines to the 2016 Guidelines, as well as those sections with substantial data that no longer reflected Regional conditions at the time this 2019 IRWM Plan Update was being developed. The 2012-2016 drought resulted in substantial shifts in water use, approaches to water supply development, and conservation, while regulatory shifts have also played a role in how the Region approaches water resource management.

In addition to stakeholder input, the 2019 IRWM Plan relied heavily on existing planning documents, including those completed during and for preparation of the 2013 and 2019 IRWM Plans. Of particular importance was the San Diego County Water Authority's 2010 and 2015 Urban Water Management Plans (UWMPs), which formed the base document of this IRWM Plan because they contain a roll-up of all water supply and recycled water flow projections for all 24 member agencies throughout the San Diego Region. The San Diego Regional Storm Water Resource Plan (SWRP) was relied on for regional stormwater management data and information. None of the other water management topics (wastewater, natural resources, flood management, etc.) has a regional resource document that contains regularly updated information compiled for all agencies in the Region managing that resource. For this reason, the IRWM Plan relied upon individual planning and management documents from the various entities that manage other (non-water supply) water resources in the Region. The 2019 IRWM Plan goals and objectives (*Chapter 2, Vision and Objectives*) generally incorporate the regional goals of all planning documents in Table 7-1. However, the IRWM Program and this IRWM Plan have no authority over the existing plans and resources that are referenced herein; this IRWM Plan is an umbrella document that attempts to consolidate current planning efforts on a broad variety of water management topics from throughout the Region.

As part of the 2013 IRWM Plan, the RWMG and the RAC created four Workgroups to develop planning studies addressing key water resource issues: Regulatory Coordination, Flood Management, Land Use, and Climate Change. These planning studies were tasked with assessing current plans in the Region for applicability to the 2013 IRWM Plan, to identify opportunities for collaboration between the IRWM Program, water managers, and other planners, and to develop recommendations to incorporation of key issues and goals of these plans (along with priority actions) into the 2013 IRWM Plan. These planning studies are presented in greater detail below.

7.2.2 Coordination with Other State and Federal Agencies

The IRWM Program recognizes the need to include other State and federal agencies in regional water resources planning. Several of these agencies are represented on the RAC – including the U.S. Bureau of Reclamation, U.S. Forest Service, U.S. Marine Corps, U.S. Indian Health Services, and the San Diego Regional Water Quality Control Board (San Diego Water Board) – and others are included on the stakeholder list as interested parties. Table 7-2 provides an overview of these other agencies and their interest in water management.

7.2.3 Coordinating and Resolving Inconsistencies

The IRWM Program engages stakeholders from throughout the Region, in an effort to increase communication and collaboration that will improve water resources management. Through an open dialogue and stakeholder involvement process, the IRWM Program helps to build relationships between stakeholder groups (including local planning agencies). This reduces conflicts between stakeholder groups, and helps to identify and resolve conflicts and inconsistences in management efforts and plans. By utilizing stakeholder input, the 2019 IRWM Plan ensures that it is addressing the concerns and needs of the Region and provides opportunities for coordinated planning efforts.

Table 7-1: IRWM Relation to Local Water Management Planning*

Types of Local Plans	Jurisdiction	Updates	Coordination During Planning Process	Relation to IRWM Plan
Urban Water Management Plans (UWMPs) Agricultural Water Management Plans (AWMPs) Groundwater Management Plans (GWMPs)	Water agencies	Every 5 years	Water supply, wastewater, recycled water projections are coordinated with land use/growth projections	Incorporated per Water Authority UWMP
Salt and Nutrient Management Plans (SNMPs)	Wastewater, Water agencies	Unknown – anticipated every 5 years	SNMPs use existing basin and regional studies, and documented issues and instances of noncompliance to develop management strategies	Incorporated per Water Authority UWMP and SWRP
Recycled Water Master Plans (RWMPs)	Wastewater, Water agencies	As needed	Recycled water projections are coordinated with land use/growth projections	Incorporated per Water Authority UWMP
Wastewater Master Plans (WWMPs)	Wastewater agencies	As needed	Wastewater projections are coordinated with land use/growth projections	Incorporated per Water Authority UWMP
Watershed Urban Runoff Management Plans (WURMPs) *– previously used* Jurisdictional Urban Runoff Management Plans (JURMPs) *– previously used* Jurisdictional Runoff Management Plans (JRMPs) Water Quality Improvement Plans (WQIPs)	Stormwater agencies	As needed	Coordination between cities and agencies within each watershed management area	Incorporated per SWRP
Hydromodification Management Plans (HMPs)	Stormwater agencies	As needed	Coordination between cities and agencies to manage hydromodification from new development	Incorporated
Flood Control Plans	Flood agencies or departments	As needed	Flood hazards are coordinated with land use/growth projections	Incorporated
Land Use Plans	Land use agencies, SANDAG	As needed	Land use planners may coordinate with other managers when developing plans. Other plans often incorporate portions General Plan	Incorporated per Water Authority UWMP
Watershed Management Plans	Land use agencies, NGOs	As needed	Watershed goals and strategies generally address surface water/habitat	Incorporated in watershed characterizations
Multiple Species Habitat Conservation Plans (MSHCPs)	Planning agencies	As needed	MSHCP outlines conservation areas; Included activities must comply with MSHCP requirements	Incorporated
Basin Plan/303(d) Listing	San Diego Water Board	Every 3 years	Basin Plan includes water quality objectives; 303(d) list identifies water bodies that are impaired	Incorporated

Types of Local Plans	Jurisdiction	Updates	Coordination During Planning Process	Relation to IRWM Plan
Storm Water Resource Plan	San Diego MS4 Copermittees, County of San Diego	As needed	SWRP is a compilation of planning documents that meet the Storm Water Resource Plan criteria and allow San Diego Copermittees to be eligible for grant funds. The SWRP identifies water quality objectives and opportunities to leverage stormwater as a resource.	Incorporated
Stormwater Capture and Use Feasibility Study	County of San Diego	As needed	Coordinated with SWRP efforts to refine the opportunities for using stormwater as a resource	To be completed in 2019 and will be incorporated
Water Needs Assessment	DWR	As needed	Coordination among regional NGOs, academics, and other groups to define, identify needs of, and outreach to DACs	To be completed in 2019 and will be incorporated
Groundwater Sustainability Plan	Groundwater Sustainability Agencies	Every 5 years	GSPs will use existing basin and regional data and studies to develop groundwater basin water budgets and identify management actions	Will be incorporated in future
San Diego Watershed Basin Study	Reclamation	As needed	Basin Study updates are regularly presented to IRWM stakeholders for input. Information included in the Basin Study are being incorporated into the IRWM Plan to align the two efforts.	Will be incorporated in future
4th Climate Change Assessment	California Climate Action Team	Every 3 years	Inter-agency effort to address California-specific policy questions and implement the Climate Change Research Plan	Will be incorporated in future

*Planning documents listed in this table are those that currently exist and are not governed by the IRWM Program. For information about implementation activities that are proposed by the IRWM Program, refer to *Chapter 11, Implementation.*

Table 7-2: Other State and Federal Agencies with Interest in IRWM

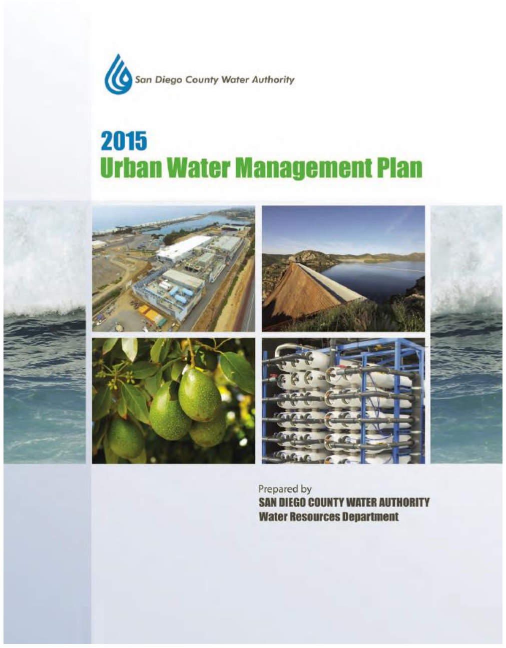
Agency	Authority and Interest in IRWM Program
State of California	
San Diego Water Board	The prime water quality regulatory authority within the Region, responsible for protecting beneficial uses and establishing and enforcing water quality standards. The San Diego Water Board is a non-voting RAC member.
Department of Water Resources (DWR)	Establishes a framework for statewide water resources management within the *California Water Plan Update 2009*, and administers the IRWM Grant Program.
California Environmental Protection Agency (Cal/EPA)	Oversees and coordinates public health and environmental regulation within six State of California departments: Air Resources Board, Department of Pesticide Regulation, Department of Toxic Substances Control, Integrated Waste Management Board, Office of Environmental Health Hazard Assessment, and the State Water Resources Control Board (State Board). These regulations affect water-related resource management decisions and requirements.
Department of Fish and Wildlife	Oversees implementation of the federal Endangered Species Act and regulates activities that may impact endangered species and their habitats. These endangered species and habitats are dependent on well-managed water resources.
California State Parks	Operates a number of state beaches, state parks, and coastal preserves and recreational areas within the Region and sponsors a project funded by San Diego IRWM grant.
California Department of Forestry	Charged with firefighting, resource management (including administering state and federal forestry assistance programs), and protecting and enhancing California's forest lands. Watershed health is affected by wildfires and healthy forests can help support healthy headwaters for local supplies.

Agency	Authority and Interest in IRWM Program
California Coastal Conservancy	Works in partnership with local governments, public agencies, nonprofit organizations, business, and private landowners to coordinate and provide funding to purchase, protect, restore, and enhance coastal resources and access.
Caltrans (California Department of Transportation)	Responsible for planning, maintaining, and constructing surface transportation facilities including highways, roads, bike paths, bridges, and rail transportation facilities. Caltrans addresses land use, air, and water quality impacts of such surface transportation facilities.
California Coastal Commission	In partnership with coastal Cities and the County, plans and regulates the use of land and water in the Region's coastal zone. In this land use planning and regulation role, the Coastal Commission is involved in coastal water quality protection, habitat protection, and public access and recreation.
California State Lands Commission	Oversees lands held in public trust. In this capacity, the Commission manages a variety of public lands, including submerged lands under tidal and navigable waterways. The Commission is also involved in securing and maintaining public access to public lands.
San Diego River Conservancy	A non-regulatory state agency working to protect, restore, and enhance the San Diego River Area. The Board of Directors includes elected officials from the Region, as well as representatives from state agencies with interest in watershed protection.
Federal Agencies	
U.S. Environmental Protection Agency (EPA)	Through powers delegated to the San Diego Water Board, implements the Clean Water Act and oversees San Diego Water Board and State Board's implementation of federal NPDES permits, water quality standards, water quality enforcement, and water quality certification programs.
U.S. Fish and Wildlife Service (USFWS)	Oversees implementation of the federal Endangered Species Act and regulates activities that may impact endangered species and their habitats. These endangered species and habitats are dependent on well-managed water resources.
National Marine Fisheries Service (NMFS)	Oversees implementation of the Endangered Species Act for marine species and regulates activities that may impact these species.
U.S. Army Corps of Engineers (USACE)	Has regulatory authority over all work within navigable waters, and regulates such projects through the issuance of permits. Additionally, the Corps of Engineers reviews and approves Special Area Management Plans (SAMPs). With this background, USACE can provide valued input to the Region's water management planning process.
U.S. Geological Survey (USGS)	Collects and analyzes regional hydrologic data, and coordinates with local agencies to perform special water resources studies; has served as consultant to several IRWM-funded projects
U.S. Bureau of Land Management (BLM)	Manages federal lands within the Region, including lands proposed as future Wilderness Areas.
U.S. Forest Service (USFS)	Manages the Cleveland National Forest, which comprises a significant portion of the upstream reaches of the larger watersheds of the Region; is a Local Project Partner (LPP) in an IRWM-funded project.
Natural Resources Conservation Service	A division of the U.S. Department of Agriculture that provides technical and financial assistance in a variety of areas related to the conservation of soil, water, and other natural resources.
U.S. Bureau of Reclamation (Reclamation)	Involved in a variety of water resources management areas central to the IRWM Plan, including water supply, the reclamation of land and water resources, surface water storage, desalination, recreation, agricultural land stewardship, water rights, and the San Diego Basin Study. Reclamation also administers funding for the Reclamation Wastewater and Groundwater Study and Facilities Act (Title XVI, Public Law 102-575) and for water projects under the WaterSMART program. Reclamation is a non-voting RAC member.
U.S. Navy	Operates numerous bases and installations within the Region, and plans and implements facilities (via the Naval Facilities Engineering Command) for the U.S. Navy and U.S. Marine Corps within the County.
U.S. Marine Corps	Operates numerous bases and installations within the Region. U.S. Marine Corps Base Camp Pendleton is a Water Authority member agency and provides non-voting RAC member representing the San Diego Military Community.
Bureau of Indian Affairs	Administers and manages lands held in trust for the Region's Native American Tribes.

7.3 Relation to Local Water Planning

7.3.1 Water Planning Overview

Numerous water supply plans address Southern California water facilities and water supply, developed by both regional and local agencies.



Water Authority's *2015 Urban Water Management Plan*

Regional Water Planning

Metropolitan Water District of Southern California (Metropolitan) provides the San Diego Region, via the Water Authority, with imported water and develops the following regional water plans:

1. The *2015 Urban Water Management Plan* (Metropolitan, 2016a) addresses imported water supply issues and reliability, regional demand reduction efforts, water quality issues, and regional approaches toward the development of local supplies.
2. Metropolitan's *Integrated Water Resources Plan* (Metropolitan, 2016b), serves as Metropolitan's master plan for long-term water reliability for Southern California.

As the Region's water wholesaler and sole supplier of imported water, the Water Authority serves as the primary regional water planning agency within the Region. All major public water agencies within the Region are either Water Authority members or receive retail supplies from a Water Authority member. Water Authority member agencies collaborate to implement the Water Authority's mission of providing a safe and reliable water supply to its 24 member agencies. Current Water Authority water development plans include the following:

1. The *2015 Urban Water Management Plan* (Water Authority, 2016) continues the Water Authority's long-standing commitment toward improving water supply reliability through diversification of the Region's water supplies and development of local water sources. This plan takes into account data from the most recent growth forecasts developed by the Region's regional land use planning agency (San Diego Association of Governments [SANDAG]). The regional growth projections are used to calculate water demands to ensure adequate supplies are being identified in the planning document to meet future growth within the region. The *2015 Urban Water Management Plan* sets forth the Water Authority's commitment to achieve water supply reliability and diversity through:
   a. comprehensive water conservation programs that that support and encourage residential conservation, commercial/industrial/institutional conservation, and agricultural water management and conservation,
   b. continued progress in implementing the Water Authority and Imperial Irrigation District agreement for long-term transfer of conserved Colorado River water,
   c. the All-American and Coachella canal-lining projects, through which the Water Authority obtained rights to water conserved as a result of the canal linings for 110 years.

d. coordination with a private enterprise to continue providing a reliable source of local supply from the Carlsbad Seawater Desalination Project,
e. supporting member agency efforts to optimize production from local groundwater aquifers, including groundwater extraction projects, brackish groundwater recovery projects, and groundwater recharge/recovery projects,
f. supporting member agency effort to assess and implement alternative supply/conservation options, and
g. supporting member agency efforts to develop supplies through non-potable recycled water supplies or indirect potable reuse.

2. The *2013 Regional Water Facilities Optimization and Master Plan Update* (Water Authority, 2014) that identifies projects and facilities required to achieve the Regional objective of reducing imported water dependence and ensuring a safe and reliable water supply.
3. A *Capital Improvements Program* to implement the projects and facilities identified in the Regional Water Facilities Optimization and Master Plan.
4. A *Water Shortage Contingency Plan* (Water Authority, 2017) that sets forth Water Authority management of water supplies during periods of shortage.

The County of San Diego, in conjunction with the San Diego MS4 Copermittees, developed a regional stormwater resource plan:

1. The *San Diego Region Storm Water Resources Plan* (County of San Diego, 2017) summarizes water quality information and identifies regional opportunities for utilizing stormwater as a resource.

As discussed above, none of the other water management topics (wastewater, natural resources, flood management, etc.) has a regional resource document that compiles information from throughout the Region. This IRWM Plan instead used the individual agency management plans for those resources as described above in Table 7-1.

Local Agency Water Planning

The Water Authority plans are developed in consultation with its member agencies, and reflect local agencies' water planning and projects. Table 7-3 identifies local water agencies that have developed UWMPs, water or recycled water master plans, or watershed sanitary survey assessments. All listed local agency UWMPs were updated in 2015 and 2016, and each of the local agency UWMPs address the same regional themes presented in the Water Authority's *2015 Urban Water Management Plan.*

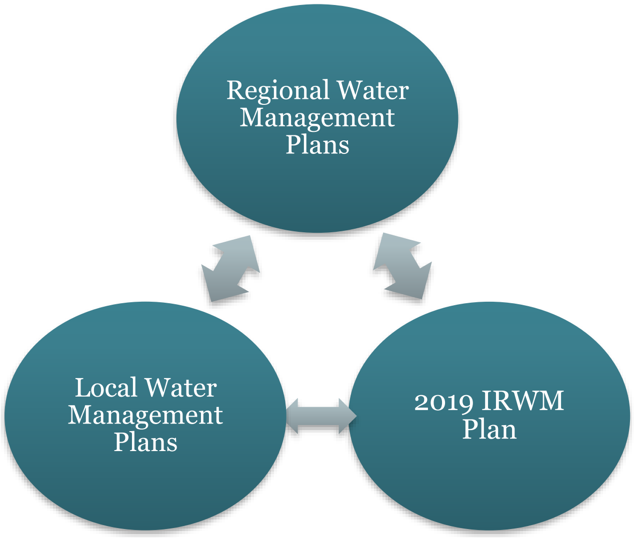
Table 7-3: Summary of San Diego Region Water Supply Plans

Water Agency	Urban Water Management Plan[1]	Water Master Plan[2]	Recycled Water Master Plan[3]	Sanitary Surveys[4]
San Diego County Water Authority	✓			
Carlsbad Municipal Water District	✓	✓	✓	
City of Del Mar		✓		
City of Escondido	✓	✓	✓	✓
Fallbrook Public Utility District	✓	✓	✓	
Helix Water District	✓	✓		✓
City of Oceanside	✓	✓	✓	
Olivenhain Municipal Water District	✓	✓	✓	✓
Otay Municipal Water District	✓	✓	✓	
Padre Dam Municipal Water District	✓	✓	✓	
City of Poway	✓	✓	✓	✓
Rainbow Municipal Water District	✓	✓		
Ramona Municipal Water District	✓	✓	✓	✓
Rincon Del Diablo MWD	✓	✓	✓	
City of San Diego	✓	✓	✓	✓
San Dieguito Water District	✓	✓		
Santa Fe Irrigation District	✓	✓	✓	
Sweetwater Authority[5]	✓	✓		✓
U.S.M.C. Base Camp Pendleton		✓	✓	
Vallecitos Water District	✓	✓	✓	
Valley Center MWD	✓	✓	✓	
Vista Irrigation District	✓	✓	✓	✓
Yuima Municipal Water District		✓		

1 Urban Water Management Plan updated in 2015 and submitted to California Department of Water Resources.
2 Includes adopted water master plans and water facilities plans for conveyance, storage, or treatment facilities. Also includes capital improvements budgets for proposed facilities.
3 Includes plans for the treatment, distribution, marketing, or sale of recycled water. Depending on the agency, the plan may be incorporated within the agency's water master plan or serve as a stand-alone planning document.
4 Includes watershed sanitary surveys that have been updated by the listed agencies within the past five years, as required under the State of California Surface Water Filtration and Disinfection Treatment Regulations (Title 22, Section 64665 of the California Code of Regulations).
5 Sweetwater Authority is comprised of the South Bay Irrigation District and City of National City, both of which are Water Authority members.

Groundwater Sustainability Planning

The Sustainable Groundwater Management Act of 2014 (SGMA) provides a framework for sustainable groundwater management through the formation of Groundwater Sustainability Agencies (GSAs) and development of Groundwater Sustainability Plans (GSPs) for designated high and medium priority groundwater basins or subbasins. GSP development across the state is currently underway, with completion of GSPs anticipated for January 2020 or 2022, depending on groundwater basin designation. Guidelines for GSP development indicate four major topics for inclusion within the plans:



1. *Basin Setting* – A hydrogeologic conceptual model and a description of groundwater conditions will be required in order to develop a water budget for the basin.
2. *Sustainable Management Criteria* – The plan will define sustainable management criteria by identifying sustainability goals and measurable objectives designed to prevent and/or mitigate undesirable results.
3. *Monitoring Networks* – The plans will establish monitoring networks designed to collected groundwater-specific data to evaluate defined groundwater indicators in support of achieving sustainability goals
4. *Projects and Management Actions* – Through the establishment of a basin's water budget and identification of sustainability criteria, a GSA will be able to develop plan to implement projects and management actions to achieve groundwater sustainability.

The following GSPs are underway in the San Diego Region:

- San Diego River Valley Groundwater Basin (Medium Priority Basin): Led by Padre Dam MWD, the San Diego River Valley GSA was formed in 2016 and includes Padre Dam MWD, County of San Diego, City of San Diego, and Lakeside Water District. The GSA is currently in the process of developing a Groundwater Sustainability Plan. A final GSP is anticipated in Fall 2021.
- San Luis Rey Valley Groundwater Basin (Medium Priority Basin): The Pauma Valley GSA, led by Yuima MWD in partnership with the County of San Diego, Upper San Luis Rey Resource Conservation District, and Pauma Valley Community Services District, is developing the Pauma Valley GSP in coordination with Mootami MWD, Pauma MWD, and Valley Center MWD. The Pauma Valley GSP is scheduled to be completed by January 31, 2022.
- San Pasqual Valley Groundwater Basin (medium Priority Basin): The San Pasqual GSA is led by the City of San Diego in partnership with the County of San Diego. The San Pasqual GSP is scheduled to begin development in early 2019, with the final GSP anticipated to be complete in 2022.

Projects identified in GSPs will be used as examples for the types of groundwater projects the Region may prioritize in future funding opportunities. In addition, basin setting information will help inform other local water supply planning efforts, as well as help establish a more coordinated network of groundwater monitoring efforts.

7.3.2 IRWM Consistency with Water Management Plans

This 2019 IRWM Plan is consistent with regional and local water plans developed by Metropolitan, the Water Authority, and local agencies, and incorporates goals and elements of these individual plans. Further, the foundation of the IRWM Plan is based on water management issues, goals, and water quality protection needs identified within regional and local water management plans. Local water management planning is often thought of in terms of urban water management planning for water supply; however, the IRWM Plan includes information from all relevant water management topics including stormwater, wastewater, natural resources, flood management, etc.

Stakeholder Coordination

Stakeholder coordination represents a key reason for the consistency between the IRWM Plan, regional water plans, and local agency water plans. Water agencies that comprise the Water Authority also serve as key stakeholders in the IRWM Process. The Water Authority, in addition to coordinating water supply planning with member agencies, serves on the RWMG within the IRWM planning effort.

As a result of this collaboration, stakeholder input from the IRWM process is incorporated into the water planning process, and stakeholder input from the water planning process is incorporated into the 2019 IRWM Plan. This collaboration and stakeholder cross-pollination ensures that both the IRWM Plan and regional/local water plans incorporate and address the same range of water supply and stakeholder-driven issues.

Consistency of Goals

The IRWM Plan goals were developed through a stakeholder-driven process, and address water supply reliability, water quality, natural resources, and integrated water resource management. In establishing these goals, the IRWM Plan goal-development process considered the goals and objectives of regional and local water plans (see *Chapter 2, Vision and Objectives*). Through this process, the IRWM Plan goals embed the Water Authority's "safe and reliable water supply" mission, as well as supporting the goals of individual local agency plans. Coordination and integration opportunities afforded through the IRWM Plan process can, in turn, influence regional and local water plan updates. Through this ongoing process, updated goals and water planning issues from local and regional water plans can be considered and incorporated into the IRWM Program.

Section 8 of the Water Authority's *2015 Urban Water Management Plan* addresses the benefits and opportunities for coordination between regional and local water supply plans and the IRWM Plan process.

Regional/Local Water Plans Incorporated into IRWM Plan

In addition to a shared stakeholder base and common goals, information and issues addressed in the regional and local water plans are incorporated directly into the IRWM Plan. Table 7-4 addresses how key elements within regional and local water plans are reflected within the 2019 IRWM Plan.

In summary, the 2019 IRWM Plan incorporates current and relevant elements of both regional and local water supply plans. By identifying and addressing management issues common to multiple local water agencies, the intent of the IRWM Process is to foster agency/stakeholder coordination and integration of projects to achieve the IRWM Plan objectives.

Table 7-4: Consistency of 2019 IRWM Plan with Regional/Local Water Plans

Elements within Regional / Local Water Plans[1]	Consistency with 2019 IRWM Plan
Goals and objectives in water plans and updated UWMPs	Incorporated into goals and objectives of IRWM Plan
Participating stakeholders	Stakeholders reviewed the 2019 IRWM Plan, and applicable stakeholders were added to IRWM stakeholder list
Institutional issues	Incorporated into IRWM Plan region description
Water demands projections	Incorporated into IRWM Plan region description
Description of water storage, treatment, and supply systems	Incorporated into IRWM Plan region description
Planned water system improvements	Incorporated into IRWM Plan region description
Implemented or planned local supply development or opportunities	Incorporated into IRWM Plan region description
Environmental or water quality issues	Incorporated into IRWM Plan region description
Constraints to supply optimization or development	Addressed in IRWM Plan region description
Project planning and support needs	Project scoring process updated to reflect regional priorities expressed by stakeholders
Climate change planning	Incorporated into IRWM Plan goals and region description

7.4 Relation to Regulatory Programs

During the course of the IRWM Program, the RWMG and RAC determined that improving the working relationships between IRWM stakeholders and regulatory agencies would facilitate better water management in the Region. As such, a planning study specifically geared toward identifying collaborative opportunities was prepared for the 2013 IRWM Plan, and its recommendations implemented as described in *Chapter 11, Framework for Implementation*, as described in this 2019 IRWM Plan.

7.4.1 Relevant Regulatory Programs

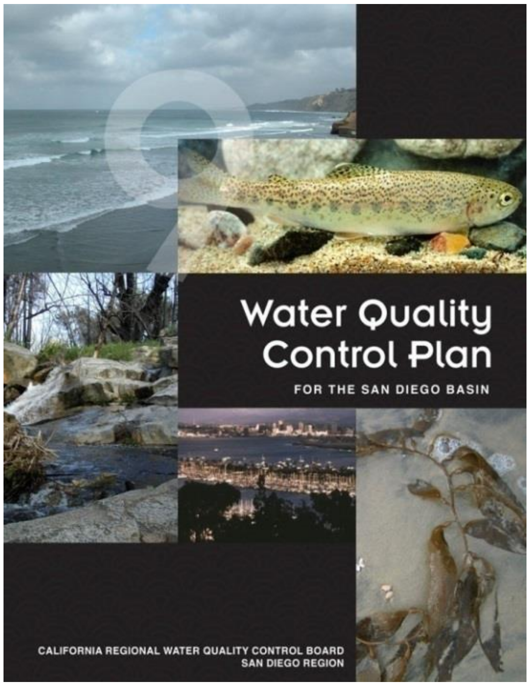
A number of regulatory agencies (see Table 7-5) influence IRWM planning and IRWM-supported projects: resource agencies, health agencies, and water quality agencies. Water quality agencies establish water quality standards or regulate water quality. Resource agencies can influence specific areas of IRWM planning, including stream channel modifications, flood channel maintenance, endangered species review, environmental protection, and land use. Health agencies regulate drinking water source control, treatment, and quality; they also assist the San Diego Water Board in regulating environmental water quality, wastewater treatment, disposal, and reuse.

Table 7-5: Summary of Key Regulatory Agencies that Influence IRWM Planning

Category	Agency
Water Quality	• Regional Water Quality Control Board, San Diego Region • State Water Resources Control Board • U.S. Environmental Protection Agency
Resource Agencies	• U.S. Army Corps of Engineers • U.S. Fish and Wildlife Service • U.S. National Oceanographic and Atmospheric Administration Fisheries Service • California Department of Fish and Wildlife • California Coastal Commission
Health Agencies	• California Department of Public Health • County of San Diego Department of Environmental Health

Establishment of Water Quality Plans and Policies

The San Diego Water Board, State Board, and EPA have broad authority in establishing receiving water standards, regulating discharges, and enforcing compliance with water quality standards, plans, and policies. Water quality plans that establish receiving water standards within the San Diego Region include:



The Basin Plan designates beneficial uses and establishes water quality objectives for the Region.

- *Water Quality Control Plan for the San Diego Region (*Basin Plan) (San Diego Water Board, 1994, with amendments effective on or before May 17, 2016), which designates beneficial uses and establishes ground and surface water quality objectives and implementation policies to protect the beneficial uses.
- *Water Quality Control Plan, Ocean Waters of California* (California Ocean Plan) (State Board, 2015), which establishes prohibitions, water quality objectives, and implementation policies for discharges to ocean waters.
- *Water Quality Control Plan for Enclosed Bays and Estuaries* (Bays and Estuaries Plan) (State Board, 2009b), which establishes water quality and sediment objectives and implementation policies for discharges to enclosed bays and estuaries.
- *Water Quality Control Plan for Control of Temperatures in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California* (Thermal Plan) (State Board, 1998), which establishes water quality objectives and implementation policies related to thermal discharges.
- *California Toxics Rule* (Title 40, Section 131.38 of the *Code of Federal Regulations*) (EPA, 1998), which establishes water quality objectives for toxic constituents for inland surface waters and enclosed bays and estuaries.

- *Point-Source National Pollutant Discharge Elimination System (NPDES) Permits* are administered under Section 402 of the Clean Water Act to regulate discharges to federal surface waters from point-source and non-point discharge sources. Point-source NPDES permits are issued to specific entities that discharge to surface waters. The San Diego Water Board implements the NPDES program under authority delegated by EPA. NPDES permits are established for five-year periods, but can be renewed.
- The San Diego Water Board regulates discharges from *Municipal Separate Storm Sewer Systems (MS4s)* under a regional permit that jointly regulates stormwater Copermittees. The MS4 NPDES permit establishes prohibitions, effluent limitations, action levels, monitoring and reporting requirements, and required runoff management programs for regulating discharges.
- *Waste Discharge Requirements* are issued by the San Diego Water Board to regulate wastewater discharges (or threatened discharges) to land or to groundwater. Waste discharge requirements specify effluent concentration limits that are based on ensuring compliance with applicable Basin Plan groundwater quality concentration objectives.
- *List of 303(d) Impaired Waters*, prepared by the San Diego Water Board pursuant to CWA Section 303(d), identifies surface waters that are not in compliance with applicable water quality standards. The list is forwarded to the State Board, along with recommended schedules for the preparation of *Total Daily Maximum Loads* (TMDLs) and waste load allocations to attain the standards. EPA approved the State's 2014/2016 303(d) impaired water bodies list in April 2018.

7.4.2 Opportunities for Collaboration

Focus on San Diego Water Board Coordination

While IRWM planning activities can be affected by regulatory actions taken by resource or health agencies (see *Section 7.4.1*), the flexibility of resource and health agencies to coordinate with the IRWM Program may be limited by a narrow range of regulatory authority or focus, inflexible regulatory requirements or mandates, and decision processes that do not incorporate stakeholder input. The San Diego Water Board purview, on the other hand, extends over a broad range of IRWM planning activities. Additionally, the San Diego Water Board consults with the resource agencies, health agencies, EPA, and the State Board in establishing water quality standards and permits requirements and offers a built-in opportunity for interagency input. Additional reasons for considering opportunities for IRWM/San Diego Water Board collaboration include:

- the IRWM Program and San Diego Water Board each focus on issues specific to the San Diego Region,
- parallels exist in the water quality protection goals of the IRWM Program and the San Diego Water Board,
- the IRWM Program and San Diego Water Board operate under open processes that encourages public participation and stakeholder input, and
- the San Diego Water Board enjoys flexibility in establishing water quality standards that are specific to the water quality and beneficial use protection needs of the San Diego Region.

Additionally, while the San Diego Water Board's regulatory mandates have expanded over the years, resources available to the San Diego Water Board and the regulated Copermittees have not kept pace with the expansion of these regulatory responsibilities. As a result, the San Diego Water Board and the Copermittees utilize their limited resources to address what it deems to represent the highest priority regional water resource protection needs. The IRWM Program is, in essence, a stakeholder-driven resource allocation process. In areas where IRWM and San Diego Water Board goals and responsibilities are compatible, the potential exists for resources provided through the IRWM Program to assist the San Diego Water Board and Copermittees in addressing a greater range of water quality issues and priorities.

IRWM Regulatory Workgroup

Recognizing this potential compatibility, the RWMG and RAC organized a Regulatory Workgroup to support the 2013 IRWM Plan that included San Diego Water Board participation along with a broad range of stakeholders. The Workgroup objectives included:

- serving as an ideas forum or "think tank" to develop suggestions on how the IRWM Program and San Diego Water Board can collaborate to more effectively address regional water issues, and
- providing direction in the preparation of an issues paper (Workgroup Report) that summarizes potential IRWM and San Diego Water Board collaborative opportunities and identifies recommended actions to pursue sensible collaborative opportunities.

Regulatory Workgroup input was provided through a series of workshops. A technical team supported the Workgroup effort by facilitating Workgroup meetings, organizing Workgroup directives, preparing documents to support and focus Workgroup discussion, and preparing a report that summarized Workgroup findings and recommendations.

The purpose of the IRWM Regulatory Workgroup was to determine where regulatory conditions may allow changes to existing regulations to better-achieve regional goals.

Shared IRWM/San Diego Water Board Goals

In 2013, the San Diego Water Board updated its "Practical Vision", which establishes a strategic plan, priorities, and intended future direction (San Diego Water Board, 2013). During development of the Practical Vision, San Diego Water Board staff presented key priority themes of the draft Practical Vision to the Work Group. In presenting the priority themes, San Diego Water Board staff also advised that IRWM and San Diego Water Board collaboration should be directed toward the shared IRWM/San Diego Water Board goals of improving water quality and environmental conditions.

Table 7-6 compares the San Diego Water Board's mission and Practical Vision priority themes with the IRWM Plan mission and objectives. As shown in the table, the IRWM Plan and San Diego Water

Board share considerable common interests; IRWM Plan objectives address each of the priority themes addressed in the San Diego Water Board's Practical Vision.

Table 7-6: Comparison of IRWM Plan and San Diego Water Board Missions and Objectives

San Diego Water Board Priorities[1]	IRWM Plan
Mission: Preserve and enhance the quality of California's water resources and to ensure their proper allocation and efficient use for the benefit of present and future generations.	**Mission:** To develop and implement an integrated strategy to guide the San Diego Region toward protecting, managing, and developing reliable and sustainable water resources. Through a stakeholder-driven process and adaptive process, the Region can develop solutions to water-related issues and conflicts that are economically and environmentally preferable, and that provide equitable resource protection for the entire Region.
Priority Themes[1] • Ensure the health of ground and surface waters • Implement effective monitoring and assessment • Support recovery of wetlands and riparian areas • Achieve proactive public outreach and communication • Support sustainable local water supplies	**IRWM Plan Objectives[2]** A. Encourage the development of integrated solutions to address water management issues and conflicts B. Maximize stakeholder/community involvement and stewardship of water resources C. Effectively obtain, manage, and assess water resource data and information D. Further the scientific and technical foundation of water management E. Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies F. Construct, operate, and maintain a reliable and resilient water management infrastructure system G. Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management H. Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment I. Protect, restore and maintain habitat and open space J. Advance water-based enriching experiences

1 Priority themes identified by San Diego Water Board staff as being presented in the *San Diego Water Board Practical Vision, 2013-2019*, which sets forth the San Diego Water Board's proposed strategic plan for the next five years.

2 Objectives identified within the 2019 San Diego Region IRWM Plan.

Identified Collaborative Outcomes

The Workgroup utilized the following process to identify potential IRWM and San Diego Water Board collaborative opportunities to achieve mutual IRWM/San Diego Water Board goals:

1. Identify potential issues of mutual interest to the IRWM Program and San Diego Water Board.
2. Prioritize the potential issues of interest to identify issues with strong and broad Workgroup support and identify desired outcomes for IRWM/San Diego Water Board collaboration.
3. Identify IRWM Program assets and identifying potential collaborative measures that could be undertaken to achieve the desired outcomes.

The Workgroup utilized five facilitated workshops to identify, assess, and prioritize issues of common IRWM and San Diego Water Board interest. Through this process, the Workgroup identified the following desired outcomes for IRWM/San Diego Water Board collaboration.

Desired Outcome No. 1: Support Science-Based Basin Plan Objectives

Support the San Diego Water Board's triennial review process and San Diego Water Board programs and efforts to update science-based assessments of relations between Basin Plan objectives and beneficial use protection.

Desired Outcome No. 2: Support Science-Based Impaired Water Listings and Compliance

Support San Diego Water Board programs and efforts to (1) update impaired water listings that are based on science and robust data and (2) achieve water quality compliance and protect beneficial uses.

Desired Outcome No. 3: Support Prioritization of Habitat Restoration Needs and Opportunities

Support the San Diego Water Board in implementing a process for prioritizing wetlands and riparian habitat restoration needs and opportunities, and coordinate with resource agencies to address regional restoration needs and issues.

Workgroup Recommendations

The Workgroup noted that limited San Diego Water Board staff resources may constrain San Diego Water Board participation in the above desired outcomes. As a result, collaboration between the IRWM Program and the San Diego Water Board may be most useful to the San Diego Water Board in areas where such collaboration:

- assists the San Diego Water Board in executing their statutory responsibilities and in complying with state and federal mandates,
- results in increased regulatory resources or efficiency,
- does not result in increased San Diego Water Board staff workloads,
- assists the San Diego Water Board in stakeholder involvement, and/or
- generates measurable outcomes that demonstrate conformance with applicable water quality standards, requirements and policies.

Recommendations of the Workgroup were presented in *Potential IRWM/San Diego Water Board Collaborative Opportunities, 2013 IRWM Plan*. The Workgroup report is presented as Appendix 7-A.

The Workgroup recommended that IRWM/San Diego Water Board collaboration be centered on benefits that the IRWM Program can provide, which include:

- vision and advocacy,
- technical expertise,
- stakeholder coordination, and
- project funding.

The Workgroup recognized that IRWM/San Diego Water Board collaboration to address the desired outcomes would require an ongoing and evolving process. To initiate progress toward achieving the desired outcomes, the Workgroup identified (1) initial objectives to facilitate progress toward the outcomes, and (2) initial recommended actions (deemed "early action" items) to achieve the initial progress objectives. Table 7-7 presents recommended initial progress objectives and early action items for supporting desired outcomes 1, 2, and 3. To support these desired outcomes, the Workgroup also identified early actions directed toward an overarching goal of improving communication between the IRWM Program and San Diego Water Board.

Table 7-7: Summary of Regulatory Work Group "Early Action" Recommendations

Desired Outcome of IRWM/San Diego Water Board Collaboration	Initial Objective to Facilitate Progress toward Desired Outcome	Early Action Recommendations to Achieve Initial Objective
1. Support science-based Basin Plan objectives	Identify science-based Basin Plan modifications that may warrant higher priority than provided in 2011 triennial review	• Convene caucus of IRWM stakeholders to (1) identify Basin Plan objectives targeted for review/revision and (2) discuss and review support needs • Organize IRWM stakeholder participation in the San Diego Water Board Triennial Review process to promote priority San Diego Water Board action on the Basin Plan issues targeted by IRWM stakeholders
2. Support science-based 303(d) impaired water listings	Identify existing 303(d) listings that may warrant reevaluation or reclassification	• Convene caucus of IRWM stakeholders to (1) identify 303(d) listings requiring modification and (2) and discuss/review support information needs • Organize IRWM stakeholder participation in the San Diego Water Board 303(d) stakeholder review process and promote priority San Diego Water Board action on the listings targeted by IRWM stakeholders
3. Support prioritization of habitat restoration needs and opportunities	Assess and promote resource agency interest in prioritization of habitat restoration opportunities	• Convene meeting between IRWM stakeholders and resource agencies to discuss means of identifying, coordinating, and prioritizing restoration opportunities
Overarching actions to support Desired Outcomes 1, 2, and 3	Improve communication between the IRWM Program and San Diego Water Board	• Assign IRWM liaison to attend San Diego Water Board meetings • Provide San Diego Water Board Executive Officer with periodic IRWM update reports for inclusion in San Diego Water Board agenda packets

Based on the recommendations from the Regulatory Workgroup, increased coordination between the San Diego Water Board and the IRWM Program has been occurring, with San Diego Water Board announcements as a standing agenda item for RAC meetings and regular attendance at one another's meetings.

7.5 Relation to Salinity Planning

As part of the 2013 IRWM Plan, regional stakeholders prepared several planning documents related to salinity planning. The *Proposed Guidelines – Salinity/Nutrient Management Planning in the San Diego Region (9)* (Water Authority et al. 2010) were completed in 2010 and accepted by the San Diego Water Board. Five Salt and Nutrient Management Plans (SNMPs) have been developed. One additional SNMP was under way during development of the 2019 IRWM Plan Update – Phase 1. *Section 7.5.3* below provides information on each of the Region's SNMPs. In addition to SNMPs, statewide salinity management efforts are also subject to the State Board's Recycled Water Policy.

7.5.1 Recycled Water Policy

In February 2009, the State Board adopted Resolution No. 2009-011, which established a statewide Recycled Water Policy. The Recycled Water Policy requires the State Board and the Regional Water Quality Control Boards to focus their limited resources on projects that require substantial regulatory review due to unique site-specific conditions, and exercise their authority to the fullest extent possible to encourage the use of recycled water, consistent with state and federal water quality regulations. An amendment regarding monitoring requirements for constituents of emerging concern (CECs) was adopted in 2013, and another amendment to provide statewide consistency for recycled water project permit requirements is underway.

While California's Porter-Cologne Act charges Regional Water Quality Boards with developing and enforcing Basin Plan groundwater quality objectives, the Regional Water Quality Control Boards' permitting and enforcement jurisdiction is limited to the regulation of "discharges of wastes", including wastewater, stormwater and recycled water. The Recycled Water Policy recognizes that wastewater and recycled water projects may represent only a portion of the overall salinity/nutrient loads within a watershed or groundwater basin. To address this, the Recycled Water Policy requires that the management of salinity and nutrient loads be done through the development of regional and sub-regional salt and nutrient management plans. The Policy identifies stakeholder-driven Salt and Nutrient Management Plans (SNMPs) as the appropriate means for identifying and managing salinity and nutrient loads; per the Policy, those stakeholders with a vested interest in groundwater are responsible for developing SNMP.

The Recycled Water Policy required that SNMPs be prepared for each California groundwater basin or sub-basin, or have made substantial progress toward completion, by May 2014. While the intent of the SNMP requirements is to promote statewide recycled water use while providing for groundwater quality protection, the San Diego Water Board essentially met this intent during the 1980s and 1990s through a series of recycled water/groundwater protection studies and associated Basin Plan modification efforts. These prior efforts resulted in the promotion of recycled water use throughout a large portion of the Region.

7.5.2 Salinity/Nutrient Planning Guidelines

1. Establish a framework under which SNMPs may be established by interested agencies and stakeholders,
2. Assess the Region's aquifers and identify aquifers that are suitable for the development of SNMPs and prioritize the Region's groundwater basins for the development of SNMPs,
3. Present "tiered" work scopes for developing SNMPs within the Region in which the level of required assessment is based on the size of the basin, the level of basin complexity, and the potential for conflicts between recycled water use and groundwater quality protection,
4. Identify roles of agencies and identify categories of potential stakeholders,
5. Identify suggested approaches and the expected level of effort for completing the required SNMP tasks for each of the required SNMP phases, including:
   - Step 1: conducting an initial basin characterization.
   - Step 2: identifying and quantifying salinity/nutrient sources,
   - Step 3: identifying supplemental monitoring needs and collecting required data,

GUIDELINES

SALINITY/NUTRIENT MANAGEMENT PLANNING

in the

SAN DIEGO REGION (9)

Suggested framework and guidelines for salinity/nutrient management plans required by the State of California Recycled Water Policy

Prepared by:
Michael R. Welch, Ph.D., P.E.
Consulting Engineer

SCSC
Southern California Salinity Coalition

San Diego County Water Authority

November 10, 2010

The SNMP Guidelines were developed to provide local agencies with guidance in developing SNMPs

  - Step 4: identifying and evaluating potential salinity/nutrient management strategies, selecting appropriate strategies for implementation, and identifying applicable Basin Plan modifications to implement the recommended strategies, and
  - Step 5: identifying assessment metrics for evaluating SNMP effectiveness.
6. Provide guidance on which SNMP constituents should be addressed,
7. Identify strategies to be considered in managing salinity/nutrient sources and loads, and
8. Outline the process for regulatory review and approval of developed SNMPs.

The San Diego Water Board formally endorsed the SNMP Guidelines on November 10, 2010 with the adoption of Resolution R9-2010-0125.

Recommended Approaches

The SNMP Guidelines identified the salinity and nutrient constituents of concern for the Region based on regional and basin-specific groundwater quality studies and characterizations, groundwater uses, recycled water standards, and compliance issues. Using the Basin Plan constituents of concern as the basis for this exercise, Table 7-8 identifies which of these constituents of concern are applicable to the Region, why they are or are not considered a constituent of concern, and if and how the various SNMPs should approach addressing these constituents.

Basin Prioritization

The SNMP Guidelines organized the Region's groundwater basins into five tiers, ranging from highest priority (Tier A) to lowest (Tier E) regarding the perceived sensitivity of groundwater resources and the related need for salt and nutrient management planning. Table 7-9 provides a listing of the groundwater basin tiers.

- Tier A basins are larger than 60,000 acre-feet, and are significantly used (or proposed for use) for municipal groundwater use. Tier A basins may be contaminated in the downstream portion, and the hydrogeology, groundwater quality, and management alternatives have been well studied. Tier A basins are the highest SNMP priority.
- Tier B basins are those basins which have a capacity of 50,000 acre-feet or less, located in urbanized or agricultural areas. While they have variable groundwater quality, it nevertheless remains useable for agricultural or municipal use. Tier B basins may experience occasional noncompliance with groundwater quality objectives, and have significantly less potential yield than Tier A basins. They are also less well studied than Tier A basins. Tier B basins are a medium SNMP priority.
- Tier C basins are smaller, shallow aquifers with capacities less than 20,000 acre-feet, in unconsolidated sediments. Wastewater and recycled water agencies in Tier C basins may experience occasional noncompliance with water quality objectives, and yields from Tier C basins are modest or small. There are fewer studies that help characterize hydrogeology, groundwater quality, and groundwater transport in Tier C basins than in Tier A or Tier B basins. Tier C basins are a medium SNMP priority.
- Tier D basins are further divided into two categories: Tier D-1 and Tier D-2. Tier D-1 basins are large or moderately sized urbanized coastal groundwater basins. They have higher salinity groundwater quality, with groundwater quality objectives for TDS that exceed 1200 mg/L. Municipal supply is developed or proposed in these basins through demineralization. Tier D-1 basins are a low SNMP priority. Tier D-2 basins are similar to Tier D-1, but are moderate to small-sized, may be coastal or inland, and are not currently developed for public water supplies. On November 10, 2010, the San Diego Water Board adopted Resolution No.

R9-2009-0125 which endorsed the SNMP Guidelines (San Diego Water Board, 2010). At its March 2013 meeting, the San Diego Water Board further confirmed that Tier D-2 basins as identified in the salt and nutrient management plan guidelines are small coastal basins that are not currently used for developing water supplies, and in which recycled water compliance with water quality objectives is not generally a high concern. The SNMP Guidelines recommend that Tier D basins do not require an SNMP.

- Tier E basins are the lowest priority basins for SNMPs. These are located in the rural, eastern portion of the Region, and generally include groundwater dependent communities located outside Metropolitan's service area, the recycled water service area, and the intended scope of the SNMP Guidelines. Tier E basins do not require an SNMP.

Table 7-8: Recommended Salt/Nutrient Management Approaches

Constituent of Concern	Management Issue	Recommended Approach in SNMP
TDS	• Recycled water effluent limits of 1000 mg/L is typical in Region • Groundwater baseline salinity is frequently near or at basin objectives • Compliance with recycled water effluent limits is often challenging	• TDS is likely to be the primary constituent of concern in SNMPs
Chloride	• Compliance is not typically an issue in the Region	• Only need to address chloride if basin-specific needs have been identified
Sulfate	• Compliance is not typically an issue in the Region	• Only need to address sulfate if basin-specific needs have been identified
Sodium	• Compliance is not typically an issue in the Region	• No need to address. May address on a project-by-project basis if necessary
Boron	• Compliance is not typically an issue in the Region • Exceptions are those agencies with industrial discharge sources from boric acid etching operations	• Only need to address Boron if basin-specific needs have been identified, or otherwise locally warranted. • Boron will likely need to be addressed for Carlsbad and Vallecitos areas now that the Carlsbad Desalination plant is operational
Fluoride	• Compliance is not typically a problem, but may be a problem in the future	• Basin Plan objectives for fluoride are inconsistent with CDPH and EPA recommendations. If the objectives are updated, there is no need to address fluoride
Nitrate	• Occasional noncompliance in areas with wastewater percolation to groundwater • Recycled water effluent limits not currently established, may be regulated in the future • Recycled water use may reduce fertilizer use	• No need to address nitrogen, except on an as-need, project-by-project basis • May prefer a mass-balance approach • If nitrate is addressed, must also address potential cumulative effects
Iron and Manganese	• Recycled water iron and manganese compliance is an increasing concern • Nutrient update by vegetation causes difficulty in determine source loads	• Needs to be addressed in either an SNMP or through project-specific modifications of effluent limits consistent with a regionally coordinated assessment of iron and manganese demands, application, and uptake.
Phosphorus	• No groundwater quality objectives exist for phosphorus in Region • Not easily transported through soil	• No need to address.

Source: Adapted from *Proposed Guidelines – Salinity/Nutrient Management Planning in the San Diego Region (9)* (Water Authority et al. 2010)

Table 7-9: Groundwater Basin Tiers in Region 9*

Tier A Basins			
• Lower Santa Margarita	• Santee/El Monte	• Hodges/San Pasqual	
Tier B Basins			
• San Mateo • San Onofre • Las Flores	• Pala/Pauma • San Marcos • Escondido	• Santa Maria • Middle Sweetwater	
Tier C Basins			
• Valley Center • Keys Creek • Vista	• Miramar • San Vicente/Gower	• National City • Poway	
Tier D Basins			
Tier D-1	**Tier D-2**		
• Oceanside Mission • Mission Valley • Lower Sweetwater	• Bonsall/Moosa • Batiquitos, Buena Vista • Agua Hedionda, Encina	• San Elijo • Lower San Dieguito • El Cajon	• Otay • Lower Tijuana
Tier E Basins			
• Santa Ysabel • Warner • Pine Valley	• Descanso • Portrero	• Campo • Cottonwood	

*Basin names correspond to the Salinity/Nutrient Management Planning guidance document (Water Authority et al., 2010), see *Chapter 5, Watershed Characterizations* for information on how these basin names correspond to those found in DWR's Bulletin 118 and the 2013 IRWM Plan.

Source: Water Authority et al. 2010

SNMP Process

The statewide Recycled Water Policy acknowledges that the salt and nutrient management needs of groundwater basins will vary across the state, and that the contents of an SNMP will be dependent on site-specific factors. Key components common to all SNMPs are that they be developed in a stakeholder driven process, they assess water quality and salinity/nutrient loads within each basin, and that they identify and evaluate strategies for achieving compliance with Basin Plan water quality objectives and protect beneficial uses.

Using existing knowledge of groundwater basins and uses in the Region, along with stakeholder input through a series of salinity/nutrient management coordination workshops in 2009 and 2010, the SNMP Guidelines identify the key components of SNMPs for the Region, which vary by Tier. However, it should be emphasized that these are meant as guidelines and not required components.

Step 1: Initial Basin Characterization

Identify the basin and define the study area to be evaluated, review existing groundwater studies, identify stakeholders and develop outreach, identify and quantify beneficial uses, characterize existing an historic groundwater quality and distribution, and identify salt/nutrient parameters to be addressed in the SNMP.

Step 2: Identify and Quantify Salinity/Nutrient Sources

Identify and quantify salt/nutrient loads to the basin for constituents identified in Step 1, and develop tools to evaluate the basin's assimilative capacity and fate and transport of salt/nutrient loads. This may include reviewing prior models, determining if a flow/transport model or mass-balance approach is appropriate, and ranking sources by impact on water quality.

Step 3: Supplemental Monitoring

Identify data gaps and develop and implement a plan for addressing them. Supplemental monitoring may be required to better assess hydrogeology or provide complete characterization of groundwater quality. The monitoring plan must be designed to determine water quality in the basin. Monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with adjacent surface waters.

Step 4: Salinity Nutrient Management Strategies

Identify the management goals for the SNMP, develop a list of appropriate management strategies, evaluate the potential effectiveness of the management strategies, evaluate and select alternative management strategies, address Basin Plan modifications that may be associated with the recommended management strategies, and to assess environmental regulatory compliance, such as CEQA and NEPA. Note that different strategies for upstream and downstream portions of basin may be appropriate and special consideration may be required in basins upstream from potable supply reservoirs. Additionally, balancing conflicts between groundwater and recycled water uses may be required using a decision model.

Step 5: Assessment of Plan Effectiveness

The final step in the SNMP process is to assess the effectiveness of the SNMP. This will require identification of metrics, development and implementation of a monitoring program, and establishment of a framework and schedule for auditing and updating the SNMP.

7.5.3 Salt/Nutrient Management Plans in the Region

In March and April 2013, the Water Authority entered into agreements with five agencies to develop SNMPs in the Region. This effort was funded in part through a Proposition 84 IRWM Planning Grant. The five SNMPs developed were in support of the basins that were prioritized by the Region. A sixth SNMP is currently underway and described below.

Lower Santa Margarita River Basin

The Fallbrook Public Utility District (Fallbrook PUD) prepared an appendix in support of the Lower Santa Margarita River Basin SNMP currently being developed by USMC Base Camp Pendleton (USMC, 2012). The Lower Santa Margarita River Basin is a Tier A groundwater basin, and therefore of highest priority for development of an SNMP. This document looked at the use of highly-treated recycled water in the upper basin that may be used to improve water quality in the lower basin. Fallbrook PUD had considered working with Camp Pendleton to implement indirect potable reuse (IPR) by discharging highly treated recycled water into Fallbrook Creek, which would then be diverted for groundwater recharge at Camp Pendleton, however, this was determined to be a less desirable option in the near-term due to costs being comparable or higher than other water management options. IPR may be reconsidered in the future as water management priorities and opportunities change. Camp Pendleton uses groundwater as its primary water supply source, and is therefore concerned with groundwater quality. Groundwater quality violations may trigger federal investigations due to Camp Pendleton's military operations. This appendix will address the impacts of the proposed IPR project on the salt and nutrient loads in the Lower Santa Margarita River Basin, and will be incorporated into the SNMP for the basin.

Santee/El Monte Basin

The Santee/El Monte Basin is a Tier A basin, with increasing salinity in the downstream (Santee) portion and lower salinity in the upstream (El Monte) portion of the basin. While the basin currently serves as a water supply for several agencies, the City of San Diego is considering it for potential expanded groundwater use. The Padre Dam Municipal Water District (Padre Dam MWD) developed an SNMP for the Santee portion of the basin in 2013 (Padre Dam MWD, 2013). This included identification of salt and nutrient sources, basin capacity and loading estimates, recycled water use and recharge goals and objectives, determination of any necessary reductions of loading rates, proposed mitigation measures, and development of a monitoring plan.

To date, Padre Dam MWD has completed water quality data collection, development and approval of a project approach plan, coordination with the San Diego Water Board, and several stakeholder meetings. The stakeholder meetings were advertised as public meetings on both the Padre Dam MWD and San Diego Water Board websites.

For further development of the Santee/El Monte Basin, historic water rights issues need to be reconciled with beneficial uses of the basin for municipal agencies contributing return flow from imported and recycled water.

San Pasqual/Hodges Basin

The San Pasqual/Hodges Basin is an agricultural basin owned by the City of San Diego. The downstream portion (Hodges) has increasing groundwater salinity, though the upstream portion (San Pasqual) remains fairly high quality. The City of San Diego is considering the San Pasqual/Hodges Basin for potential future water supply, making it a Tier A basin. The City of San Diego Public Utilities Department completed a SNMP for the San Pasqual portion of the basin in 2014 (City of San Diego, 2014). The City of San Diego also developed a preliminary salt and nutrient loading analytical tool. They conducted a consumptive use analysis, built a soil moisture budget that included groundwater recharge and irrigation pumping analysis, and developed a summary of the basin salt and nutrient budget data. All of this work was rolled up into a summary of preliminary results, which was used for development of the final SNMP.

Santa Luz golf course in the San Dieguito Watershed uses recycled water for irrigation and water features.

Source: Jeff Pasek, City of San Diego

The final SNMP included basin characterization, the identification of salinity/nutrient sources, and identified the need for additional supplemental monitoring of well, surface water, and agricultural run-off.

Escondido Valley Basin

The Escondido Valley Basin is a Tier B groundwater basin and is managed primarily by Rincon del Diablo Municipal Water District (Rincon MWD). Rincon MWD finalized the SNMP in October 2013 (Rincon MWD, 2013). This SNMP included identification of the salt and nutrient sources in the basin, along with basin capacity and loading estimates. It also considered the recycled water use and recharge goals and objectives for the Escondido subarea, and determined what reductions in loading rates are necessary. It proposed feasible mitigation measures, scheduled tasks to identify measures that can be used to reduce or improve the Escondido subarea, and developed a monitoring plan.

San Vicente/Gower Basin

The San Vicente/Gower basin is a Tier C groundwater basin. The Ramona Municipal Water District (Ramona MWD) entered into an agreement with the Water Authority to develop an SNMP for the Gower portion of the basin. The plan was completed in October 2013 (Ramona MWD, 2013). As part of the SNMP, Ramona MWD identified the salt and nutrient sources in the basin, as well as the basin capacity and loading estimates. It considered recycled water use and recharge goals and objectives, and determined necessary reductions to loading rates. Finally, it recommended mitigation measures, scheduled completion tasks to identify measures to reduce or improve the Gower basin, and developed a monitoring plan.

For the Gower SNMP, Ramona MWD compiled and analyzed water quality and other relevant data in GIS, developed a project workplan, and hosted several stakeholder meetings.

Poway Valley Basin

The Poway Valley basin is a Tier C groundwater basin. The City of Poway and the City of San Diego are currently working together to develop a SNMP for the Poway Valley basin. The SNMP will include identification of salt and nutrient sources, basin characterization, recycled water use and recharge goals and objectives, determination of any necessary reductions of loading rates, proposed mitigation measures, and development of a monitoring plan.

SNMP development will include two workshops for the purpose of presenting information, gathering input from stakeholders, and providing a forum for discussion of salt and nutrient issues.

7.5.4 Salt/Nutrient Management Plan for Tier D and E Basins

Although the SNMP Guidelines recommended that no SNMP is necessary for Tier D and E basins, the following presents recommendations for managing salts and nutrients in Tier D and E basins within the San Diego IRWM Region.

As described above, Tier D basins are divided into two categories: Tier D-1 and Tier D-2. Tier D-1 basins are large or moderately sized urbanized coastal groundwater basins. They have higher salinity groundwater quality, with groundwater quality objectives for TDS that exceed 1200 mg/l. Municipal supply is developed or proposed in these basins through demineralization. Tier D-1 basins are a low SNMP priority. Tier D-2 basins are similar to Tier D-1, but are moderate to small-sized, may be coastal or inland, and are not currently developed for public water supplies. Tier E basins are the lowest priority basins for SNMPs. These are located in the rural, eastern portion of the Region, and are outside both Metropolitan's service area and the recycled water service area. Groundwater in many of these basins remains good to excellent. Table 7-10 lists the Tier D and E basins in the Region.

Based on the potential impacts to the basins by salt and nutrient loadings, the existing groundwater quality, or designated beneficial uses, specific basin-wide analysis for the Tier D and E basins is not recommended by the SNMP Guidelines. Typical salt loading in the San Diego Region comes from application of potable water, recycled water, groundwater or other supplies to irrigate landscaping or agriculture. Nutrient loading comes primarily from use of fertilizers. Impacts from nutrients can be minimized by understanding the background nutrient concentration in the water supply and only adding nutrients necessary for proper plant growth. Salt loading can be minimized by avoiding overwatering and planting landscapes that require minimal application of water. Nutrient loading to use areas from irrigation and fertilizers should not exceed the nutrient demands of the vegetation.

Measures that agencies and stakeholders may implement to minimize nutrient and salt loading include providing information to the public regarding application of irrigation water at agronomic rates, encouraging training for site supervisors or landscapers at large irrigation sites, encourage appropriate use of fertilizers, encourage use of smart controllers, consider adopting water rate structures that encourage water use efficiency, promote landscapes that require minimal watering, and supporting other appropriate measures deemed necessary to lessen nutrient loading. These approaches can be incorporated into existing water conservation, recycled water and stormwater programs.

Table 7-10: Tier D and E Groundwater Basins

Basin Tier	Groundwater Basin	Municipal Water Agencies	Municipal Wastewater Agencies
Tier D-1	Oceanside Mission	• City of Oceanside	• City of Oceanside
	Mission Valley	• City of San Diego	• City of San Diego
	Lower Sweetwater	• Sweetwater Authority	• City of National City • City of Chula Vista
Tier D-2	Bonsall/Moosa	• Rainbow MWD	• Rainbow MWD • Valley Center MWD
	Batiquitos, Buena Vista	• Carlsbad MWD	• City of Carlsbad • Carlsbad MWD • Leucadia WWD
	Agua Hedionda, Encina	• Carlsbad MWD	• City of Carlsbad • Carlsbad MWD • Leucadia WWD
	San Elijo	• Olivenhain MWD • San Dieguito Water District	• Olivenhain MWD • San Elijo JPA
	Lower San Dieguito	• Olivenhain MWD • Santa Fe Irrigation District	• Olivenhain MWD • Rancho Santa Fe CSD • Fairbanks Ranch CSD
	El Cajon	• Helix Water District • Otay Water District	• City of El Cajon
	Otay	• City of San Diego • Otay Water District	• City of San Diego • Otay Water District
	Lower Tijuana	• City of San Diego	• City of San Diego
Tier E	Santa Ysabel	• N/A	• N/A
	Warner	• Vista Irrigation District	• N/A
	Pine Valley	• N/A	• N/A
	Descanso	• N/A	• N/A
	Portrero	• N/A	• N/A
Tier E	Campo	• N/A	• N/A
	Cottonwood	• N/A	• N/A

Source: Water Authority et al., 2010

7.6 Relation to Flood Control Planning

Flood management in the Region is dispersed across various agencies, and often grouped within other departments, such as planning departments, emergency response, sanitary districts, and others. The Region lacks a centralized agency to coordinate flood management, which provided an opportunity during development of the 2013 IRWM Plan to compile flood information across the Region and present recommendations for Regional flood management that may be utilized by individual agencies. Floodplain Management Association is an active member of the RAC and provides a flood management perspective and input for the IRWM Program.

7.6.1 Relevant Flood Control Plans

Given the fragmented, and sometimes marginalized, nature of flood management in the Region, flood control plans may be incorporated as part of other plans, such as General Plans, rather than individual Flood Control Plans. Plans with relevant flood information were reviewed for the Integrated Flood Management (IFM) Study, described below. IFM is an integrated, multidisciplinary effort, so other sources of data used in the IFM included flood hazard and flood plain analyses, environmental documentation, biology and wildlife studies, water quality reports, watershed hydrology and hydraulic studies, land use plans, and various GIS layers and existing maps. Appendix 7-B details these plans further.

The other significant plan used during development of the IFM study was *California's Flood Future: Recommendations for Management the State's Flood Risk* (Flood Future Report, 2013). This report was developed by DWR and the USACE as part of the State Flood Management Planning Program, funded under Proposition 84. The Flood Futures Report documents flood threats and management approaches in California, and recommends strategies for managing flood risks.

Flooding can impact multiple jurisdictions or agencies, such as transportation, planning, and sanitation.

Photo credit: Bruce Phillips, PACE

7.6.2 Opportunities for Collaboration

The Integrated Flood Management Workgroup was convened in 2012 and 2013 to develop an IFM Study. This IFM Study acts as a guidance document to facilitate integrated water resources approaches to flood management. It identifies a sustainable flood and water management approach as:

- interconnecting flood risk management actions within broader water resources management, ecosystems, and land use planning,
- providing and recognizing value of coordinating across geographic and agency boundaries,
- evaluating opportunities and potential impacts from a system perspective,
- recognizing the importance of environmental stewardship and sustainability, and
- providing for system flexibility and resiliency in response to changing conditions, such as climate change and population growth

Issues that make integrated flood management in the Region challenging include:

- Projects require extensive stakeholder involvement, which increases project planning costs.
- Flood management responsibility is fragmented.

- Different methodologies and inadequate data make risk assessment complex and costly to complete.
- Land use decisions may not adequately prioritize public safety.
- Delayed permit approvals and complex permit requirements are obstacles to flood risk reduction.
- Flood management projects are not prioritized from a "watershed" system-wide or multi-benefit perspective.
- Flood risk funding as well as long term funding for operations and maintenance.

In order to develop the IFM guidance planning document, the IFM Workgroup underwent a series of six steps: 1) Involving watershed/floodplain managers and stakeholders; 2) Understanding the problems and the flood risks; 3) Defining watershed goals and objectives; 4) Identifying opportunities or constraints; 5) Identifying possible management strategies and approaches; 6) Creating a planning guidance document; and 7) Developing implementation prioritization evaluation criteria. Figure 7-2 shows the process of the IFM Workgroup. Throughout this process, the Workgroup focused on integrating the needs and opportunities of individual watersheds into the Region as a whole, recognizing that each watershed's needs may vary.

Watershed/Floodplain Managers Workgroup

Stakeholder involvement occurred through three workshops during the IFM process. The first workshop, held on June 26, 2012 provided stakeholders with the program objectives and an overview of IFM. The second workshop, on December 4, 2012, defined the opportunities, goals, and strategies for IFM in the Region. The final workshop, on June 5, 2013, provided an opportunity to review the draft version of the document and give feedback.

Understanding the Flood Risks

In order to understand the problems and the flood risks for each watershed, the Workgroup used hydrology information for the Region and FEMA's flood hazard maps. It is noted that the FEMA flood hazard maps are regional, and may not reflect local flood risks. The County of San Diego has also developed flood maps for areas that are known risks, but may not be captured by the FEMA maps. The Workgroup reviewed the flood management plans for each of the 19 entities responsible for flood management within the IRWM Region.

Flash flooding is a flood risk common to all watersheds in the San Diego Region.

Photo credit: Bruce Phillips, PACE

The Workgroup identified flash flooding as a flood risk common to all watersheds in the Region. A flash flood is defined as one when the peak flow travels from one end of the watershed to the other in less than six hours. None of the watersheds in the Region have a response time longer than six hours, making all of them vulnerable to flash flooding, though the greatest risk is in the central and eastern portions of San Diego County. Other flood risks include shallow flooding – due to a lack of channels for water to drain, flooding from inadequate drainage systems (most stormwater systems in the Region are designed for the 10-year flood), and dam failures – typically a result of age, poor design, or disaster. Table 7-11 summarizes flood types in the Region.

Table 7-11: Flood Types and Causes

Flood Hazard	Description Cause
Coastal Flooding	Winter and spring coastal storm, high winds and storm surges
Debris Flow Flooding	Heavy localized rainstorms on hillsides and high sediment producing or unstable areas subject to erosion or post-watershed fires
Slow Rise Flooding	Floodplain with limited hydraulic capacity and heavy precipitation generate runoff greater than capacity
Flash Flooding	High volume rainstorm, thunderstorms, or slow moving storms
Alluvial Fan Flooding	High volume rainstorm and thunderstorm displacing high volume of sediment to alluvial fan geographic features
Urban Drainage Flooding	Large rainstorms which exceed the capacity of the local urban drainage system resulting in flooding

In order to evaluate flood risks, flood hazards were characterized using indicator maps (e.g. spatial distribution of flow velocity, water height, duration) to estimate how these would interfere with human activities in the flood areas. An analysis of the data and sources described above led to an estimate of flood damages within each watershed and flood risks by land use types, per Figure 7-1.

Figure 7-1: Total Estimated 100-Year Approximate Dollar Flood Damage by Watershed

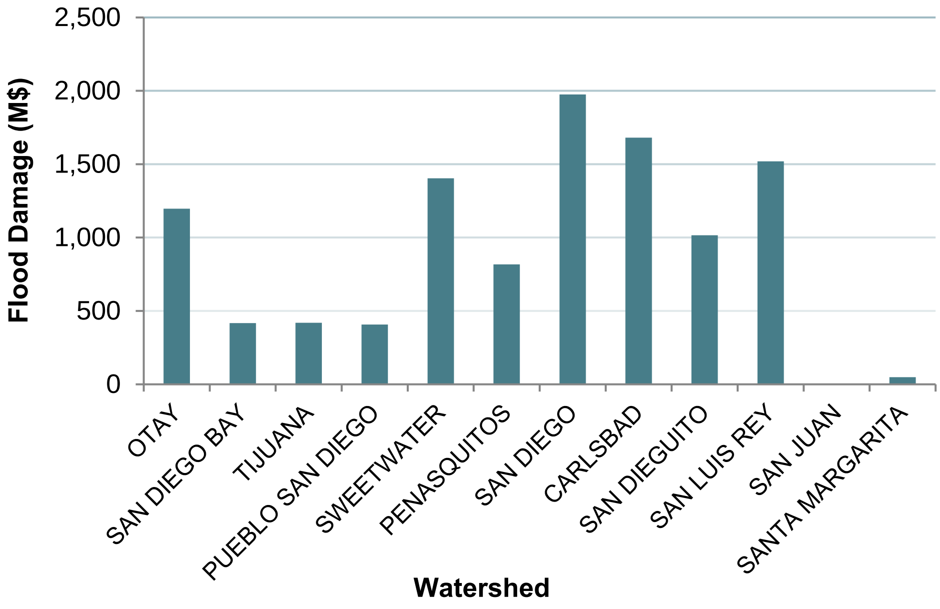
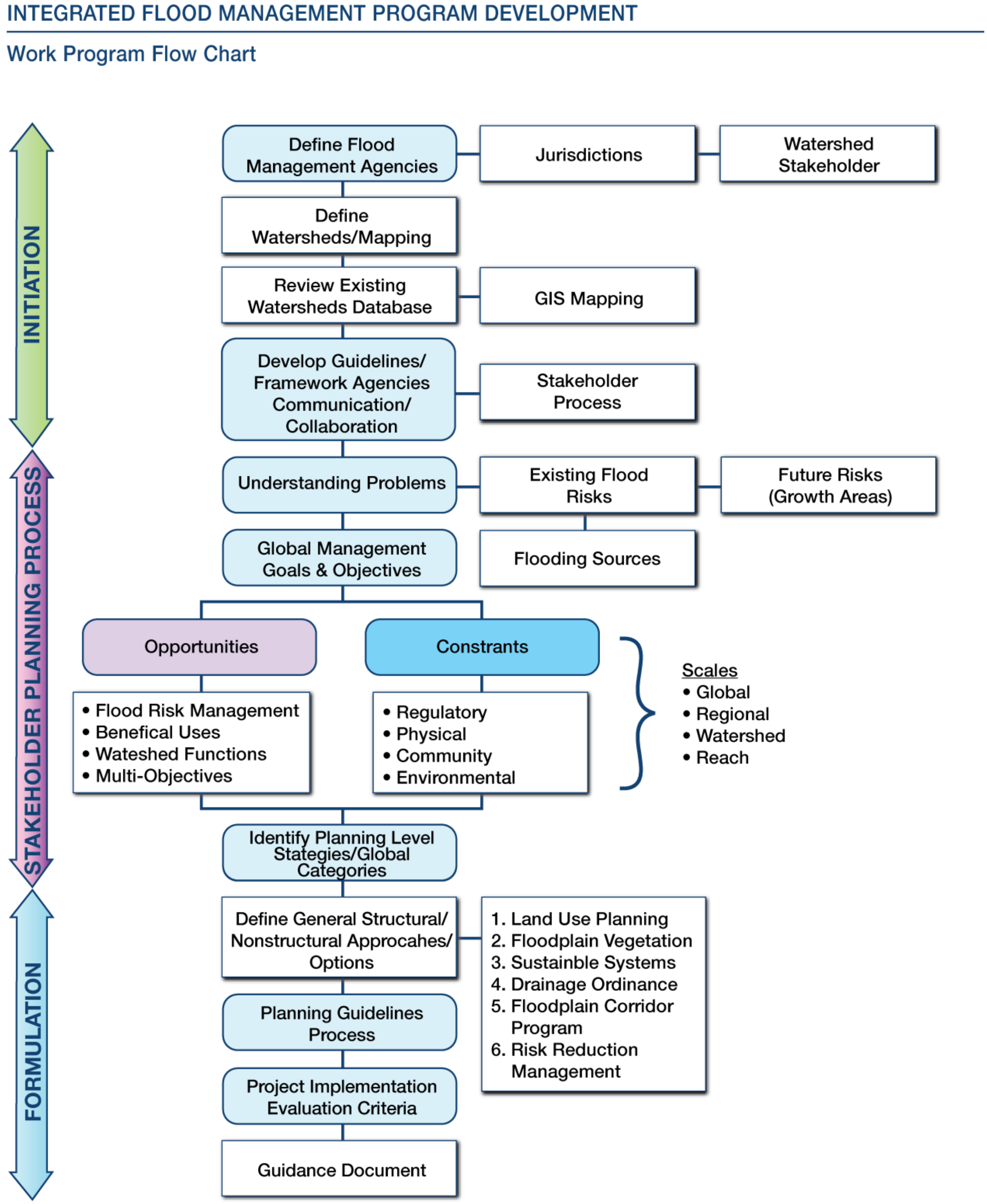


Figure 7-2: Overview of General Work Plan for Integrated Flood Management Study



Defining Watershed Goals and Objectives

IFM uses a different approach to flood management than traditional flood protection strategies. In IFM, structural projects, nonstructural measures, and natural watershed functions are all used to manage flooding. Different strategies may be necessary in individual watersheds, but may include land stewardship, conjunctive water manage, ecosystem restoration, land use planning and management, surface storage, and urban runoff management, among others. IFM requires communication with watershed stakeholders, an integration of land and water management, management of the water cycle as a whole, adoption of a mix of complementary strategies, and adoption of integrated hazard management approaches, and follows these principles:

1. Every flood risk scenario is different: there is no flood management blueprint.
2. Designs for flood management must be able to cope with a changing and uncertain future.
3. Rapid urbanization requires the integration of flood risk management into regular urban planning and governance.
4. An integrated strategy requires the use of both structural and non-structural measures and good metrics for "getting the balance right".
5. Heavily-engineered structural measures can transfer risk upstream and downstream.
6. It is impossible to entirely eliminate the risk from flooding. Hard-engineered measures are designed to defend to a pre-determined level.
7. Many flood management measures have multiple co-benefits over and above their flood management role.
8. It is important to consider the wider social and ecological consequences of flood management spending.
9. Clarity of responsibility for constructing and running flood risk programs is critical.
10. Implementing flood risk management measures requires multi-stakeholder cooperation.
11. Continuous communication to raise awareness and reinforce preparedness is necessary.
12. Planning should target quick recovery, and should use that recovery to build capacity.

Identification of Opportunities or Constraints

Flood management in the Region is challenging because of the varied geomorphic conditions within and across watersheds; the presence of urban development in close proximity to steep, rainfall-collecting terrain and coastal flooding; the climate which leads to short but potentially intense rainy seasons; and the risk of sudden flooding as a result of the geographic and meteorological conditions in the Region. This study classified each opportunity or constraint into four categories: 1) physical conditions, 2) regulatory, 3) land use, and 4) environmental/biological. Opportunities and constraints for each of these categories are described in Table 7-12.

Table 7-12: Opportunities/Constraints for Regional Floodplain Management

Opportunity / Constraint	Reference
Physical Features	
Hydraulic conveyance limitations of existing roadway and utility crossings	• Identification of hydraulic limitations as potential target areas for fixes that may reduce areas of flooding and sedimentation
Existing facilities and structures located with the floodplain	• Define existing flood risk from existing facilities/uses within the floodplain
Sediment delivery with flood flows from foothill areas	• Excessive sediment delivery causes deposition and will ultimately be deposited at a downstream location with flatter slope • High sediment yields bulk the flood waters and increase depth of flooding
Limited topographic relief/slope that limits hydraulic conveyance in valley areas	• Facility sizes will increase further downstream within the watershed because of the reduced slope
Soils/geology primarily alluvial deposits that are highly erodible	• Channel migration routinely occurs • Erosion hazards for development adjacent to channels
Specialized geographic/geomorphic features which include alluvial fans and coastal plains	• Hydraulic conditions are unique and conventional flood management solutions are not applicable
Topographic features result in steep slopes in the mountains/foothills and extremely flat slopes on the valley floors	• Changes in hydraulic conveyance and sediment delivery because of the change in slopes
Regulatory	
No centralized regional flood agency for the entire San Diego region. San Diego County Flood Control District is only responsible for the unincorporated County areas and all other municipalities manage floodplains individually	• Flooding problems within the County area are extremely varied and associated with the different individual watersheds • Comprehensive planning required that reflects the current though process for flood management and the environmental considerations for each of the regional watersheds that will cross over political boundaries
FEMA/NFIP requirements for community floodplain regulations	• NFIP requirements have the most influence on floodplain restrictions
Water quality limitations and restrictions based on the Basin Plan and identified TMDLs	• Water quality restrictions should be implemented as part of the regional planning solution
Land Use Features	
Various urban/commercial land use and additional manmade encroachments within the floodplain	• Limitations of development and land use restrictions within active flood hazard zones
Environmental/Biological	
Environmental permitting limitations for activities/structures within the floodplain (i.e. endangered species, etc.)	• Additional costs or limitations on the potential solutions available because of environmental regulatory restrictions
Many existing floodplain corridors have special defined ecological preserve or similar designations because of habitat for sensitive species	• Existing floodplains and streams are valuable biological resources for preservation

Identification of Possible Management Strategies and Approaches

Four types of IFM strategies could be used Region-wide: 1) Non-structural approaches, 2) Restoration of natural floodplain functions, 3) Structural approaches, and 4) Emergency management. These strategies are described in greater detail in Appendix 7-B, and summarized in Table 7-13 below. Appendix 7-B also provides detailed descriptions of how to apply IFM strategies.

Table 7-13: IFM Strategies

Strategy	Actions
Non-Structural Approach	
Land Use Planning	Policies, ordinances, regulations to limit development in floodplain
	Policies, ordinances, regulations to encourage land uses that are compatible with floodplain functions
Floodplain Management	Floodplain mapping and risk assessment
	Land acquisitions and easements
	Building codes and flood-proofing
	Retreat – relocation, abandonment, demolition of buildings
	Flood risk awareness (information and educations)
	Flood insurance
Restoration of Natural Floodplain Functions	
Restoration of function	Promoting natural hydrologic, geomorphic, and ecological processes
	Protecting and restoring quantity, quality, and connectivity of native floodplain habitats
	Invasive species reduction
Structural Approach	
Flood Infrastructure	Levees and floodwalls
	Channels and bypasses
	Retention and Detention Basins
	Culverts and pipes
	Shoreline and streambank stabilization
	Debris mitigation structures
Reservoir and Floodplain Storage and Operations	Storage Operations
	Groundwater Recharge
Operations and Maintenance	Maintenance of flood control structures, especially for those constructed in early to mid-Twentieth Century
Flood Emergency Management	
Emergency Management	Flood preparedness
	Emergency response
	Post-flood recovery

Development of Implementation Prioritization Evaluation Criteria

IFM strategies should be selected that will ensure the maximum number of benefits are achieved, the best location to maximize benefits is selected, that multiple flood hazard issues are addressed, and that different water resources objectives are achieved. The IFM Workgroup used the GIS IFM watershed planning tool to evaluate different IFM opportunities. The criteria for identifying opportunities included floodplain areas, highly permeable soils, groundwater basins, riparian vegetation or sensitive habitat area, and high sediment producing areas. Opportunities were those areas where multiple criteria overlapped. The IFM Planning Study included as Appendix 7-B contains maps of each watershed in the Region showing the various opportunities that were identified.

Recommendations

As described above, flood management in the Region is the responsibility of 19 different agencies, fragmenting flood management efforts. As such, the IFM Workgroup recommends creation of a Watershed/Floodplain Managers Forum to promote collaboration and coordination to implement IFM strategies.

The IFM Workgroup also recommends that flood management projects include numerous alternatives in order to cover a range of available potential solutions. Analysis of these alternatives could then be used as part of any environmental or regulatory requirements, such as CEQA. Design solutions should be developed with an understanding of the underlying hydrologic and hydraulic processes. By using a “toolbox” of design components, innovative solutions may be generated that are more appropriate or effective for a given watershed than a routine alternative.

Other recommendations include:

- Improve understanding and accuracy of regional and local flood risks,
- Develop regional watershed database to assist in flood management planning,
- Develop watershed based planning, including collaboration with stakeholder groups,
- Initiate understanding and awareness of IFM,
- Identify applicable IFM strategies that can be used within the County, and
- Develop watershed planning guidance program implementing IFM through different land planning regulations.

Recommendations and actions that were selected by the RAC and RWMG for inclusion as a priority in this 2013 IRWM Plan are provided in *Chapter 11, Implementation*.

7.7 Relation to Stormwater Resource Planning

Storm Water Resource Plan

The County of San Diego, along with its MS4 Copermittees, developed a Storm Water Resource Plan (SWRP) for the San Diego Region that identified the stormwater quality objectives and priorities for each watershed, and the potential for utilization of stormwater as resource. The SWRP was based on the Water Quality Improvement Plans (WQIPs) required under the MS4 permit for the nine watershed management areas in San Diego County, only the San Juan WMA was excluded, and thereby covered ten of the eleven watersheds in the Region – again the San Juan watershed was excluded. The SWRP utilized the IRWM program as a forum for Stormwater entities to collaborate on a regional plan. Outcomes of the SWRP process were presented to stakeholders at RAC meetings, with input solicited on the processes used to develop the SWRP at multiple RAC meetings in 2016 and 2017. The RAC recommended the SWRP be incorporated into the 2013 IRWM Plan via a formal letter notification from the RWMG in April 2017. The 2017 SWRP is available on the Project Clean Water website and the San Diego IRWM Program website (http://www.projectcleanwater.org/; http://sdirwmp.org). Project Clean Water also hosts completed WQIPs for the ten watershed management areas in San Diego County, and the Stormwater Capture and Use Feasibility Study (SWCFS) that is currently being developed. The 2017 SWRP was intended to provide tools and guidance to support development of multi-benefit stormwater and dry weather runoff projects to achieve watershed and regional planning goals. It was also designed to help project proponents identify potential competitiveness of their projects as well as identify opportunities to adjust their projects to provide additional benefits and strengthen project competitiveness.

The WQIPs that formed the basis of the SWRP were developed in a six-step process:

1. Determination of water quality priorities, based on science demonstrating water body quality was negatively affected by runoff from the MS4.
2. Identification of the source of pollution for highest priority water quality conditions.
3. Develop goals, strategies, and timelines to address highest priority water quality conditions.
4. On-going monitoring and assessment to evaluate progress towards implementing WQIPs and meeting WQIP goals.
5. Update the WQIP as needed through an adaptive management process to improve effectiveness of response to priority water quality conditions.
6. Report on the findings of the assessments in Step 5 and any potential changes to the WQIP.

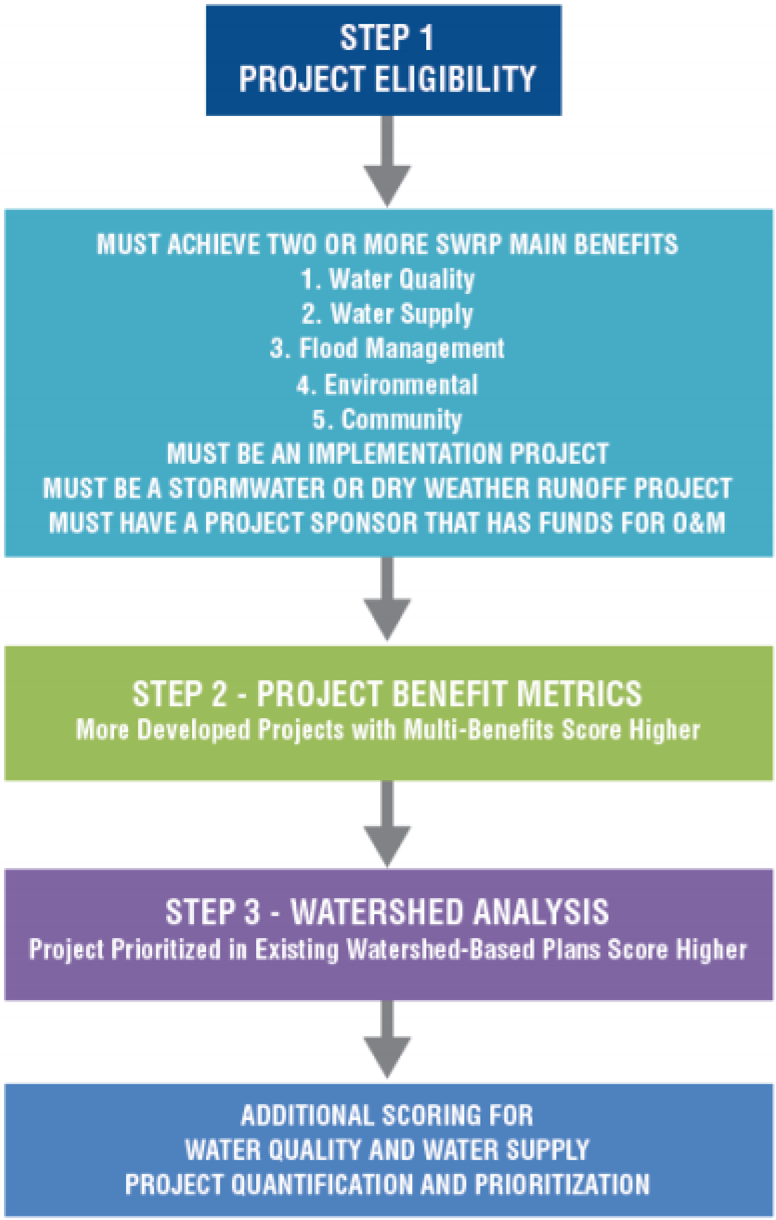
Highest priority water quality conditions identified in the WQIPs and summaries in the SWRP have been incorporated into *Chapter 3, Region Description*.

Per SB 985, all stormwater projects are required to be included in a SWRP, and that the SWRP be incorporated into the regional IRWM Plan. The SWRP includes a process for project scoring, which is intended to help project proponents understand how well their projects meet the priorities for the region. The San Diego IRWM Plan's online project database, OPTI, was updated to incorporate the project prioritization and ranking process from the SWRP. Project proponents are able to add stormwater projects into the SWRP, quantify their projected project benefits, and see how their project compares to others that have been submitted. This provides an opportunity for project proponents to identify areas where their projects could be improved to better meet the priorities of the region or stormwater funding. Integrated, multi-benefit stormwater projects generally score better and as a result, the SWRP encourages projects that also align well with IRWM priorities. The SWRP's project evaluation process is shown in Figure 7-3.

To support project sponsors with submitting projects to the SWRP, guidance was developed to help project sponsors quantify common benefits. This quantification of benefits is an important component in ranking projects in the SWRP. Stormwater project benefits have traditionally been challenging to quantify, especially during the early stages of project development. The SWRP includes appendices and online tools that provide information to help projects develop quantified benefits. The project database is a shared tool among IRWM and SWRP projects – project applying to both projects are submitted to the same database – and includes a link to a spreadsheet that may be used by project sponsors to estimate certain benefits using general information about each watershed and simple, user-friendly fields.

The SWRP is being implemented in coordination with the San Diego IRWM Program, as it utilizes both the IRWM project database system and the IRWM stakeholder list for outreach and notices. The overlap between SWRP and IRWM stakeholders makes this an efficient approach, as well as supportive of an integrated water management. Similar to the IRWM project list, the SWRP project list is a living document, and projects are expected to be added periodically as projects are developed and seek funding through a variety of programs. As stormwater funding opportunities arise, and as appropriate, the online project database and guidance documents are anticipated to be updated to reflect the current conditions and priorities of the funding opportunity.

Figure 7-3: SWRP Project Evaluation Process



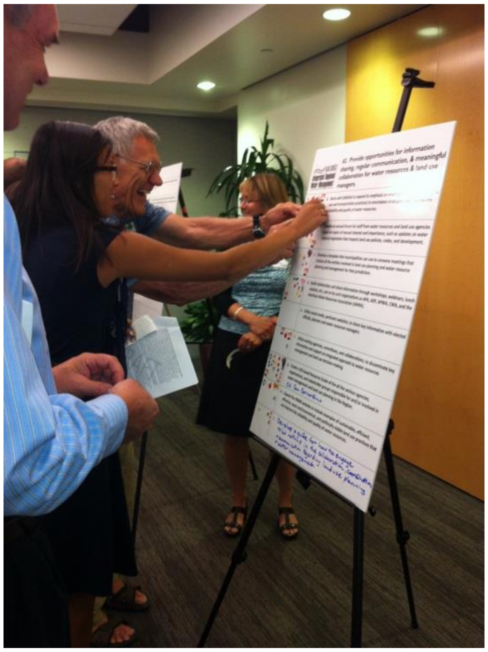
Stormwater Capture and Use Feasibility Study

Funded through the Proposition 1 Planning Grant, the County is developing a Stormwater Capture and Use Feasibility Study (SWCFS). This study is evaluating the storage potential for public parcels to be used for stormwater capture and reuse, at a higher level of refinement from that evaluated in the SWRP. The SWCFS, anticipated to be finalized at the end of 2018, quantifies the total volume of stormwater that could reasonably be captured on identified public parcels, and identifies eight stormwater use alternatives, including discharge to groundwater for either potable use or restoration, small and large-scale irrigation, flow through systems for water quality or restoration (treatment wetlands), and diversion to sanitary sewer for solids management, recycled water or indirect potable use.

The use alternatives were prioritized for the region based on four criteria; potential volume of stormwater capture on a parcel, cost per acre-foot of water captured for reuse, additional benefits that may be achieved, and constraints and opportunities to stormwater capture and reuse. The methodology described in the SWCFS may be used to evaluate potential for stormwater capture and reuse on private parcels as well, an area of particular interest for the Region's industrial stakeholders. Updates on the SWCFS are regularly made to the RAC and input solicited at the RAC meetings to supplement the discussions being held by the SWCFS's Technical Advisory Committee (TAC). Results of the SWCFS will be incorporated into the 2019 San Diego IRWM Plan Update – Phase 2.

7.8 Relation to Land Use Planning

The Land Use and Water Management Study (Land Use Study) was developed by the Land Use Planning Workgroup, and was presented to the RAC and stakeholders at the February 6, 2013 RAC meeting. The Land Use Study examines how integrated land use planning and water resources management occurs in the San Diego IRWM Region, and identifies ways to improve regional collaboration and coordination between water managers and land use planners. The study found a lack of communication between water managers and land use planners in the Region and that efforts to link water management and land use decisions were often challenging. The relationships between water managers and land use planners were often reactive, instead of proactive. Recommendations included in the Land Use Study seek to resolve these issues and improve relationships between these two groups in order to promote orderly growth and development, and economic and environmental well-being of communities, while protecting water resources.



Land Use Planners and Water Managers at the workshop identified opportunities for collaboration.

Photo Credit: Rosalyn Prickett, Woodard & Curran

Land Use Workgroup

The Land Use Workgroup used an eight-step process to assess the current relationship between water management and land use planning in the Region: 1) Gap analysis; 2) Assessment of current collaboration and cooperation between water managers and land use planners; 3) Workshop with water managers and land use planners to solicit input on current relationships and identify issues and opportunities for collaboration; 4) Identification of strengths, opportunities, and challenges to create key issues matrix; 5) Development of a Model Water Element for use in general plan updates; 6) Development of preliminary recommendations to improve collaboration and coordination; 7) Workshop with water managers, land use planners, and stakeholders to review and comment on draft Model Water Element; 8) Incorporation of stakeholder input on Model Water Element and Recommendations and Key Issues Matrix. The RWMG was also involved throughout the Land Use Study process to provide guidance, input, and review of deliverables.

Two workshops were held to develop the Land Use Study: May 2, 2012 and August 21, 2012. The May 2, 2012 workshop provided an opportunity for water managers, land use planners, and other stakeholders to give feedback on the survey results and the general nature of the collaborative relationships. This workshop saw 30 people in attendance. The August 21, 2012 workshop allowed the Workgroup to review and provide feedback on the draft recommendations and Model Water Resources General Plan Policy Guide, described below.

7.8.1 Relevant Land Use Planning Documents

As described above, the first step in developing the Land Use Study was to conduct a data gap analysis. The Land Use Workgroup reviewed the 19 General Plans in the Region to identify gaps between water resources management and land use planning. This review sought to determine the extent to which water policy was covered within each General Plan, identify gaps in water policy in the region, and assess the complexity of water resources management as it relates to land use planning. The Regional Comprehensive Plan, produced by SANDAG, was also reviewed because it is the long-term planning framework for greater San Diego County.

In addition to the land use planning documents, the Workgroup reviewed a series of water resources management plans, such as Urban Water Management Plans, Recycled Water Master Plans, Floodplain Master Plans, and Water Supply Assessments. They found that information related to water resources management was typically found throughout the General Plans, rather than in a single, consolidated section. This is due, in part, to the variety of water management topics, including water supply and demand, water quality, wastewater treatment and disposal, watershed features and processes, flood management, and stormwater management. Another significant challenge to coordination and collaboration is the mismatch between land use planning jurisdictions and water management jurisdictions.

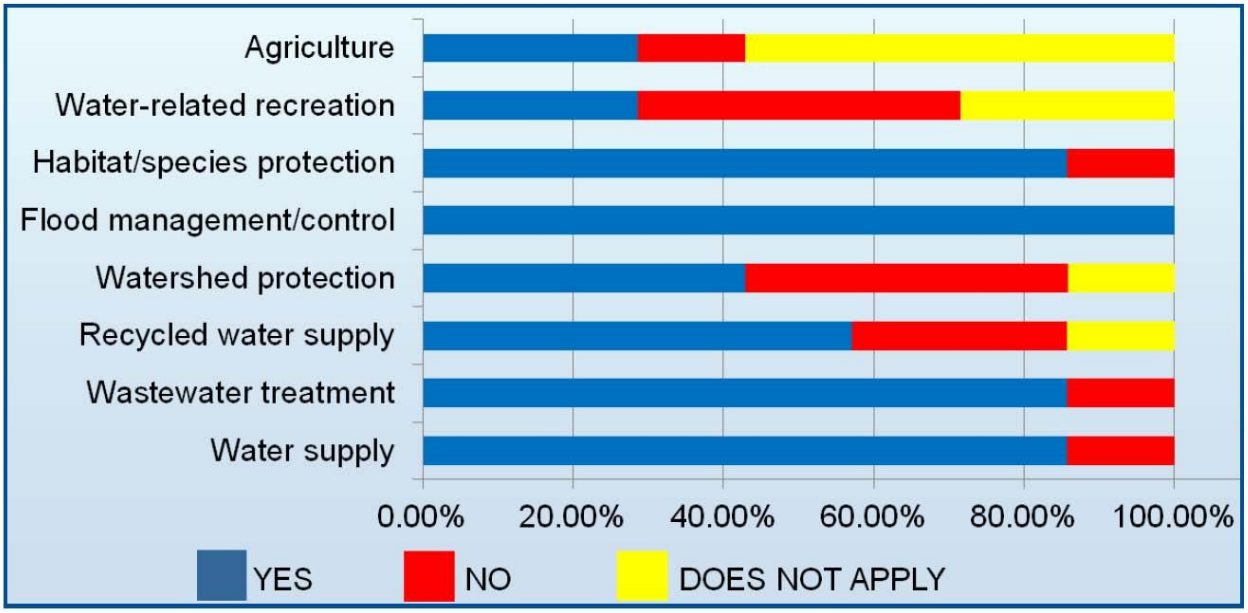
The gap analysis found seven major issues that contribute to the challenges of coordinated water resources management and land use planning:

1. Plans varied greatly in time frames and preparation dates
2. General Plans lacked a dedicated Water Element
3. Communities anticipating growth focused on water policies for new development; built-out communities focused on water policies for redevelopment
4. Substantial variation in natural features affects the issues addressed in General Plans
5. Local land use control may be limited by water-related issues under jurisdiction of State and Federal agencies
6. Considerable variation was observed in the strength of long-range water policies, depending on the age of the General Plan
7. Responsibility for water management tasks within departments varies from agency to agency

7.8.2 Existing Relationships between Water Managers and Land Use Planners

To determine the extent of existing collaboration and coordination between water managers and land use planners, and identify issues and opportunities for these relationships, the Land Use Workgroup distributed surveys to a total of 44 people, approximately half of whom were water managers and half land use planners. The Land Use Workgroup received 14 surveys back, again, approximately half from land use planners and half from water managers. The results from the survey were analyzed and presented at the first workshop. As shown in Figures 7-4, land use planners cooperate with water managers to varying degrees.

Figure 7-4: Percentage of Planning/Community Development Departments with Working Relationships with Water Resource Agencies/Staff



7.8.3 Opportunities for Collaboration

The information from the Gap Analysis, Surveys, and Workshop #1 were used to characterize the relationship between land use planners and water managers, and identify the strengths, opportunities, and challenges facing the relationship, and to develop methods for overcoming existing impediments to enable proactive, rather than reactive, relationships. Characterization of the relationship was challenging due to variation in degree of coordination, type of resource involved, and level at which coordination occurs within different agencies. The strengths, opportunities, and challenges are summarized in Table 7-14.

Table 7-14: Strengths, Opportunities, and Challenges Identified by Land Use Workgroup

Strengths	Opportunities	Challenges
• Coordination is already occurring regularly • Most planners consult with water agencies when updating General Plans • One water agency uses General Plans when doing its plan update • Most planning and water agencies work together on joint policy/implementation efforts • Urban Water Management Plans are prepared in coordination with land use projections • Land use planners and water managers from several jurisdictions participated in Land Use Study Workshops	• Beneficial to have: joint training to improve information exchange; cross training and joint activities to explore improved integration • Planners more likely than other departments to be responsible for implementation of water-resource activities • A set of water resources goals, objectives, and policies for Region would be beneficial • Legislation mandates more interaction between land use planners and water managers	• Too many silos exist, reluctance to give up authority • Awareness and understanding of issues and processes is lacking between managers and planners • Plans, policies, projects, and programs must be integrated; framework for integration needed; a universal approach will not be effective • Decision-making often does not consider impacts beyond jurisdictions • Information is extensive but not readily available • Land use planners not aware of IRWM program • General Plans do not address spectrum of water management topics and water policies are not specific enough • Challenge to address water rights with tribes • Staff does not have resources to take on extra work

Conclusion and Outcomes

The final four steps in the process involved drafting a Model Water Resources General Plan Policy Guide (Policy Guide); drafting recommendations for improved collaboration and coordination; hosting a workshop to review the draft Policy Guide and recommendations and solicit public input; and finalizing the Policy Guide, Recommendations, and Key Issues Matrix in the Land Use Study. Each of these three deliverables is available as Attachments 1, 2, and 3, respectively, in the Land Use Study found in Appendix 7-C.

The Policy Guide can assist land use planners in incorporating and addressing water management issues and needs in local land use documents. Workgroup recommendations regarding the relationship between land use planners and water managers focused on two categories:

1. Support or facilitate collaborative preparation of various joint water resources and land use planning efforts and work in the Region
2. Provide opportunities for information sharing, regular communication, and meaningful collaboration for water resources and land use managers

Recommendations that will be implemented as priority actions in the 2013 IRWM Plan are provided in *Chapter 11, Implementation*.

The Key Issues Matrix also provides recommendations to address each issue. These recommendations are broken down by actions that can be implemented by the IRWM Program, Municipalities/Land Use Planners, and Water Agencies/Managers. Details can be found in Attachment 3 of Appendix 7-C.

7.9 Relation to Climate Change Planning

The 2013 Climate Change Study, developed by the Climate Change Workgroup and approved by the RAC, serves as an initial guide for the IRWM Region for incorporating climate change adaptation and mitigation measures into IRWM Planning. To develop this guidance, the Climate Change Workgroup reviewed current climate change science, policies, and regulations, and assessed how they related to the IRWM Region.

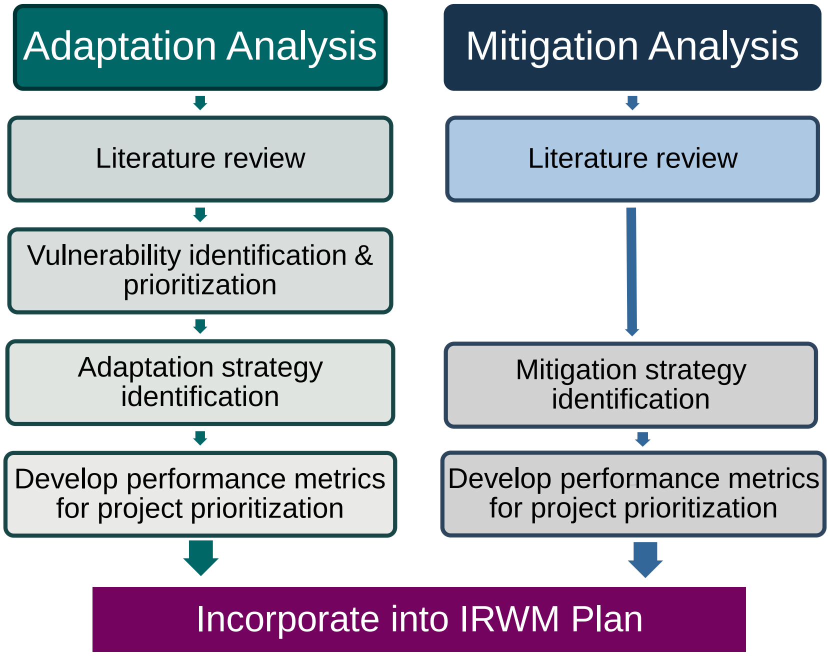
Three major climate change impacts were considered to be closely related to water resource management in the San Diego IRWM Region:

1. Temperature increases
2. Precipitation pattern changes
3. Sea level rise

Climate Change Analysis Process

The Climate Change Workgroup used the following review process, shown in Figure 7-5, to meet DWR's 2012 IRWM Plan Guidelines' Climate Change Standard.

Figure 7-5: Climate Change Analysis Process



7.9.1 Relevant Climate Change Planning Documents

To provide a context for understanding climate change, its potential impacts in the Region, and how to assess adaptation or mitigation strategies, the Climate Change Workgroup reviewed a number of climate change documents and data, including the relationship between water supplies, water infrastructure, and energy use. Water resources and energy use are linked in three primary ways:

1) Water pumping and purification, 2) Wastewater treatment, and 3) Water heating. Because of this linkage, energy use may be reduced both by conserving water and optimizing water operations.

The Climate Change Workgroup also reviewed State legislation and policies related to climate change:

- Executive Order S-3-05
- Assembly Bill 32 (AB32): The California Global Warming Solutions Act of 2006
- Climate Change Scoping Plan
- Senate Bill 97 (SB97)
- Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water
- Executive Order S-13-08
- California Climate Adaptation Strategy
- GHG Reporting Rule

Review of the AB 32-required Scoping Plan identified six GHG emissions reduction measures:

1. Water use efficiency
2. Water recycling
3. Water system energy efficient
4. Reuse of urban runoff
5. Increase renewable energy production
6. Public goods charge

The Workgroup identified The Climate Registry as a useful tool and database for agencies or entities to report GHG emissions. The San Diego County Water Authority, the County of San Diego, and the City of San Diego belong to The Climate Registry, along with a number of other agencies and organizations in the IRWM Region. A number of climate mitigation and adaptation plans for individual cities and agencies in the Region were also identified and reviewed. Finally, the Workgroup reviewed the San Diego Foundation's Climate Initiative, which recommended that every jurisdiction in the County complete a GHG emissions inventory.

The literature review conducted in this step of the process resulted in Table 7-15, a breakdown of the impacts and effects of climate change on the San Diego IRWM Region. This table was presented to and vetted by the Workgroup in June 2012.

Table 7-15: Impacts and Effects of Climate Change on Region

Impact	Effect
Temperature	1.5°F to 4.5°F average temperature increase
Rainfall	Variable projections predict between 35% drier and 17% wetter Increase in variability between years
Supply	Up to 25% decrease in SWP supply Up to 20% decrease in Colorado River supply 164,000 acre-feet per year shortfall in imported supply
Demand	Potential 0.6% to 1.8% increase in demand by 2035
Sea level rise	12 to 18 inch rise in mean sea level
Wildfires	40% increase in California Coastal Shrub acreage burned in Southwestern U.S. 54% increase in overall acreage burned in Western U.S.

Vulnerability Identification and Prioritization

Using DWR's *Climate Change Handbook for Regional Water Planning*, the Climate Change Workgroup developed an analysis of the Region's vulnerabilities. This analysis was the primary activity of the Climate Change Workgroup during their June 2012 workshop. Once vulnerabilities were identified, they were ranked and categorized. Vulnerabilities were categorized into five priority levels: Very High, High, Medium, Low, and Very Low. Table 7-16, below, shows the vulnerability issues and their respective rankings. Details regarding processing of vulnerabilities can be found in the Climate Change Study, included in this Plan as Appendix 7-D.

The potential risk that could arise from not addressing the climate change vulnerabilities include: insufficient water supply, inability to meet demand during droughts, poorer water quality, damage from increased flooding, damage to habitats and sensitive species, and coastal flooding and inundation of storm drains and sewer systems.

Table 7-16: Prioritized Climate Change Vulnerability Issues

Priority Level	Category and Vulnerability Issue
Very High	Water Supply: Decrease in imported supply
High	Water Supply: Sensitivity due to higher drought potential Water Quality: Increased constituent concentrations Flooding: Increases in flash flooding and inundation (extreme weather) Ecosystem/Habitat: Decrease in available necessary habitat Sea Level Rise: Inundation of storm drains and sewer systems Ecosystem/Habitat: Decrease in ecosystem services Water Supply: Lack of groundwater and surface water storage* to buffer drought Ecosystem/habitat: Decrease in environmental flows (e.g., stream flows)
Medium	Water Demand: Crop demand would increase Water Demand: Industrial demand would increase Water Supply: Decrease in groundwater supply Water Quality: Increase in treatment cost due to water quality impacts to reservoirs Sea Level Rise: Damage to coastal recreation / tourism due to inundation Water Quality: Increased eutrophication
Low	Water Demand: Limited ability to conserve further Flooding: Increases in inland flooding Ecosystem/Habitat: Increased impacts to coastal species Sea Level Rise: Damage to ecosystem/habitat
Very Low	Water Demand: Limited ability to meet summer demand Water Supply: Invasive species can reduce supply available Water Quality: Decrease in recreational opportunity Sea Level Rise: Decrease in land Hydropower: Decrease in hydropower potential

*The Region's current storage capacity is sufficient; however, it lacks the ability to connect and convey water stored in some regional reservoirs.

Adaptation/Mitigation Strategy Identification

Potential adaptation and mitigation strategies were identified using the State of California's *California Water Plan* and refined through the review of other climate change reports and plans, including regional climate change documents. Strategies were identified and prioritized by determining feasibility and relevancy, using the following tiers:

- **Tier 1:** Considered "no regret" strategies, mitigates GHGs or is GHG neutral, or addresses the imported water (very high) vulnerability
- **Tier 2:** Strategies that are included in other local climate change documents, mitigate GHGs or are GHG neutral, or addresses at least three vulnerability areas
- **Tier 3:** Address at least one vulnerability area or mitigates GHGs

The final list of prioritized strategies, along with clarifying descriptions, is provided in Chapter 5 of Appendix 7-D. A list of strategies, by Tier, is presented in Table 7-17.

Table 7-17: Climate Change Management Strategies

Tier 1		
• Urban water use efficiency • Crop idling for water transfers • Education • Gray water use • Rainfed agriculture • Conveyance – Regional/local • System reoperation • Conjunctive management & groundwater storage • Recycled municipal water • Drinking water treatment and distribution	• Groundwater/aquifer remediation • Pollution prevention • Salt and salinity management • Urban runoff management • Flood risk management • Agricultural lands stewardship • Economic incentives • Ecosystem restoration • Land use planning and management • Recharge area protection	• Water-dependent recreation protection • Watershed/soils/forest management • Water-dependent cultural resources and practices preservation • Increase urban forest management • Building water facilities in coordination with land use/sea level rise planning
Tier 2		
• Conduct emissions inventory and target • Increase use of renewable energy courses • Surface storage – Regional/local	• Protective infrastructure • Sediment management • Protect water facilities through the relocation or removal of vulnerable structures	• Protect resources and facilities by constructing seawalls or levees • Protect/restore/create coastal wetlands
Tier 3		
• Water meters installation • Treatment and distribution efficiency • Water transfers	• Localized treatment • Shift water use to off-peak hours • Optimize sewer systems	• Desalination • Indirect potable reuse/Potable reuse

7.9.2 Current Climate Change Study Efforts

Multiple climate change studies have been underway since the completion of the 2013 IRWM Plan. The California Natural Resources Agency (Resources Agency) recently released the *Safeguarding California Plan: 2018 Update* (Resources Agency, 2018). This plan follows the 2014 and 2016 versions, titled *Safeguarding California Plan: Reducing Climate Risk* and *Safeguarding California Plan: Implementation Action Plans*, respectively, which themselves expanded on the 2009 *California Climate Adaptation Strategy*. These earlier plans provided policy guidance for decision makers at the state level, highlighted climate risks, made sector-specific recommendations, and presented implementation plans that could be used to execute the identified actions. The 2018 plan is a roadmap the State will use to respond to climate change. It lays out clear mechanisms for completing over 1,000 ongoing actions and recommendations to achieve the State's goals of addressing the impacts of climate change. Thirty-eight state agencies provided input on the plan, resulting in 76 policy recommendations across 11 policy sectors. Policy sectors include energy, public health, water, and agriculture. It may be used by stakeholders to evaluate which state agency efforts align with their local or regional climate interests and provides a foundation for coordinating climate adaptation strategies across the state. The plan also serves as a tool for the public to evaluate the State's progress in reaching its climate change goals. It did not update regional climate vulnerability assessments, such as the one completed by the San Diego IRWM Program in 2012 and 2013.

The Resources Agency is currently developing its *Fourth Climate Change Assessment* (Assessment) using the framework laid out in the Safeguarding California Plan. The Assessment will consolidate data and findings from 32 State-funded research projects into one report that highlights vulnerabilities and solutions to climate change impact across the 11 policy sectors outlined in the *Safeguarding California Plan.* The Assessment builds off the success of the three prior assessments to help understand California-specific policy questions and information needs. The State is assessing resources, providing data, and conducting research for climate conditions specifically for individual communities. California still lacks critical information about expected climate impacts, such as extreme weather, and understanding climate risks and management options can help the State prioritize actions and investments to help safeguard California.

The San Diego Region was the subject of one of the studies that will be incorporated into the Assessment, and preliminary findings of climate change impacts related to water resource management was presented to the RAC in June 2018. Anticipated climate change impacts to the San Diego Region's water supplies include wetter winters and drier spring and fall seasons, reduced snowpack, and changes to timing of water availability, among other impacts. A shift in plant communities is anticipated as droughts are expected to become more frequent and more intense, coupled with potential changes to the fire regime.

The Region's climate change vulnerabilities developed during the 2013 Climate Change Study have been re-evaluated in light of new climate science understanding, and are presented in Table 7-16. To help project proponents better identify which climate change vulnerabilities their projects address, a crosswalk of the Resource Management Strategies (RMS) (see *Chapter 8, Resource Management Strategies*) and the climate change vulnerabilities are provided in *Chapter 9, Project Evaluation and Prioritization*.

7.9.3 Opportunities for Collaboration

The Climate Change Study contains a list of recommendations for successful implementation of identified climate change adaptation and mitigation strategies. These recommendations focus on implementation of adaptive management, and prioritization of projects that address climate change impacts.

Adaptive management uses a flexible path of actions in order to implement different measures if key risk triggers or early warning indicators are met. This allows managers to plan for and adjust management strategies to best respond to changes, which can be important when managing issues with high uncertainty, such as climate change. According the Climate Change Handbook, the five steps in an adaptive management plan are:

1. Identify risk triggers associated with important vulnerabilities or uncertainties
2. Quantify impacts and uncertainties
3. Evaluate strategies and define an implementation path that allows for multiple options at specific triggers
4. Monitor performance and critical variables in the system
5. Implement or reevaluate strategies when triggers are reached

In addition to adaptive management, the Climate Change Workgroup recommended prioritizing projects that help to address climate change, which may be done in two ways: 1) Include climate change adaptation or mitigation in the IRWM Plan Objectives, and 2) Include a weighted climate change scoring category in project selection, based on strategy prioritization described above. Both of these recommendations have been incorporated into this IRWM Plan (see *Chapter 2, Vision and Objectives* and Table 9-2, *Chapter 9, Project Evaluation and Prioritization*).

7.10 Summary of Agency Coordination

As described in *Chapter 6, Governance and Stakeholder Involvement*, the San Diego IRWM program facilitates the RAC and Workgroups to allow for agency coordination and communication. These stakeholder groups enable the various planning entities within the Region to communicate about the water resource issues and challenges they are facing, as well as IRWM-funded projects and programs. Increased knowledge of what other entities are doing allows stakeholders to partner or combine activities and reduce redundancies.

As described in *Chapter 3, Region Description*, the San Diego RWMG cooperates with the two neighboring IRWM regions in the San Diego Funding Area on topics of mutual interest: the Upper Santa Margarita and South Orange County IRWM Regions. The three RWMGs coordinate directly through the Tri-County FACC's period meetings and conference calls. The group addresses water management issues that occur within the two watersheds that overlap Region boundaries: Santa Margarita and San Juan. The group is specifically tasked through their MOU to identify projects that will address issues within the overlay areas (see *Chapter 3, Region Description*). For example, the Upper Santa Margarita and San Diego IRWM Regions both submitted a joint project in Proposition 84-Rounds 1 and 2 that document and address nutrient loading in the Santa Margarita River Estuary and tributaries. Although the three RWMGs coordinate directly through the Tri-County FACC, they have not consolidated into a single IRWM region because of differences in political boundaries, water management infrastructure, regulatory permitting, and land use authority.

As described above, the IRWM Program coordinates directly with numerous local planning entities on water resource issues and projections. Other State and federal agencies participate in the IRWM Program through the RAC and stakeholder email list (see Table 6-4 in *Chapter 6, Governance and Stakeholder Involvement).*

7.11 References

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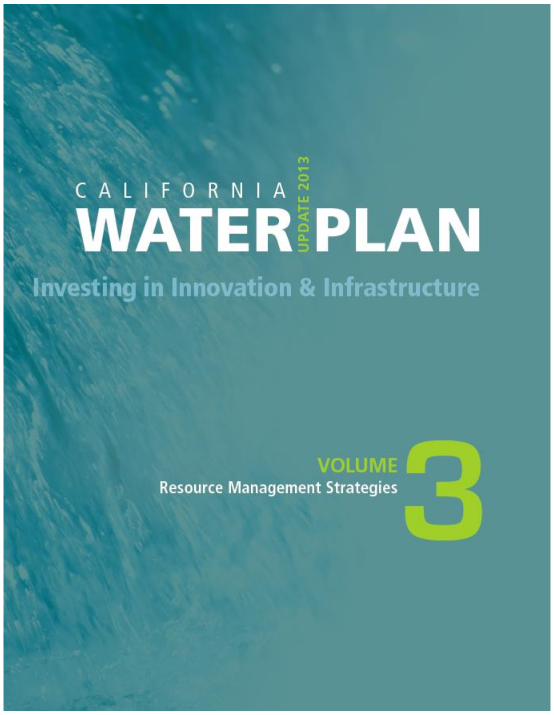
8 Resource Management Strategies

This chapter addresses requirements set forth in the Resource Management Strategies (RMS) Standard in the *2016 IRWM Program Guidelines* (DWR, 2016). As such, this chapter considers each RMS listed in the *California Water Plan (CWP) Update 2013* (DWR, 2013), documents which RMS will help achieve the 2019 IRWM Plan objectives, presents all RMS considered for the IRWM Plan Update, and includes an evaluation of the adaptability of water management systems in the San Diego IRWM Region to climate change.

8.1 Overview

The *2016 IRWM Program Guidelines* require that an IRWM Plan consider each RMS listed in the *CWP Update 2013.* As part of the stakeholder outreach and involvement process conducted for the 2019 IRWM Plan (refer to *Chapter 6, Governance and Stakeholder Involvement*), stakeholders were asked to provide input on other potentially applicable RMS that could be considered in the 2013 IRWM Plan. Those additional RMS are described in *Sections 8.2* and *8.4* below.



California Water Plan Update 2013 contains a wide range of water management strategies.

8.1.1 Resource Management Strategies in *California Water Plan Update 2013*

Division 26.7, Chapter 7, Section 79740 of the California Water Code authorizes funding for long-term water needs of the state, and requires that eligible projects implement IRWM Plans that address the water management strategies identified within the *CWP Update 2013.*

Table 8-1 lists RMS included within the *CWP Update 2013*, listed by the categories generated by the California Department of Water Resources (DWR).

Table 8-1: Resource Management Strategies Addressed in *California Water Plan Update 2013*

No.	RMS within CWP Update 2013[1]	Strategy Overview	Included in 2019 IRWM Plan
Reduce Water Demand			
1	Agricultural Water Use Efficiency	Increasing water use efficiency and achieving reductions in the amount of water used for agricultural irrigation. Includes incentives, public education, and other efficiency-enhancing programs.	Yes
2	Urban Water Use Efficiency	Increasing water use efficiency by achieving reductions in the amount of water used for municipal, commercial, industrial, irrigation, and aesthetic purposes. Includes incentives, public education, and other efficiency-enhancing programs.	Yes
Improve Operational Efficiency and Transfers			
3	Conveyance - Delta	Maintaining, optimizing use of, and increasing the reliability of conveyance facilities associated with the Bay-Delta. Included within this strategy is Bay-Delta restoration efforts.	Yes
4	Conveyance – Regional/Local	Strategies include improvement conveyance systems, upgrading aging distribution systems, promoting development of more extensive interconnections among water resources systems, establishing performance metrics for quantitative and qualitative indicators (e.g., quantity of deliveries, miles of rehabilitated conveyance facilities, and resiliency of conveyance to earthquakes and fewer regulatory conflicts), and assuring adequate resources to maintain the condition and capacity of existing constructed and natural conveyance facilities.	Yes
5	System Reoperation	Managing surface storage facilities to optimize the availability and quality of stored water supplies and to protect/enhance beneficial uses. Includes balancing supply and delivery forecasts, coordinating and interconnecting reservoir storage, and optimizing depth and timing of withdrawals.	Yes
6	Water Transfers	Contracting to provide additional outside sources of imported water to the Region over and above contracted State Water Project and Colorado River supplies	Yes
Increase Water Supply			
7	Conjunctive Management and Groundwater	Using and managing groundwater supplies to ensure sustainable groundwater yields while maintaining groundwater-dependent beneficial uses, including coordinating management of groundwater and surface water supplies (conjunctive use)	Yes
8	Desalination – Brackish and Seawater	Developing potable water supplies through desalination of seawater and brackish groundwater. Includes disposal of waste brine.	Yes
9	Precipitation Enhancement	Strategy involves increasing precipitation yields through cloud seeding or other precipitation enhancing measures.	No
10	Recycled Municipal Water	Developing usable water supplies from treated municipal wastewater. Includes recycled water treatment, distribution, storage, and retrofitting of existing uses.	Yes
11	Surface Storage – CALFED	Strategy involves developing additional CALFED storage capacity or more efficiently using existing CALFED storage capacity.	Yes
12	Surface Storage – Regional/Local	Developing additional yield through construction or modification (enlargement) of local or regional surface reservoirs or developing surface storage capabilities in out-of-region reservoirs.	Yes
Improve Water Quality			
13	Drinking Water Treatment and Distribution	Includes improving the quality of the potable supply delivered to potable water customers by increasing the degree of potable water treatment. Strategy also may include conveyance system improvements that improve the quality of supply delivered to treatment facilities.	Yes

No.	RMS within CWP Update 2013[1]	Strategy Overview	Included in 2019 IRWM Plan
14	Groundwater / Aquifer Remediation	Includes strategies that remove pollutants from contaminated groundwater aquifers through pumping and treatment, in situ treatment, or other means.	Yes
15	Matching Quality to Use	Optimizing existing resources by matching the quality of water supplies to the required quality associated with use.	Yes
16	Pollution Prevention	Strategies that prevent pollution, including public education, efforts to identify and control pollutant contributing activities, and regulation of pollution-causing activities. Includes identifying, reducing, controlling, and managing pollutant loads from non-point sources.	Yes
17	Salt and Salinity Management	Recommendations that encourage stakeholders to proactively seek to identify sources, quantify the threat, prioritize necessary mitigation action and work collaboratively with entities with the authority to take appropriate actions.	Yes
18	Urban Stormwater Runoff Management	Includes strategies for managing or controlling urban runoff, including intercepting, diverting, controlling, or managing stormwater runoff or dry season runoff.	Yes
Practice Resources Stewardship			
19	Agricultural Lands Stewardship	Includes strategies for promoting continued agricultural use of lands (e.g. agricultural preserves), strategies to reduce pollutants from agricultural lands, and strategies to maintain and create wetlands and wildlife habitat within agricultural lands. Stewardship strategies for agricultural lands include wetlands creation, land preserves, erosion reduction measures, invasive species removal, conservation tillage, riparian buffers, and tailwater management.	Yes
20	Ecosystem Restoration	Strategies that restore impacted or impaired ecosystems, and may include invasive species removal, land acquisition, water quality protection, re-vegetation, wetlands creation and enhancement, and habitat protection and improvement, habitat management and species monitoring.	Yes
21	Forest Management	Strategies that promote forest management include long-term monitoring, multi-party coordination, improvement in communications between downstream water users and communities and upstream forest managers, residents, and workers, and revisions of water-quality management plans between the State Water Board and forest management agencies to address concerns with impaired water bodies.	No
22	Land Use Planning and Management	Includes land use controls to manage, minimize, or control activities that may negatively affect the quality and availability of groundwater and surface waters, natural resources, or endangered or threatened species.	Yes
23	Recharge Areas Protection	Includes land use planning, land conservation, and physical strategies to protect areas that are important sources of groundwater recharge.	Yes
24	Sediment Management	Strategies that utilize sediment for habitat restoration, beach nourishment, riparian and wetland health, as well as reduce its impact on water quality.	Yes
25	Watershed Management	Comprehensive management, protection, and enhancement of groundwater and surface waters, natural resources, and habitat	Yes
Improve Flood Management			
26	Flood Management	Strategies that decrease the potential for flood-related damage to property or life including control or management of floodplain lands or physical projects to control runoff.	Yes

No.	RMS within CWP Update 2013[1]	Strategy Overview	Included in 2019 IRWM Plan
Other			
27	Other Strategies	Other RMS include: • Crop Idling for Water Transfers • Dewvaporation/Atmospheric Pressure Desalination • Fog Collection • Irrigated Land Retirement • Rainfed Agriculture • Waterbag Transport	No
People and Water			
28	Economic Incentives (Loans, Grants, and Water Pricing)	Includes economic incentives (e.g. loans, grants, water pricing) to promote resource preservation or enhancement.	Yes
29	Outreach and Engagement	Tools and practices used by water agencies to facilitate contributions by public individuals and groups towards good water management outcomes.	Yes
30	Water and Culture	Increasing the awareness of how cultural values, uses, and practices are affected by water management, and how they affect water management.	Yes
31	Water-Dependent Recreation	Enhancing and protecting water-dependent recreational opportunities and public access to recreational lands.	Yes
San Diego IRWM Region RMS (not included in the *CWP Update 2013*)			
N/A	N/A	San Diego IRWM Region-Specific RMS include: • Water Resources Data Collection, Management, and Assessment • Scientific and Technical Water Quality Management and Enhancement • Wastewater Management	Yes

Source: DWR, 2013

8.2 Resource Management Strategies Considered and Selected for the IRWM Plan

8.2.1 California Water Plan Update 2013

As required by DWR in the 2016 IRWM Program Guidelines, this IRWM Plan Update considered each RMS included in the *CWP Update 2013.* Each of these RMS is included in Table 8-1 and are analogous to those RMS included within the 2016 IRWM Program Guidelines (DWR, 2016). For purposes of presenting and discussing RMS, the 2019 IRWM Plan utilizes the RMS organizational structure and convention set forth in the *CWP Update 2013*.

8.2.2 Resource Management Strategies Specific to the 2013 IRWM Plan

In addition to the RMS listed within the *CWP Update 2013,* RMS specific to the San Diego IRWM Region were considered for inclusion within the 2019 IRWM Plan. The 2013 IRWM Plan included four Region-specific RMS, which were re-evaluated by stakeholders as part of the 2019 IRWM Plan. Those additional RMS include:

1. *Stakeholder and Community Involvement* – Strategies to involve stakeholders in water resources planning or management activities, including public outreach and education.

2. *Water Resources Data Collection, Management, and Assessment* – Includes collection, analysis, and management of water resources data to support regional water management activities.
3. *Scientific and Technical Water Quality Management Knowledge Enhancement* – Includes technical and scientific analysis to support regulatory compliance issues and options, regional coordination, and compliance.
4. *Wastewater Management* – Includes addressing management of wastewater flows as a water resource, for public and environmental health, and for improved efficiency.

Of the four Region-specific RMS included in the 2013 IRWM Plan, one (Stakeholder and Community Involvement) was incorporated into the "Outreach and Engagement" RMS that was added during the *CWP Update 2013*.

8.3 Documenting the Process

One of the priorities of the IRWM Program is to maximize stakeholder involvement and input into the IRWM planning process. As such, members of the Regional Water Management Group (RWMG), Regional Advisory Committee (RAC), and the public were asked to discuss and vet RMS during a public workshop held on August 1, 2012. The RAC reviewed updates to this chapter during a joint RAC Meeting-IRWM Plan Update Workshop on April 4, 2018.

IRWM stakeholders were asked to consider all RMS listed within the *CWP Update 2013,* the additional RMS included within the 2013 IRWM Plan, and any additional RMS that may be relevant to the Region. Stakeholders were also asked to consider whether each RMS is being implemented within the Region and if so, to provide an example. Further, as described in detail in *Section 7.9* in Chapter 7, *Regional Coordination*, the Climate Change Workgroup also evaluated each RMS in terms of how they could help the Region to address climate change vulnerabilities or mitigate greenhouse gas emissions.

Section 8.4 includes a compilation of RMS examples that are currently implemented in the Region, the majority of which were provided by IRWM stakeholders.

8.3.1 Selected IRWM Plan Resource Management Strategies

Stakeholder review and consideration of RMS for inclusion within the 2019 IRWM Plan involved considering the potential applicability of each strategy to the Region. Specifically, stakeholders were asked to consider how each RMS could potentially help the Region to meet the San Diego IRWM Objectives in Chapter 2*, Vision and Objectives*. Upon reviewing all RMS listed within the *CWP Update 2013,* as well as the three Region-specific RMS, stakeholders determined that two RMS are only partially relevant to the San Diego IRWM Region. Although these two RMS are critical for supply reliability for the Region, they will not be implemented within the Region itself. Because of the importance of these RMS for

RMS exercise conducted at joint Public Workshop/RAC Meeting in August 2012

Photo Credit: Rosalyn Prickett, RMC Water and Environment the Region's imported water supply, they are included in this 2019 IRWM Plan:

1. Conveyance – Delta (#3)
2. Surface Storage – CALFED (#11)

IRWM stakeholders also noted that the following RMS are not applicable to the Region due to the fact that they cannot be realistically implemented or are not directly applicable to the Region. These eight RMS were not selected by the Region's stakeholders for inclusion within the 2013 IRWM Plan:

1. Precipitation Enhancement (#9)
2. Forest Management (#21)
3. Crop Idling for Water Transfers (#27, Other Strategies)
4. Dewvaporation /Atmospheric Pressure Desalination (#27, Other Strategies)
5. Fog Collection (#27, Other Strategies)
6. Irrigated Land Retirement (#27, Other Strategies)
7. Rainfed Agriculture (#27, Other Strategies)
8. Waterbag Transport (#27, Other Strategies)

As such, 29 strategies were selected for inclusion within the 2019 IRWM Plan, including the three Region-specific RMS.

8.4 Current Application of Water Management Strategies in Region

Determining the applicability of RMS to the San Diego IRWM Region was done, in part, by assessing how the Region may already implement those RMS listed within the *CWP Update 2013.* The following sections include a description of each RMS and examples of current efforts in the San Diego IRWM Region that involve implementation of the RMS included in Table 8-1.

8.4.1 Agricultural Water Use Efficiency

Agricultural water use efficiency is practiced both by private agricultural businesses and by local water agencies. The San Diego County Water Authority (Water Authority) and local agencies maintain programs to encourage agricultural water conservation and increase efficiency of use. Water costs represent a significant portion of the overall operating costs for many growers within the Region and economic factors have led to significant improvements in agricultural water use efficiency within the Region during the past 30 years. The Water Authority's Agricultural Water Management Program provides free irrigation system evaluations for agricultural operations of one acre or more (Winzler and Kelly et al., 2011). Additional irrigation efficiency expertise, technology, and advice are available to the Region's agricultural businesses through the University of California Agricultural Extension, U.S.

Natural Resource Conservation Service, and local growers' organizations.

8.4.2 Urban Water Use Efficiency

The Water Authority and local water agencies currently implement programs to enhance urban water use efficiency within the Region. The Water Authority offers numerous programs to assist customers in using water more efficiently, including residential surveys, retrofits, a landscape efficiency program, voucher programs to encourage flow-efficient toilets and washing machines, and a commercial/industrial/ institutional water efficiency program. The Water Authority assists local water agencies in implementing urban water use efficiency programs, resulting in additional water conservation savings of an estimated 128,000 AFY of savings by 2040 (see *Chapter 3, Region Description*) (Water Authority, 2016). Local municipalities encourage conservation through land use

regulations, building codes, and incentives.

Three Water Conservation Summits (2006, 2007, and 2009) were held to bring regional water and land use agencies and urban landscape stakeholders together to shape the future of water conservation in the Region, outline the actions needed to change the conservation ethic, and demonstrate how to implement water conservation programs.

Urban water use efficiency programs focus on conversion to water wise landscaping.

Photo Credit: Toby Roy, San Diego County Water Authority

***Urban Water Use Efficiency* RMS in the San Diego IRWM Region**
San Diego County Water Authority - Sustainable Landscapes Program The Sustainable Landscapes Program is designed to reduce water waste and pollutant infiltration into local waterways through the development and implementation of landscape standards and specifications generally consistent with the California Model Water Efficient Landscape Ordinance and the San Diego Regional Water Quality Control Board Municipal Stormwater Permit. This project is sponsored by the Water Authority and was developed in partnership with City of San Diego, County of San Diego, California American Water, and non-profit partners such as California Center for Sustainable Energy, Surfrider Foundation, and Association of Compost Producers. The Sustainable Landscapes Program relies on the integration of landscape standards and specifications development, education and training, materials, incentives, outreach, and technical assistance to achieve project goals (water waste and pollution reduction). The project is targeted towards the residential sector, but also includes commercial participants. Due to continued drought conditions, project benefits expected to accrue beyond 2022 include: • water use reduction • green waste reduction • labor reductions associated with maintenance • carbon dioxide emissions reduction • water quality improvements The Water Authority has developed education and training curricula that are geared towards the residential sector and include long- and short-format workshops, online video series, ad hoc training events, and Qualified Water Efficient Landscaper (QWEL) training. The average size of turf replacement projects planned by participants is more than 1,000 square feet. *Source: San Diego County Water Authority, 2016*
Biogen Idec – Use of Recycled Water in Cooling Towers Biogen Idec is a biotechnology firm that specializes in the development of therapeutic products for the medical field. Biogen Idec was one of the first companies to use recycled water from the North City Water Reclamation Plant. The company has used recycled water for irrigation of its 42-acre campus in San Diego since 2004 and in its cooling towers since November 2006. The cooling towers at Biogen Idec are the largest users of water in the facility. Conversion to recycled water has allowed Biogen Idec to realize significant cost savings through discounted rates and has provided Biogen Idec with a drought-proof source of water. *Sources: San Diego County Water Authority, NDc; San Diego County Water Authority, 2009a*

8.4.3 Conveyance – Delta

As described in *Chapter 3, Region Description*, the Region receives imported water supply from the State Water Project; therefore, the Region relies upon conveyance facilities associated with the Sacramento-San Joaquin River Delta (Bay-Delta) for water supply.

Although implementation activities that directly improve or enhance the Delta would not be located within the Region, such activities could be financially and politically supported by the Region. For example, the Water Authority's *2015 Urban Water Management Plan* identified advocating for near-term actions and permanent fixes to the Delta as a potential strategy for managing future water uncertainties (Water Authority, 2016). As of this writing, the Water Authority has not endorsed any specific proposal under consideration to restore the Bay-Delta ecosystem and create a more reliable water supply for California.

8.4.4 Conveyance – Regional/Local

The Water Authority aqueduct system delivers both treated and untreated water to the Region. Conveyance facilities for flood flows include lined or armored flood channels, culverts, natural stream courses, and storm drains. Member agency operations for conveying local reservoir supplies include:

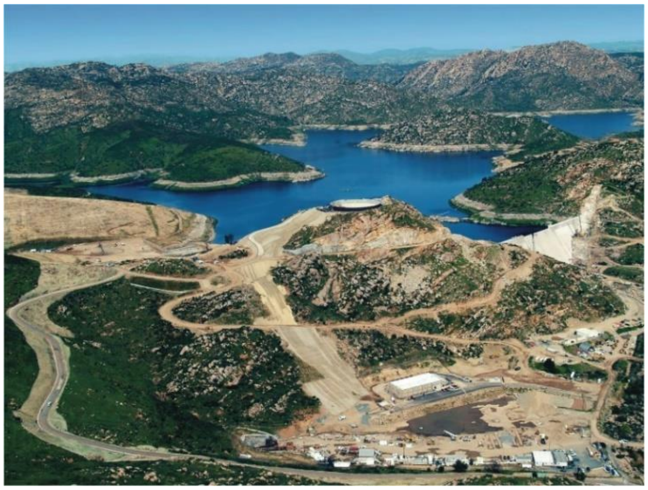
- Pipelines (e.g. Hodges, Olivenhain, San Vicente, El Capitan, Sweetwater, and Otay Reservoirs)
- Releases to natural stream channels (e.g. Sutherland, Loveland, Morena, and Cuyamaca Reservoirs)
- Canals, surface channels, and flumes (e.g. Wohlford, Barrett, and Henshaw)

Alternative pipeline transmission facilities are located between reservoirs within the Region to provide system flexibility in an earthquake emergency. Provision of such pipelines enhances reliability without augmenting supplies by increasing flexibility to move water between storage locations and points of use.

8.4.5 System Reoperation

All local reservoir-operating agencies (see *Chapter 3, Region Description*) employ some form of system operation and reservoir management. Key reservoir reoperation/management programs within the Region include the following reservoirs that capture local runoff, serve large water treatment facilities, are connected to the imported water system, and are interconnected with other local reservoirs:

- San Vicente Reservoir (City of San Diego),
- Sweetwater Reservoir (Sweetwater Authority),
- Otay Reservoir (City of San Diego),
- El Capitan Reservoir (City of San Diego), and
- Hodges Reservoir (City of San Diego).



The San Vicente Dam Raise (completed in 2014) will contribute to long-term water supply reliability for the region.

Photo Credit: Toby Roy, San Diego County Water Authority

The Water Authority works with its member agencies through storage agreements and aqueduct operating plans to optimize the use of local storage (Water Authority, 2016). The storage agreements allow for carryover storage in member agency reservoirs and provide increased local storage, which can be used during peak demands on the aqueduct system. The aqueduct operating plans coordinate imported water deliveries and optimize reservoir fill opportunities. A series of regional systems operations projects build upon each other to optimize functionality of Hodges Reservoir. The Water Authority coordinated with its member agencies to model and evaluate whether other opportunities for storage optimization exist as part of preparing its *2013 Regional Water Facilities Optimization and Master Plan Update* (Water Authority, 2014).

***System Reoperation* RMS in the San Diego IRWM Region**

The City of San Diego is undertaking a multi-pronged approach to improving water quality in Lake Hodges. Lake Hodges is part of the region's Emergency Storage Project and is connected with the Water Authority's regional distribution system. Water quality in the reservoir, however, make it undesirable as a supply. Improving water quality in the reservoir will allow water stored in Lake Hodges to be distributed through the Regional system, where it currently cannot. The four projects described here were funded by IRWM Implementation Grants and each contributes to improved water quality in the reservoir, ultimately expected to result in the ability to operate the reservoir as designed.

San Diego County Water Authority, Lake Hodges Water Quality and Quagga Mitigation

The project addresses two issues centered within the San Dieguito Hydrologic Unit. The first is improving low water quality within Lake Hodges. The second is mitigating against the potential long- term effects of quagga mussels on Lake Hodges, San Dieguito Reservoir, Olivenhain Reservoir, and attached facilities. This project is sponsored by the San Diego County Water Authority, but is complementary to the ongoing effort by the San Dieguito Water District, Santa Fe Irrigation District, City of San Diego, San Dieguito River Valley Conservancy, and the San Dieguito Watershed Council to address long term water quality and environmental issues within the Lake Hodges watershed.

Regional Emergency Storage and Conveyance System Intertie Optimization

This project will install a Speece Cone at Hodges Reservoir to oxygenate the deep portions of the reservoir and improve water quality, increasing the volume of useable water in the reservoir, enabling movement of water from Hodges to other storage reservoirs and reducing the need to import additional water. Over its 20-year life, this project is anticipated to result in 102,163 AF of additional local supplies that are not now available to the Region.

Hodges Reservoir Natural Treatment System

The City of San Diego is creating a biofiltration wetland at the Hodges Reservoir to treat seasonally degraded water quality in the reservoir. This project addresses the water quality issues facing the reservoir that prevent full implementation of the Pumped Storage Project, which is a major element of Water Authority's Emergency Storage Project. The wetland will provide habitat, and as water quality in the reservoir improves, additional recreational opportunities are likely to become available. Project partners include the Santa Fe Irrigation District, San Dieguito Water District, San Dieguito Valley Conservancy, and SDCWA. This project supports the Region's goals of water supply reliability, improved water quality, and sustainable integrated water resources management.

8.4.6 Water Transfers

As discussed in *Chapter 3, Region Description*, the Water Authority has implemented water transfer agreements to take delivery of conserved agricultural water from the Imperial Irrigation District and water conserved through lining the All-American and Coachella Canals in Imperial County. Local water agencies have implemented agreements and facilities to allow for transfer of supplies among agencies.

***Water Transfer* RMS in the San Diego IRWM Region**
San Diego County Water Authority – Water Transfer On April 29, 1998, the Water Authority signed an agreement with the Imperial Irrigation District for the long-term transfer of conserved Colorado River water to San Diego County. The Water Authority–Imperial Irrigation District Water Conservation and Transfer Agreement is the largest agriculture-to-urban water transfer in United States history. Colorado River water is being conserved by Imperial Valley farmers who voluntarily participate in the program, and then transferred to the Water Authority for use in San Diego County. Deliveries into San Diego County from the transfer began in 2003 with an initial transfer of 10,000 AF. The Water Authority has received increasing amounts of transfer water each year, according to a water delivery schedule contained in the transfer agreement. In 2015, the Water Authority received approximately 100,000 AF. The quantities will increase annually to 200,000 AF by 2021 then remain fixed for the duration of the transfer agreement. The initial term of the Transfer Agreement is 45 years, with a provision that either agency may extend the agreement for an additional 30-year term. During dry years, when water availability is low, the conserved water will be transferred under the Imperial Irrigation District's 's Colorado River rights, which are among the most senior in the Lower Colorado River Basin. Without the protection of these rights, the Water Authority could suffer imported water delivery cutbacks. *Source: San Diego County Water Authority, 2016*

8.4.7 Conjunctive Management and Groundwater

As shown in *Chapter 3, Region Description*, approximately 10 of the region's major water agencies incorporate groundwater as part of their water supply portfolio. Groundwater supplies are projected to comprise 32,670 AFY of supply for Water Authority member agencies by 2040 (see *Section 3.10* in *Chapter 3, Region Description*). The Region's water agencies have prepared groundwater resources development and management plans for many of the Region's groundwater basins.

Groundwater represents the sole source of supply throughout much of the less developed eastern portion of the Region outside the Water Authority's service area. Groundwater that can be extracted and used as a potable water supply with minimal treatment generally occurs within the upper reaches of the east–west trending watersheds and outside the influence of human activities. Because no backup supply exists in areas outside the Water Authority's service area, management of groundwater is critical to ensuring continued water availability to this portion of the Region's population.

Groundwater that is high in salts and total dissolved solids (TDS) and other contaminants, and requires advanced treatment prior to potable use, is typically found in shallow basins in the downstream portions of watersheds. Brackish groundwater recovery projects use membrane technology, principally reverse osmosis, to treat extracted groundwater to potable water standards. The City of Oceanside's 6.37-million-gallon per day (mgd) capacity Mission Basin Desalter and the Sweetwater Authority's existing 4.0-mgd Richard A. Reynolds Groundwater Desalination Facility are currently the only operating brackish groundwater recovery and treatment facilities within the Water Authority's service area (Water Authority, 2016). The Richard A. Reynolds Groundwater Desalination Facility recently completed an expansion that increased its capacity to 8,800 AFY. Olivenhain Municipal Water District is exploring groundwater extraction options and recently completed its *San Dieguito Valley Brackish Groundwater Desalination Study* (OMWD, 2017).

Unit costs for brackish groundwater recovery projects are considerably higher than those for simple groundwater extraction and disinfection projects due to the additional treatment requirements and the cost of concentrate (brine) disposal. However, where economical options exist for disposal of brine, this type of groundwater project has proven to be an economically sound water supply option (Water Authority, 2016). Because most of the higher-quality groundwater within the Water Authority's service area is already being fully utilized, the focus for future local groundwater development is brackish groundwater recovery and treatment.

Artificial recharge and recovery projects, also referred to as conjunctive-use projects, can increase groundwater basin yields by supplementing the natural recharge process. Conjunctive use represents an important form of groundwater management, which could be implemented in the Region to ensure the sustainability of the Region's groundwater supplies. FPUD, Camp Pendleton, Padre Dam MWD, and Helix WD are currently exploring the feasibility of such projects (Water Authority, 2016).

8.4.8 Desalination Brackish and Seawater

The Water Authority's *2015 Urban Water Management Plan* establishes a target of 56,000 AFY of seawater desalination within the Region by 2040 based on the production capacity of the Claude "Bud" Lewis Carlsbad Desalination Plant (Carlsbad Desalination Plant) (see *Chapter 3, Region Description*). Under terms of a water purchase agreement, the Water Authority buys between 48,000 and 56,000 acre-feet per year (AFY) of desalinated seawater from the Carlsbad Desalination Plant enough water to meet about 8 percent of the San Diego region's projected water demand in 2020.

The Carlsbad Desalination Plant includes a seawater desalination plant and conveyance pipelines that were developed by a private, investor-owned company (Poseidon Resources). The Water Authority modified its aqueduct system to incorporate this water supply. The Carlsbad Desalination Plant is located on industrially zoned land adjacent to the Encina Power Station and Agua Hedionda Lagoon, in Carlsbad (Water Authority, 2016). At the end of the water purchase agreement's 30-year term, the Water Authority may purchase the plant for $1. The Water Authority also is evaluating a potential Camp Pendleton Desalination Project in collaboration with the Camp Pendleton.

The Region also participates in several efforts to desalinate brackish groundwater. There are two projects within the Region being implemented that desalinate brackish groundwater. As described above, the City of Oceanside's 6.37-mgd capacity Mission Basin Desalter and the Sweetwater Authority's existing 4.0-mgd Richard A. Reynolds Groundwater Desalination Facility are the only brackish groundwater recovery and treatment facilities operating within the Water Authority's service area (Water Authority, 2016).

***Desalination** RMS in the San Diego IRWM Region*
San Diego County Water Authority – Carlsbad Desalination Project and Camp Pendleton Desalination Project
The Water Authority currently imports approximately 70 percent of its water supply from Metropolitan Water District of Southern California (Metropolitan). Metropolitan's ability to provide reliable water supplies, particularly in dry years, is constrained by the preferential right of each of its member agencies, as well as by uncertainties regarding the continued reliability of the State Water Project and the Colorado River. For these reasons, developing new, local water supplies for the region, such as seawater desalination, is a key component in the Water Authority's water supply diversification efforts. The Claude "Bud" Lewis Carlsbad Desalination Plant has been producing water since 2015 and another project that would be located at U.S. Marine Corps Base Camp Pendleton is under study.
The Carlsbad Desalination Plant is located at the Encina Power Station in Carlsbad in northern San Diego County. It was developed by Poseidon Resources. In addition to the treatment facility, the plant includes a pipeline connection to the Water Authority's regional aqueduct system. The Water Authority participates in the Carlsbad Desalination Plant as a purchaser of product water from the facility under the terms of a 30-year water purchase agreement. The Carlsbad Desalination Project is fully operational and provides a highly reliable local supply of 48,000 to 56,000 AFY for the Region. The Water Authority has the option to purchase the plant for $1 at the end of the agreement term.
The Water Authority, with participation from U.S. Marine Corps Base Camp Pendleton, continues to evaluate the cost and feasibility of a desalination plant located at Camp Pendleton. The Camp Pendleton desalination plant would provide between 50 and 150 million gallons per day of desalinated water. Following the completion of a feasibility study in 2009, the Water Authority completed further technical studies at the proposed facility site in 2013. The studies included detailed facility siting and pipeline alignment studies, as well as onshore and offshore field investigations near the proposed project sites to determine the viability, costs, and impacts to marine life of seawater intake and discharge systems. In 2015, the Water Authority's Board of Directors authorized a contract for building, operating, and reporting on a pilot-scale seawater intake testing program.
Source: San Diego Water Authority, 2017 and San Diego County Water Authority, 2016

8.4.9 Precipitation Enhancement

Regional efforts do not currently focus on precipitation enhancement as an important water management strategy in the Region as a result of (1) the highly seasonal nature of precipitation in the region, (2) the potential for flash flooding, and (3) the virtually nonexistent role of snow pack in storing water within the Region. Upon review, stakeholders determined the precipitation enhancement strategy is not an appropriate RMS for the San Diego IRWM Region.

8.4.10 Recycled Municipal Wastewater

Recycled water is currently produced and distributed by many of the Region's water and recycled water agencies. Tertiary treatment capacity within the Region is currently approximately 68 mgd, and the Region's water supply plans propose to increase recycled water use within the Region from 29,000 AFY in year 2015 to 47,000 AFY by year 2040 (see *Section 3.5.5* in *Chapter 3, Region Description*) (Water Authority, 2016). Attaining this recycled water use target will involve expanding existing recycled water distribution systems, increasing the number of users, and increasing the variety of recycled water uses.

Recycled water can be used for landscape irrigation, cooling towers, and ornamental ponds.

Photo Credit: Jeff Pasek, City of San Diego

Currently, recycled water (tertiary-treated wastewater) is used exclusively for non-potable purposes, such as irrigation and industrial use. The Region is exploring potable reuse, purifying tertiary treated wastewater with advance treatment technology, as a potential future water supply. The City of San Diego has been conducting a demonstration project for indirect potable reuse, which involves blending purified water with raw water sources in an environmental buffer (in this case, a reservoir) prior to re-treating the water at a drinking water treatment plant. The City of San Diego is also working with the WateReuse Foundation to study various treatment trains for direct potable reuse which would involve the same process as indirect potable reuse without an environmental buffer.

Several agencies are completing studies pertaining to potable reuse in San Diego County through groundwater recharge or reservoir augmentation. The City of Oceanside completed the investigative phase of their Indirect Potable Reuse Project, which involves recharging of the Mission Groundwater Basin using water treated at the San Luis Rey Water Reclamation Facility (SLRWRF). The project will be implemented in two phases, with a final capacity of 4.5 mgd, which will provide an ultimate yield of 3,300 AFY of groundwater recharge. This project will be operational in 2020. Pure Water San Diego, the City of San Diego's phased, multi-year program to produce purified water is scheduled to be operational by 2021. The project's long-term goal is to produce 83 mgd, or one-third of San Diego's future drinking water supply, by 2035.

***Recycled Municipal Wastewater* RMS in the San Diego IRWM Region**
City of San Diego - Pure Water The City of San Diego is developing a large-scale potable reuse project called Pure Water San Diego. This project will provide up to one-third of the City's projected supplies by 2035 by advance treating wastewater for potable reuse with an environmental buffer. Previously, the City had undertaken the 1 mgd Water Purification Demonstration Project to evaluate the feasibility of using advanced treatment technology on tertiary recycled water that can be sent to a local reservoir, blended with other raw water, and then treated and distributed as potable water (also known as indirect potable reuse/reservoir augmentation). The Pure Water San Diego project will produce reliable, drought-proof, local supply, and offset demands for imported water. It represents the next steps of recycled water, going beyond traditional non-potable water reuse (traditional recycled water).
North San Diego County Regional Recycled Water Project North San Diego County water and wastewater agencies are collaborating to connect the region's recycled water infrastructure – taking inventory of where there are available supplies of wastewater and where there are demands for recycled water for irrigation or industrial uses. The North San Diego Water Reuse Coalition consists of Carlsbad Municipal Water District, City of Escondido, City of Oceanside, Leucadia Wastewater District, Olivenhain Municipal Water District, Rincon del Diablo Municipal Water District, San Elijo Joint Powers Authority, Santa Fe Irrigation District, Vallecitos Water District, Vista Irrigation District, and U.S. Marine Corps Camp Pendleton. The Coalition's project will maximize recycled water use among the agencies, develop interconnections to more efficiently distribute recycled water, and construct new water reclamation facilities to increase the supply of recycled water available to each of these agencies' respective customers. Regional planning, design, environmental compliance, and construction is underway, all supported with San Diego IRWM funding. By working together, these agencies are demonstrating a commitment to provide a reliable, drought-proof source of water for the region and reduce discharge of wastewater to the ocean.
Padre Dam Municipal Water District, Padre Dam Advanced Water Treatment – Phase IA Expansion Padre Dam Municipal Water District's (MWD's) project is a key component of the East County Regional Water Reuse Program, a water reuse partnership with Helix Water District, County of San Diego, and City of El Cajon. The project will expand the Ray Stoyer Water Reclamation Facility by 4 mgd to deliver recycled water for irrigation, and to deliver tertiary effluent to the Advanced Water Purification Facility, to allow for future potable reuse. This project helps to move Padre Dam MWD and Helix Water District towards potable reuse, supporting the Region's goal of supply reliability and sustainability.

Recycled Municipal Wastewater ***RMS in the San Diego IRWM Region***
City of Escondido, Escondido Advanced Water Treatment for Agriculture The City of Escondido's project will construct a new microfiltration/reverse osmosis (MFRO) advanced treatment facility with a total production capacity of 2.0 million gallons per day (mgd). Water treated at the MFRO facility will be blended with tertiary treated water from an existing recycled water plant and distributed to agricultural customers in the northern and eastern areas of the City of Escondido. The City of Escondido has partnered with Escondido Growers for Agricultural Preservation, Vista Irrigation District, City of San Diego, and Rincon Del Diablo Municipal Water District to implement this project. This project supports the Region's goals of supply reliability and sustainability, and protects water quality while supporting local agriculture and the economy.

8.4.11 Surface Storage - CALFED

CALFED water storage is critical to the reliability of the State Water Project, and in turn to the reliability of Metropolitan's supplies delivered to the Region. Regional efforts do not include constructing or optimizing additional CALFED storage as these storage facilities are not located within the Region. The plans and programs of state agencies and Metropolitan are more likely to incorporate this strategy. Instead, the Region focuses on water resources actions to improve conservation, increase water storage, and increase the diversity of the Region's supplies. For this reason, IRWM stakeholders indicated that this RMS was only applicable to the Region in a limited capacity.

8.4.12 Surface Storage - Regional/Local

Regional surface storage is critical in balancing seasonal and other temporal differences between water supply availability and demand. *Chapter 3, Region Description* summarizes existing regional surface water storage. The Emergency Storage Program (*Section 3.5.2* in *Chapter 3, Region Description*) represents an important part of the Region's effort to increase regional water storage.

Surface Storage – Regional/Local ***RMS in the San Diego IRWM Region***
San Diego County Water Authority - San Vicente Dam Raise The San Vicente Dam Raise Project is a component of the Water Authority's Emergency & Carryover Storage Project, a system of reservoirs, interconnected pipelines and pumping stations designed to make water available to the San Diego Region in the event of an interruption in imported water deliveries. The San Vicente Dam Raise Project increased the height of the San Vicente Dam from 220 feet to 337 feet and increased storage capacity from 90,000 AF to 242,000 AF. This project serves two purposes: to use the additional water storage capacity to capture surplus water that is available during wet seasons for use in potential future dry years, and to store water for use in a regional water supply emergency. As such, the project helps to balance seasonal differences between water supply availability and demand, and provides additional storage that may be necessary in the event of a catastrophic emergency such as an earthquake that cuts off imported water supplies to the Region. *Source: San Diego County Water Authority, 2013b*
City of San Diego – Watershed Sanitary Survey All public water systems using surface water must conduct a comprehensive sanitary survey of its watersheds every five years. The purpose of the 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. The City of San Diego prepared an update to its Sanitary Survey in 2010. The update identified the potential contaminant sources as well as recommendations to protect the watershed and source water quality. The three categories of recommendations include watershed management and control practices, public education, and inter-jurisdictional coordination. *Source: City of San Diego, 2011*

Surface Storage – Regional/Local ***RMS in the San Diego IRWM Region***
City of San Diego - Source Water Protection Guidelines for New Development The City of San Diego owns and operates nine drinking water reservoirs. Seven of those reservoirs (Barrett, El Capitan, Hodges, Morena, Otay, San Vicente, and Sutherland), located mainly outside of the City, warrant protection because they are at risk of being polluted as runoff volumes and associated pollutant discharges increase from potential future development. Due to its concern for the water quality of its reservoirs, the City prepared the *Source Water Protection Guidelines for New Developments* (Guidelines). The Guidelines were prepared to assist municipal agencies, designers, land planners, developers, and laypersons in conducting site design planning and select best management practices (BMPs) that protect or improve the quality of runoff draining into the reservoirs. They are not focused on construction activities, but rather site design and source controls that occur over the life of a project. The Guidelines provide a stepwise, simplified BMP selection process to ensure that preferred source water protection BMPs are considered. Although the use of the Guidelines is voluntary, the guidance is consistent with state and local stormwater permit requirements, as well as local planning protocols. *Source: City of San Diego Water Department, 2004*

8.4.13 Drinking Water Treatment and Distribution

Water Authority-treated water supplies are derived from two sources: a Metropolitan-operated treatment facility at Lake Skinner in Riverside County, and the Twin Oaks Valley Water Treatment Plant, owned and operated by the Water Authority, which has the capacity to treat up to 100 mgd of untreated water delivered from Metropolitan. In addition, the Region includes additional (non-Water Authority) potable water treatment capacity of 752 mgd (*Section 3.5.2*, *Chapter 3, Region Description*) that allows for treatment of locally-derived supplies and untreated supplies delivered via the Water Authority's aqueducts. Each water agency maintains its own distribution network, and the agency systems are interconnected to create a potable water delivery system that extends throughout the Water Authority's service area.

Small water systems and community wells are an important source of supply in the portion of Region outside the Water Authority's service area. A lack of backup facilities and interconnections among these small community systems render them vulnerable to supply interruptions or water quality problems. Upgrades in treatment and conveyance to these small water systems would enhance both water quality and system reliability among the Region's rural populations.

8.4.14 Groundwater / Aquifer Remediation

Toxic organic contaminants have been documented in several of the Region's groundwater aquifers. The San Diego Water Board and San Diego County oversee investigation and remediation at more than 100 cleanup/remediation sites throughout the Region. The San Diego Water Board also maintains a program for investigating, monitoring, and enforcing cleanup/remediation of soil and groundwater pollution from (1) Department of Defense sites and (2) pollution sources other than underground storage tanks.

8.4.15 Matching Quality to Use

Many of the Region's water agencies have adopted regulations requiring the use of recycled water in place of potable supplies for certain non-potable irrigation uses. Additional instances where quality is matched to use within the Region include (1) using untreated water for dust control, (2) using poor quality groundwater for non-potable uses such as irrigation, (3) using gray water for toilet flushing and non-potable uses, and (4) using recycled water for fire suppression.

__Matching Quality to Use__ ***RMS in the San Diego IRWM Region***
University of California, San Diego The University of California, San Diego (UCSD) is the second-largest user of recycled water in the City. UCSD's recycled water efforts began with irrigation retrofits in 1998, and later recycled water features were designed into the new development within the campus. Currently, recycled water is about five percent of UCSD's total water usage, but UCSD intends to expand recycled water use in the future. *Source: San Diego County Water Authority, NDb*
Lomas Santa Fe Country Club, Solana Beach The Lomas Santa Fe Country Club, located in Solana Beach, receives recycled water from the San Elijo Water Reclamation Facility which is owned by the San Elijo Joint Powers Authority. A total of 100 acres of the country club is irrigated with recycled water; less than 5 acres are irrigated with potable water. The use of recycled water for irrigation decreases the amount of fertilizer needed (due to high nitrogen levels in recycled water) and reduces potable water use. *Source: San Diego County Water Authority et al., NDd*

8.4.16 Pollution Prevention

Approximately 48 inland surface waters and 65 coastal waters or beach segments are listed as 303(d)-impaired water bodies (*Section 3.7*, *Chapter 3, Region Description*). The San Diego Water Board is currently implementing TMDLs for several of the affected waters and has prioritized TMDLs for remaining impaired waters. The purpose of the TMDLs is to determine pollutant loads, assign pollutant loads and responsibilities to watershed agencies, and implement activities that can reduce pollutant levels to those required by relevant water quality statutes.

In addition, the County and the Municipal Separate Storm Sewer Systems (MS4) copermittees implement a regional storm runoff program that includes activities to manage runoff discharge and implement programs to prevent, control, and treat sources of pollutants. Ongoing pollution prevention efforts associated with the MS4 program and also implemented by other agencies in the Region include:

- Conducting pollutant monitoring,
- Conducting MS4 discharge and receiving water monitoring,
- Planning and implementing stormwater capture and treatment,
- Developing and implementing non-point source controls including BMPs,
- Planning and implementing dry season diversion of surface flows and storm drain flows to the sewer system,
- Inspections of pollutant-generating activities such as commercial, industrial, residential, and construction,
- Implementing education programs for the general public, school children, and target audiences,
- Implementing wastewater collection system maintenance, rehabilitation, and sewer spill prevention programs, and
- Performing storm drain maintenance and community cleanup events.

8.4.17 Salt and Salinity Management

Several environmental uses of water can be impacted by excessive salinity. The most urgent need for salt management results from the loss or impending loss of beneficial uses caused by the following: nitrate contamination, seawater intrusion, soil and groundwater salinization, and reduced availability of fresh water flows. The Salt and Salinity Management strategy in the *CWP Update 2013* identifies recommendations to address urgent needs for salt management. It recommends that stakeholders proactively identify sources, quantify the threat, prioritize necessary mitigation actions and work collaboratively with entities with the authority to take appropriate action to address salt loading.

***Salt and Salinity Management** RMS in the San Diego IRWM Region*
Proposed Guidelines for Salinity/Nutrient Management Planning in the San Diego Region, San Diego County Water Authority and Southern California Salinity Coalition
In 2010, the Water Authority and Southern California Salinity Coalition worked together to develop guidelines for implementation of the State's 2009 Recycled Water Policy in the San Diego Region (San Diego Water Board). The guidelines are intended to assist agencies and stakeholders to develop salinity/nutrient management plans by establishing a standardized approach and framework that has been reviewed by the San Diego Water Board. The Guidelines assess San Diego Region aquifers and identify aquifers that are suitable for development of salinity/nutrient management plans, and present suggested tasks and procedures to be used in developing those plans.
Source: San Diego County Water Authority and Southern California Salinity Coalition, 2010

8.4.18 Urban Stormwater Runoff Management

Urban runoff management within the Region is conducted by multiple entities in the Region, including both public and private parties. Urban runoff management in the form of stormwater runoff management generally occurs through activities related to flood management and runoff management actions implemented by the MS4 Copermittees and other relevant agencies, such as the California Department of Transportation and the U.S. Navy. Ongoing urban runoff management strategies implemented by applicable entities within the Region have been directed toward the following:

- Regulatory requirements to implement strategies such as BMPs and public education to effectively eliminate non-stormwater runoff,
- Physical means of control such as flow and pollutant reduction through minimizing impervious areas, capture and retention, diversion to the sewer, or treatment,
- Standards to manage the increase in runoff discharge rates and durations from all Priority Development Projects, to ultimately prevent erosion of channel beds and banks, and
- MS4 discharge and land use monitoring to characterize pollutant loading and BMP monitoring to evaluate effectiveness.

***Urban Runoff Management** RMS in the San Diego IRWM Region*
Integrated Water Resource Solutions for the Carlsbad Watershed, San Elijo Joint Powers Authority
This project, implemented by San Elijo Joint Powers Authority (SEJPA), utilizes recycled water and low-impact development strategies to offset potable water demands, reduce urban runoff, and implement water quality monitoring at San Elijo Lagoon. Improvements provided by the project are anticipated to provide water quality benefits to San Elijo Lagoon and Cottonwood Creek/Moonlight Beach. In addition, SEJPA and its partners (City of Encinitas, City of Solana Beach, San Dieguito Water District, Santa Fe Irrigation District, Olivenhain Municipal Water District, and San Elijo Lagoon Conservancy) will conduct community outreach targeting DACs. This project supports the Region's supply reliability and sustainability goals and protects water quality and natural resources.

8.4.19 Agricultural Land Stewardship

While agricultural lands represent 3% of San Diego County (*Chapter 3, Region Description*), agricultural activities are an important element affecting the Region's water resources. Land preservation is a key agricultural land stewardship activity implemented within the Region. The

County and several municipalities maintain agricultural land preserve programs in which owners agree to set aside lands for agriculture or open space in return for reduced property taxes. Agricultural land stewardship practices implemented by private landowners include erosion control, habitat conservation, and pollution-reduction. Agencies that have programs that assist and advise in agricultural land stewardship practices within the Region include the U.S. Natural Resource Conservation Service, the County of San Diego Department of Agriculture Weights and Measures, the University of California Agricultural Extension, and Resource Conservation Districts.

The San Diego Water Board is also involved in assisting in agricultural land stewardship through regulation (including issuance of discharge permits or conditional waivers) of animal confinement, agricultural and nursery operations, and silviculture operations.

8.4.20 Ecosystem Restoration

Habitat restoration can reduce creek pollution, flooding, and soil erosion.

Photo credit: Charles Davis, Jacob Center for Neighborhood Innovation

The ecosystem restoration strategy identified in the *CWP Update 2013* incorporates a broad range of strategies directed toward conserving, protecting, enhancing, and creating habitat, ecosystems, and wetlands. Ecosystem restoration, environmental and habitat protection and improvement, and wetlands enhancement and creation projects and programs have been implemented by government and non-government organizations within the Region. Ongoing efforts within the Region include multiple species conservation programs, land conservation, invasive species control, land contouring, rehabilitation and re-vegetation, addressing flow hydraulics and preserving natural flow hydrology, and wetlands preservation, conservation and creation. The California Department of Fish and Wildlife and the United States Fish and Wildlife Service are active in several of the Region's restoration programs. As detailed in *Chapter 3, Region Description*, three multiple species conservation and preservation plans are being implemented within the Region. In addition to government ecosystem restoration efforts, private foundations and conservancies have been established within the Region to preserve lands, restore ecosystems, and to provide environmental management of conserved lands.

***Ecosystem Restoration* RMS in the San Diego IRWM Region**
San Diego River Park Foundation, Sustaining Healthy Tributaries to the Upper San Diego River and Protection Local Water Supplies
This project will protect Boulder Creek, within the San Diego River Watershed, from numerous threats such as sedimentation, temperature increase, and nutrient loading. Given the high quality of Boulder Creek, data collected along the creek will be used as a baseline for other streams in the San Diego River Watershed. Additionally, this project has a goal to purchase and restore up to 3,000 feet of stream currently damaged by private development and wildlife. Utilizing the partnerships formed in developing this project, increased monitoring of creeks draining into the El Capitan Reservoir will occur, and educational programs will be implemented to engage private land owners and reduce pollutant loading, erosion, and sedimentation. Further, outreach specifically geared to three tribes will enable them to survey and monitor water quality on tribal lands. This project is important for protecting the largest local water supply in the region, the El Capitan Reservoir. By protecting and improving water quality upstream of the reservoir, water treatment costs are reduced and the reservoir will better maintain its capacity, reducing the need for imported water. Organizations involved in this integrated effort include the San Diego River Park Foundation, Kumeyaay Diegueno Land Conservancy, San Diego River Conservancy, San Diego State University, Helix Water District, San Diego Stream Team, and San Diego Fly Fishers

8.4.21 Forest Management

Almost all forest management activities can affect water quantity and quality. The Forest Management strategy in the *CWP Update 2013* includes long-term monitoring to understand hydrologic changes resulting from climate change and management actions, multi-party coordination of forest management, improvement in communications between downstream water users and communities and upstream forest managers, residents, and workers, and revisions of water-quality management plans between the State Water Resources Control Board and forest management agencies to address concerns with impaired water bodies.

However, the Region has a Mediterranean climate and does not support extensive forestlands. For this reason, IRWM stakeholders indicated that this RMS was only applicable to the Region in a limited capacity.

8.4.22 (Urban) Land Use Planning and Management

The municipalities across the Region utilize urban land use management as a means of influencing water management through the Region's stormwater runoff program, zoning regulations, building codes, landscape ordinances, septic tanks, and agricultural preserve/land conservation programs. As part of its land use plans, the County limits development in areas dependent on groundwater supply so that water needs do not exceed available supplies. In addition, bills enacted by the State legislature (Senate Bills 610 and 221) require water agencies responsible for water resource planning to work with the local land use agencies to improve the coordination between land use planning and development and available long-term water supplies.

***Land Use Planning and Management* RMS in the San Diego IRWM Region**
San Diego County Water Authority and San Diego Association of Governments – Memorandum of Agreement The Water Authority entered into a Memorandum of Agreement (MOA) with the Region's regional transportation planning authority, the San Diego Association of Governments (SANDAG), in 1992. Per the MOA, the Water Authority agrees to use SANDAG's most recent regional growth forecasts for regional water supply planning purposes, provide updated information on changes in plans or programs, and implement relevant actions contained in the Water Element of the Regional Growth Management Strategy. The MOA ensures that the Water Authority will use land use management information (population projections) as the basis for conducting future water management. Further, the MOA ensures that water supply is considered as a component of the Region's overall growth management strategy. *Source: Appendix 7-C: Land Use Planning Study*

8.4.23 Recharge Areas Protection

Land use or land conservation measures to protect important groundwater recharge areas have been addressed in several of the Region's watershed management plans. Local water agencies using groundwater as a source of supply have identified key recharge area issues through sanitary surveys and within groundwater plans. Agencies that own and conserve significant land holdings to protect important groundwater recharge areas within the Region include:

- Camp Pendleton (lower portion of Santa Margarita River Watershed),
- Vista Irrigation District (upper portion of San Luis Rey Watershed), and
- City of San Diego (San Pasqual Valley in the San Dieguito River Watershed).

8.4.24 Sediment Management

Sediment management has been integrated into habitat and riparian restoration efforts across the Region. These multi-beneficial projects help to both restore local wetlands and coastal habitats, while providing key flood mitigation assistance and improving water quality in both natural waterways and in reservoirs.

Sediment Management *RMS in the San Diego IRWM Region*
San Diego Healthy Headwaters Restoration Project, Resource Conservation District of Greater San Diego County The San Diego Healthy Headwaters Restoration Project, sponsored by the Resource Conservation District of Greater San Diego County, will remove invasive species and restore open space impacted by unauthorized trails, routes, and recreation sites in the San Diego River Watershed. Restoring impacted sites, improving drainage on routes, and restoring the area will reduce sedimentation in the watershed. The combination of restoration activities will help to improve water quality and habitat, and contribute to a healthy watershed. The project supports the Region's goals of supply reliability, protection of natural resources, and sustainable integrated water resource management. Project partners include the U.S. Forest Service, City of San Diego, American Conservation Experience, Back Country Land Trust, San Diego River Park Foundation, San Diego River Conservancy, Animal and Plant Health Inspection Service, and the County of San Diego.

8.4.25 Watershed Management

Watershed management plans have been prepared for the Region's eleven hydrologic units by MS4 Copermittees and other required agencies. The management plans address watershed-specific water management issues outside the limitations of jurisdictional boundaries. The Region's watershed planning efforts also include non-government stakeholders in water management planning decisions. Watershed management includes monitoring, modeling, and assessments to improve understanding of the ambient condition of receiving water bodies, to characterize pollutant loading and management, and to support scientific basis for water quality regulations.

8.4.26 Flood Management

Flood management facilities within the Region include armored and lined channels, levees, natural channels and natural floodplain management, retention basins, culverts, and an extensive regional storm drain system. As described in Chapter 3, *Region Description*, the County of San Diego Flood Control Section coordinates region-wide flood control projects among the County's municipalities to: (1) engineer, maintain, and improve storm conveyance facilities, (2) perform stream restoration and maintenance, (3) update flood mapping, (4) provide for vegetation and debris removal, and (5) maintain stream flow and flood alert systems.

8.4.27 Other Strategies

The Other Strategies chapter of the *CWP Update 2013* discusses a variety of water management strategies that can potentially generate benefits but that are currently limited in their capacity to strategically address long-term regional water planning needs. As described above, all six Other Strategies were considered to be only partially applicable to the Region because they are either not realistic to implement, have already been fully satisfied, or are not directly implemented in the Region.

Rainfed Agriculture

Rainfed agriculture involves meeting all crop consumptive water use demands directly by rainfall on a real-time basis. Due to unpredictability of rainfall frequency, duration, and amount, there is significant uncertainty and risk in relying solely on rainfed agriculture. Currently, improvements in rainfed agricultural production offer limited opportunities to further increase water supply in

California. Due to the limited precipitation in San Diego, this RMS can only be implemented in a limited fashion.

Waterbag Transport/Storage Technology

The use of waterbag transport/storage technology involves diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them to an alternate coastal region. This strategy is not currently being used in California, although a proposal was recently considered. The Alaska Water Exports Company proposed to divert up to 30,000 AF of water from the Albion and Gualala Rivers in Northern California and transport the water to the San Diego metropolitan area. The proposal received significant local opposition in Northern California. In 2003, the Albion and Gualala Rivers were added to the California Wild & Scenic Rivers system, and thus ended the plan. No other plans to implement this RMS are currently being considered in the Region.

Crop Idling for Water Transfers

Crop idling is a strategy that removes land from irrigation and makes water available for transfer to other uses. Crop idling could enhance water supply reliability by making water available for other uses, enhancing water quality, and protecting and restoring fish and wildlife. Agriculture in the Region is already limited, but constitutes an important part of the local economy. For these reasons, this RMS was considered to be unrealistic to implement in the Region.

Dewvaporation or Atmospheric Pressure Desalination

Dewvaporation is a specific process of humidification-dehumidification desalination. Brackish water is evaporated by heated air, which deposits fresh water as dew on the opposite side of a heat transfer wall. The energy needed for evaporation is supplied by the energy released from dew formation. Dewvaporation can provide small amounts of water in remote locations. The technology of dewvaporation is still being developed and therefore is not considered realistic to implement in the Region.

Fog Collection

Precipitation enhancement in the form of fog collection has not been used in California as a management technique, but experimental projects have been built or considered internationally. There has been some interest in fog collection for domestic water supply in some of the dry areas of the world near the ocean where fog is frequent. Because of its relatively small production, fog collection is limited to producing domestic water where few other viable water sources are available, and is not considered realistic to implement in the Region.

Irrigated Land Retirement

Irrigated land retirement is the removal of farmland from irrigated agriculture. Land retirement could enhance water supply reliability by making water available for redistribution, enhancing water quality, and protecting and restoring fish and wildlife resources, but it results in the loss of agricultural lands. Agriculture in the Region is already limited, but constitutes an important part of the local economy. For these reasons, this RMS was considered to be unrealistic to implement in the Region.

8.4.28 Economic Incentives

Many water agencies in the Region offer several economic incentive programs to encourage water conservation, including rebate programs for water-conserving washing machines, and outdoor irrigation systems (e.g., smarter controllers, rain barrels, turf replacement) (City of San Diego, NDb and Water Authority, NDd). As detailed in Table 11-5 in *Chapter 11, Implementation*, there are many additional regional financial incentive programs available.

8.4.29 Outreach and Engagement

Stakeholder outreach and education builds a sense of creek stewardship in local residents.

Photo credit: Charles Davis, Jacob Center for Neighborhood Innovation

Stakeholder/community involvement was added as a RMS by IRWM stakeholders during development of the 2013 IRWM Plan to address the previous Objective A (now Objective B): Maximize stakeholder/community involvement and stewardship. Stakeholder and community involvement continues to be an important component of IRWM planning in the Region. There are many examples of how this RMS is being implemented in the Region:

- In 2008, the San Diego IRWM Program launched a publicly accessible website, which continues to be updated and maintained to reflect current information (www.sdirwmp.org).
- Selection of IRWM projects continues to focus on stakeholder and community involvement; many of the IRWM projects funded to-date include outreach components. Inclusion of a stakeholder and community involvement program now is required for a project to be considered for inclusion in a San Diego Region IRWM grant application.
- IRWM stakeholders played an important role in providing input and information to update the IRWM Plan. This effort is discussed in detail in *Chapter 6, Governance and Stakeholder Involvement.*
- The Regional Advisory Committee (RAC) provide input on IRWM Program initiatives, as well as serves as a forum for information sharing about topics of interest to IRWM practitioners and stakeholders (see *Chapter 6, Governance and Stakeholder Involvement*).
- Solicitation and selection of local non-profit/academic partnerships to support the Water Needs Assessment, which is an evaluation of water management issued in DAC. EDA, URC, and EJ communities throughout the Region.

***Outreach and Engagement* RMS in the San Diego IRWM Region**
Water Needs Assessment, Tri-County Funding Area Coordination Committee The Tri-County Funding Area Coordination Committee (Tri-County FACC) is working jointly to develop the Water Needs Assessment for the San Diego Funding Area. This Water Needs Assessment will be based on information gathered during extensive outreach to DACs, EDAs, URCs, EJ communities, and Tribes, with a focus on those not previously involved with IRWM. The Tri-County FACC is committed to providing up to 25 community meetings with organizations serving DACs, EDAs, URCs, EJs, and Tribes to increase engagement with IRWM and to better understand the challenges to participation by these communities. In partnership with the Rural Community Assistance Corporation and the Climate Science Alliance, the Tri-County FACC has contacted over 200 organizations in the San Diego Funding Area to solicit input on the Water Needs Assessment questionnaire. The questionnaire will be used to identify DACs, EDAs, URCs, and EJs, their water and wastewater resource management needs and priorities, and to inform the Water Needs Assessment, which will be critical for helping each of the three IRWM Regions in the Funding Area better understand these communities and identify opportunities to assist them with addressing their greatest water needs.

8.4.30 Water and Culture

The Region's emphasis on conservation ethics means that demand management is important, particularly through times of drought. The 2019 IRWM Plan's Objective E specifically focuses on promoting an ethic of "conserve, reuse, and recycle" as a means to encourage the efficient use and development of local water supplies. In addition, the Region has acknowledged the cultural connection between local Tribes and their water resources. A series of stories, myths, songs, and poems from Tribes in Southern California, called *Tribal Water Stories*, is meant to educate and inform readers, as well as honor the cultures and peoples from whom these stories come. The *Tribal Water Stories* are included in the 2019 IRWM Plan as Appendix 4-A.

8.4.31 Water-Dependent Recreation

Chapter 3, Region Description describes water-dependent recreational opportunities within the Region. Recreational uses (either non-contact or contact uses) are supported in virtually all of the Region's inland surface waters, reservoirs, lagoons, estuaries, bays, and coastal waters.

8.4.32 Water Resources Data Collection, Management, and Assessment

Water Resources Data Collection, Management, and Assessment was added as a RMS by IRWM stakeholders during development of the 2007 IRWM Plan to address previous Objective B (now Objective C): Effectively obtain, manage, and assess water resource data and information. This objective continues to be an important tenet of IRWM planning in the Region. There are many examples of how this RMS is being implemented in the Region:

- In 2010, the San Diego IRWM Program launched a publicly-accessible online project database (OPTI), which contains information regarding all IRWM projects submitted for inclusion in the IRWM Plan.
- The successful 2011 Proposition 84-Round 1 Implementation Grant included the *Regional Water Data Management Program,* which evaluated the feasibility of developing a comprehensive data management system for the IRWM Region.
- OPTI was updated in 2017 to allow project proponents to add stormwater projects, including their quantified benefits, consistent with the Regional Stormwater Resource Plan.
- In 2018, OPTI was updated to host project completion and project monitoring reports for IRWM-funded projects.
- The San Diego Basin Study, currently being developed by the City of San Diego and U.S. Bureau of Reclamation (Reclamation), will be leveraged as a resource for identifying priority projects in the Region.

8.4.33 Scientific and Technical Water Quality Management Knowledge Enhancement

Scientific and Technical Water Quality Management Knowledge Enhancement was added as a RMS by IRWM stakeholders during development of the 2007 IRWM Plan to address previous Objective C (now Objective D): Further scientific and technical foundation of water quality management. This objective continues to be an important tenet of IRWM planning in the Region. There are many examples of how this RMS is being implemented in the Region:

- The San Diego IRWM Program's RWMG participated in the San Diego Water Board's 2011 and 2014 Triennial Review Advisory Committee to provide feedback on amendments to the *Water Quality Control Plan for the San Diego Basin* from an IRWM perspective.
- The Regulatory Workgroup Report was completed in 2012 to evaluate potential opportunities for the IRWM Program to collaborate with regulatory agencies (specifically the San Diego Water Board) to achieve mutual water quality protection and management goals, particularly regarding enhancing the scientific and technical basis behind water quality regulations. Please refer to *Chapter 7, Regional Coordination* for more information.
- Representatives from the San Diego Region Water Quality Control Board provide regulatory and permitting updates pertaining to the San Diego region during RAC meetings.
- The San Diego IRWM Program has completed or is in the process of completing 27 of the 40 Implementation Actions described in the 2013 IRWM Plan

8.4.34 Wastewater Management

Wastewater Management was added as a RMS by IRWM stakeholders during the development of the 2013 IRWM Plan. Wastewater Management includes those activities that consider wastewater flows as a water resource, and therefore involves active and comprehensive management of wastewater as part of the Region's water supply. Specific actions that fall under this RMS include: improving wastewater treatment, maximizing wastewater reuse by managing wastewater as a regional resource, managing discharges, improving the collection system, improving efficiency, and any other aspect of wastewater management that would provide benefits or reduce costs to the Region. The Wastewater Management RMS can contribute to Objective A (integrated solutions), Objective E (diverse mix of water resources), Objective F (reliable water infrastructure), and Objective H (pollution reduction).

***Wastewater Management* RMS in the San Diego IRWM Region**
South Bay International Wastewater Treatment Plant (SBIWTP) The International Boundary and Water Commission, a partnership between the U.S. and Mexican governments, built the South Bay International Wastewater Treatment Plant in San Ysidro, CA to treat wastewater from the City of Tijuana in Mexico that would otherwise be discharged to the Tijuana River and impact the quality of this waterbody. Wastewater at the plant is treated to secondary standards prior to discharge through the South Bay Ocean Outfall. The facility treats an average of 25 mgd, and has the potential to expand to 100 mgd. The SBIWTP has reduced the amount of sewage entering the Tijuana River, and reduced the impacts to residents in the Region, and the City of Imperial Beach in particular. *Source: International Boundary & Water Commission (http://www.ibwc.state.gov/mission_operations/sbiwtp.html); RWQCB, Tijuana River Valley Recovery Strategy: Living with the Water.*

8.5 Objectives Assessment

Table 8-2 presents the RMS and how they contribute to meeting each of the IRWM Plan objectives, including the three additional San Diego IRWM Plan-specific RMS identified by the stakeholder group (listed in *Section 8.2.2*). The selected RMS for inclusion in the 2013 IRWM Plan indirectly or directly supports attainment of one or more IRWM Plan objectives. When selecting RMS, the effects of climate change on the Region and how each RMS will help address these effects was taken into consideration (*Section 3.14*, *Chapter 3, Region Description*).

8.6 Applicability to the Region's Watersheds

As described in *Chapter 5, Watershed Characterization*, the Region's eleven watersheds share many region-wide water quality management problems and needs. Key water management similarities among the Region's watersheds include:

- Water quality impairment associated with bacteriological, nutrient, and sediment loads,
- Ecosystem protection and restoration needs and the need for invasive species control,
- Water supply diversity and water infrastructure reliability needs,
- Hydromodification and flood control issues, and
- Climate change impacts and need for adaptive or mitigation water resource management.

While the Region's watersheds face many similar water management needs, not all of the water management strategies are applicable to each of them:

- Agricultural Water Use Efficiency and Agricultural Land Stewardship RMS are not applicable within the Pueblo HU, as that watershed does not support any significant commercial agriculture.
- The San Juan and Pueblo HUs do not feature any existing or planned surface storage reservoirs. System Reoperation and Surface Storage – Regional/Local are thus not applicable within these watersheds.
- While the Pueblo HU may possess significant manageable deep-aquifer groundwater resources (San Diego Formation), no usable near-surface groundwater exists within the hydrologic unit. As a result, Groundwater and Aquifer Remediation and Recharge Area Protection are not applicable within the watershed.
- Groundwater resources exist in the upper reaches of the Peñasquitos HU (private wells in the Poway area), but aquifer storage capacities and yields are not sufficient to warrant implementation of Groundwater and Aquifer Management and Recharge Area Protection within the Peñasquitos HU.
- Only one seawater desalination site (within the Carlsbad HU) has been identified within the Region's water plans. Seawater desalination may be feasible in other locations, but a lack of availability of facility sites and brine disposal issues may prevent this strategy from being implemented in all but a few select locations within the Region.

Table 8-2: IRWM Plan Objectives Supported by Resource Management Strategies

Resource Management Strategies	IRWM Plan Objectives Supported by Resource Management Strategies									
	A: Encourage the development of integrated solutions to address water management issues and conflicts.	B: Maximize stakeholder/community involvement and stewardship of water resources, emphasizing education	C: Effectively obtain, manage, and assess water resource data and information.	D: Further scientific and technical foundation of water management.	E: Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of	F: Construct, operate, and maintain a reliable and resilient infrastructure system.	G: Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management.	H: Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment.	I: Protect, restore, and maintain habitat and open space.	J: Advance water-based enriching experiences.
Agricultural Water Use Efficiency	○	○		○	●	○		○		
Urban Water Use Efficiency	○	○		○	●	○		○		
Conveyance – Delta					○	○				
Conveyance – Regional/Local					○	●				
System Reoperation	○				○	○				
Water Transfers					●					
Conjunctive Management & Groundwater	○		○	○	●	○			●	
Desalination – Brackish and Seawater			○	○	●	○				
Precipitation Enhancement			○	○	○					
Recycled Municipal Water	●		○	○	●	○				
Surface Storage – CALFED		○	○	○	○	○			○	
Surface Storage – Regional/Local		○	○	○	○	○			○	
Drinking Water Treatment and Distribution		○	○	○	●	○				
Groundwater and Aquifer Remediation		○	○	○	●					
Matching Quality to Use			○	○	○					
Pollution Prevention		○	○	○				●	○	●
Salt and Salinity Management	○	○	○	○				●	○	○
Urban Stormwater Runoff Management		○					○	○	○	○
Agricultural Lands Stewardship				○				●	●	●
Ecosystem Restoration		○	○	○				○	●	○
Land Use Planning and Management	○	○		○					●	●
Recharge Areas Protection					○	○		○		
Sediment Management							●	●	●	○
Watershed Management	○	●	●	●	○		●	●	○	○
Flood Management	○	○	○	○			●		○	○
Economic Incentives (Loans, Grants, and Water Pricing)	○	○		○	○	○	○	○	●	○
Outreach and Engagement		●								●
Water and Culture	●	●			●					●
Water-dependent Recreation		○	○	○				○	○	●
Water Resources Data Collection, Management, and Assessment			●	○						
Scientific and Technical Water Quality Management Knowledge Enhancement			●	●	○	○	○			
Wastewater Management	●		○	○	●	●		●		

● Water management strategy primarily and directly supports attainment of the IRWM Plan objective | ○ Water management strategy helps achieve the IRWM Plan objective

8.7 Adapting Resource Management Strategies to Climate Change

Climate change is expected to directly impact a number of areas related to water resources, in particular temperature, precipitation, and sea level rise. As global temperature increases, seasonal precipitation patterns including the timing, intensity and form of precipitation, are projected to change. These changes could present some uncertainty to the availability of future imported water delivery capabilities, cause changes to local water quality, cause sea level rise, increase flooding, and impact the frequency and intensity of wildfires. See *Section 7.9* in *Chapter 7, Regional Coordination*, and Appendix 7-D for a detailed assessment of the Region's potential climate change vulnerabilities.

RMS that are implemented to manage water resources can also address climate change adaptation and mitigation. Table 8-3 was extracted from the *CWP Update 2013*; it categorizes RMS and identifies greenhouse gas (GHG) reduction opportunities associated with each RMS. The GHG reduction opportunities were considered when determining which RMS to incorporate into the 2019 IRWM Plan.

Table 8-3: Resource Management Strategies and GHG Reduction Opportunities

Management Objectives	Resource Management Strategy	GHG Reduction Opportunities
Reduce Water Demand	Agricultural Water Use Efficiency Urban Water Use Efficiency	Reduce dependency on energy to transport water resources
Improve Operational Efficiency and Transfers	Conveyance – Delta Conveyance – Regional/local System Reoperation Water Transfers	Decrease emissions by reducing operational efficiency/ transfer vehicle use and energy required for operations/transfers
Increase Water Supply	Conjunctive Management & Groundwater Desalination Precipitation Enhancement Recycled Municipal Water Surface Storage – CALFED Surface Storage – Regional/local	Localize water use, reduce imported water use, which requires additional energy and increases GHG emissions.
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation/Aquifer Remediation Matching Quality to Use Pollution Prevention Salt and Salinity Management Urban Runoff Management	Stabilize water cycles by restoring water systems to their natural state. Matching quality to use could also reduce the need for water treatment, which requires energy and results in greenhouse gas emissions.
Improve Flood Management	Flood Risk Management	Control flooding so recharge can be redirected efficiently. Redirecting to reservoirs and groundwater recharge can prevent droughts and reduce the Region's dependence on energy-intensive water importation, and improve water supply reliability in dry seasons.
Practice Resources Stewardship	Agricultural Lands Stewardship Ecosystem Restoration Forest Management Land Use Planning and Management Recharge Area Protection Sediment Management Watershed Management	Provide opportunities for carbon sequestration, reforestation, and restoration/maintenance of urban land surfaces.
People and Water	Economic Incentives (Loans, Grants and Water Pricing)	Design water projects that are tailored to grant programs with energy and water efficiency priorities.
	Outreach and Engagement	Provide educational opportunities to inform the public on the nexus between water and energy
	Water and Culture	Promoting a conservation ethic as a means to reduce water demand in the Region

Management Objectives	Resource Management Strategy	GHG Reduction Opportunities
	Water-Dependent Recreation	Provide outreach signage and materials about the relationship between water and GHG reduction in areas where water-dependent recreation occurs.
Other	Crop Idling for Water Transfers Dewvaporation or Atmospheric Pressure Fog Collection Irrigated Land Retirement Rainfed Agriculture Waterbag Transport/Storage Technology	Reduce energy requirements and GHG emissions through decreased demand on imported water.
Strategies Identified by Stakeholders	Stakeholder/Community Involvement Water Resources Data Collection, Management, and Assessment Scientific and Technical Water Quality Management Knowledge Enhancement Wastewater Management	Collaboration among stakeholders will help to strengthen water resources (including climate change-related) data, which will help to strengthen the scientific and technical basis of water management. Wastewater management includes increased efficiencies and comprehensive management of wastewater supplies. Collectively, these actions will help the Region reduce GHG emissions by increasing collaboration and efficiency in all realms of water planning, which will in turn enhance operational efficiency and reduce energy required in water planning and implementation processes.

Source: DWR, 2013

A crosswalk has been developed to help project proponents identify which RMS are likely to address the prioritized climate change vulnerabilities described in *Chapter 7, Regional Coordination*. This was developed so that project proponents can better understand if their Projects implement an RMS that addresses a specific climate change vulnerability. This crosswalk is provided in Table 8-4.

Table 8-4: RMS Anticipated to Address Climate Change Vulnerabilities

Key: ● = directly reduces vulnerability | ○ = indirectly reduces vulnerability or possibly addresses vulnerability depending on project description

IRWM Plan Prioritized Climate Change Vulnerability Issues	**Resource Management Strategies**																														
	Agricultural Water Use Efficiency	Urban Water Use Efficiency	Conveyance – Delta	Conveyance – Regional/Local	System Reoperation	Water Transfers	Conjunctive Management &	Desalination – Brackish and	Recycled Municipal Water	Surface Storage – CALFED	Surface Storage – Regional/Local	Drinking Water Treatment and	Groundwater and Aquifer	Matching Quality to Use	Pollution Prevention	Salt and Salinity Management	Urban Stormwater Runoff	Agricultural Lands Stewardship	Ecosystem Restoration	Forest Management	Land Use Planning and	Recharge Areas Protection	Sediment Management	Watershed Management	Flood Management	Economic Incentives	Outreach and Engagement	Water and Culture	Water-dependent Recreation	Water Resources Data Collection,	Scientific and Technical Water	Wastewater Management
Very High																																
Water Supply: Decrease in imported supply	●	●	○	●	○	●	●	●	●	○	○	○	○	●		○	○	○		○	○	●	○	○		○						○
High																																
Water Supply: Sensitivity due to higher drought potential	●	●	○	○	●	●	●	●	●	○	●	○	○	●		○	○	○	○	○	○	○	○	●		○		●		○		○
Water Quality: Increased constituent concentrations					●							●	●	●	●	●	○	●	●	○	●	○	●	●	○	○		●		●	●	●
Flooding: Increases in flash flooding and inundation (extreme weather)				○	○						○						●	○	○	●	●	○	●	●	●	○				●		
Ecosystem/Habitat: Decrease in available necessary habitat			●	●	●		○		○		○				●	○	○	●	●	●	●	●	●	●	○	○		●	○	●	○	
Sea Level Rise: Inundation of storm drains and sewer systems																					●				●	○				●		
Ecosystem/Habitat: Decrease in ecosystem services		○	●	●	●		○						●		○	○	○	●	●	●	●	○	●	●	●	○		●	○	●	●	
Water Supply: Lack of groundwater and surface water storage* to buffer drought	○	●			●	○	●	○	○	○	○	○	●			○	○				●	●		●	○	○				●		
Ecosystem/habitat: Decrease in environmental flows	●	●	●	●		○	●	○	○		○			○			○	●	○	●	●		●	●	○	○				●		

IRWM Plan Prioritized Climate Change Vulnerability Issues	**Resource Management Strategies**																															
	Agricultural Water Use Efficiency	Urban Water Use Efficiency	Conveyance – Delta	Conveyance – Regional/Local	System Reoperation	Water Transfers	Conjunctive Management &	Desalination – Brackish and	Recycled Municipal Water	Surface Storage – CALFED	Surface Storage – Regional/Local	Drinking Water Treatment and	Groundwater and Aquifer	Matching Quality to Use	Pollution Prevention	Salt and Salinity Management	Urban Stormwater Runoff	Agricultural Lands Stewardship	Ecosystem Restoration	Forest Management	Land Use Planning and	Recharge Areas Protection	Sediment Management	Watershed Management	Flood Management	Economic Incentives	Outreach and Engagement	Water and Culture	Water-dependent Recreation	Water Resources Data Collection,	Scientific and Technical Water	Wastewater Management
Medium																																
Water Demand: Crop demand would increase	●					●	○	●	●		●		○	●				●								○	●	●		●		○
Water Demand: Industrial demand would increase		●				●	○	●	●		●		○	●												○	●	●		●		○
Water Supply: Decrease in groundwater supply	●	●	●		○	○	●	●	○		○	○	●	○		○	○	○	○	○	○	●		●	○	○				●		○
Water Quality: Increase in treatment cost		○			●		○				○	●	●	●	●	●	○	○	○	○	●	●	○	○		○				○	●	○
Sea Level Rise: Damage to coastal recreation / tourism due to inundation																			●		●		○	●		○		●	●			
Water Quality: Increased eutrophication	○				●							●		○	○	●	○	●	○	●	●		●	●		○				●	●	○
Low																																
Water Demand: Limited ability to conserve further	●	●				○		●	●		●		○	●												○	●	●				
Flooding: Increases in inland flooding			●	●	○						○				○		○	○	●	●	●		●	●	●	○				●		
Ecosystem/Habitat: Increased impacts to coastal species			○	○											○		○		●	○	●		○	●		○		●		●	○	
Sea Level Rise: Damage to ecosystem/habitat																			●		●		●	●		○		●				
Very Low																																
Water Demand: Limited ability to meet summer demand	●	●	●	●	●	●	●	●	●	●	●	○	○	●		○		○				○				○	●	●				○
Water Supply: Invasive species can reduce supply available					●			○	○		○				○			○	●	●	●	○	○	●		○				●	○	

IRWM Plan Prioritized Climate Change Vulnerability Issues	Resource Management Strategies																														
	Agricultural Water Use Efficiency	Urban Water Use Efficiency	Conveyance – Delta	Conveyance – Regional/Local	System Reoperation	Water Transfers	Conjunctive Management &	Desalination – Brackish and	Recycled Municipal Water	Surface Storage – CALFED	Surface Storage – Regional/Local	Drinking Water Treatment and	Groundwater and Aquifer	Matching Quality to Use	Pollution Prevention	Salt and Salinity Management	Urban Stormwater Runoff	Agricultural Lands Stewardship	Ecosystem Restoration	Forest Management	Land Use Planning and	Recharge Areas Protection	Sediment Management	Watershed Management	Flood Management	Economic Incentives	Outreach and Engagement	Water and Culture	Water-dependent Recreation	Water Resources Data Collection,	Scientific and Technical Water	Wastewater Management
Water Quality: Decrease in recreational opportunity		○			○						○				○		○		●	○	●	○	○	●	○	○	○	●	●		●	
Sea Level Rise: Decrease in land																			●		●		○	●		○		●				
Ecosystem/habitat: Decrease in environmental flows	●	●	●	●		○	●	○	○		○			○			○	●	○	●	●		●	●	○	○				●		
Hydropower: Decrease in hydropower potential		○			●	○																				○				●		

*The Region's current storage capacity is sufficient, however it lacks the ability to connect and convey water stored in some regional reservoirs.

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9 Project Evaluation and Prioritization

This chapter addresses requirements set forth in the Integration Standard and the Project Review Process Standard in the 2016 IRWM Program Guidelines (DWR, 2016). As such, this chapter includes information regarding the structures and processes that provide opportunities to develop and foster project integration, as well as the processes used to select projects for inclusion in the IRWM Plan.

9.1 Overview

The intent of this chapter is to document the project evaluation and prioritization processes associated with the San Diego IRWM Program for the purposes of IRWM grant funding. Specifically, this chapter includes information regarding:

- The system developed to promote and encourage integration.
- The process used for submitting, reviewing, and selecting projects for inclusion in the IRWM Plan and grant applications.

9.2 Integration

According to DWR, integration generally means combining separate pieces into an efficiently functioning unit (DWR, 2016). During development of the 2013 IRWM Plan, the Priorities and Metrics Workgroup defined integration as it pertains to the IRWM Program (refer to *Chapter 6, Governance and Stakeholder Involvement* for more information on the Priorities and Metrics Workgroup). IRWM Program Objective A encourages the development of integrated solutions to address water management issues and conflicts. With respect to the San Diego IRWM Program, integration refers to the five following aspects: partnerships, resource management, beneficial uses, geography, and hydrology. Each integration component defined by the IRWM Program is explained in the following sections. *Section 9.2.6* describes actions taken by the IRWM Program to promote and encourage integration.

The North San Diego County Regional Recycled Water Project – funded by Proposition 84-Round 1 and Round 2 – features multiple partnerships, watersheds, and beneficial uses.

Photo Credit: Kim Thorner, Olivenhain Municipal Water District

Due to the importance of integration, projects must meet Objective A, Objective B, and at least one additional IRWM objective to be considered for IRWM-related grant funding (refer to *Section 9.3* for more information). The following sections also explain the manner in which projects are assessed to determine if they meet each definition of integration.

9.2.1 Partnership Integration

Definition: Establishing partnerships between different organizations through sharing of data, resources and infrastructure to produce better outcomes than could be achieved independently. Please refer to *Chapter 6, Governance and Stakeholder Involvement* for details on IRWM Program efforts to help establish partnerships.

As described in *Section 9.4*, the method by which this integration criterion is assessed for IRWM projects is based upon the number of entities involved in implementing the project. In order to be considered involved in implementation, partners (entities) must be responsible for completing work associated with the project. Partnerships between different departments in a single organization may also be considered as partnership integration; however, to garner points in the project evaluation process, a project must include partnerships with outside entities. Partners that provide only funding support are considered full partners. Passive support, such as provision of a letter of support, is not considered integration by the San Diego IRWM Program.

Example: Rural Disadvantaged Communities Partnership Program

The *Rural Disadvantaged Communities (DAC) Partnership Program* was included in Proposition 84 Implementation Grant – Round 4, and expanded on previous iterations of this program funded in prior rounds of IRWM grants. This program funds projects that serve the needs of rural DACs and Tribes, through the Rural Community Assistance Corporation (RCAC).

RCAC has extensive experience helping to fund infrastructure and capacity-building projects in rural communities. By utilizing their resources and experience, RCAC can assist implementation of projects conceptualized by Tribes or rural DACs and serves as the local project sponsor for the program. Because RCAC has extensive experience working with funding agencies, Tribes, and rural communities, it is well-suited to serve as the local project sponsor for Proposition 84 funding. In addition, RCAC understands the specific requirements of the IRWM grant program and is therefore able to address common issues that might impede project implementation. Utilizing the resources of RCAC can fill gaps in Tribal or rural DAC skill sets, helping to overcome potential barriers and ensure the success of projects. The partnership between RCAC and rural communities allows for a more cost-effective and comprehensive approach to addressing critical issues in rural DACs and tribal communities.

9.2.2 Resource Management Integration

Definition: Employing multiple resource management strategies within a single project to effectively address a variety of issues. For more information about resource management strategies as they relate to the San Diego IRWM Program, please refer to *Chapter 8, Resource Management Strategies.*

As described in *Section 9.4*, the method by which this integration criterion is assessed for IRWM projects is based upon the number of IRWM objectives addressed by the project. Due to the comprehensive nature of the IRWM objectives, these objectives cumulatively cover the resource management strategies pertinent to the Region.

Example: Conservation Home Makeover in the Chollas Creek Watershed

The *Conservation Home Makeover in the Chollas Creek Watershed* project included in Proposition 84 Implementation Grant – Round 4 represents an example of resource management integration. The project installs stormwater capture, greywater systems, and landscape upgrades in low-income homes in the Encanto neighborhood of San Diego. This project increases urban water use efficiency, matches quality to use, captures stormwater reducing urban runoff, and better manages local resources. This project increases pride of place in low-income communities, reduce cost of living by lowering water use, and provide opportunities to increase access to healthy food through irrigation of fruit trees with greywater and captured stormwater.

Photo Credit: Loisa Burton, Water Authority

9.2.3 Beneficial Use Integration

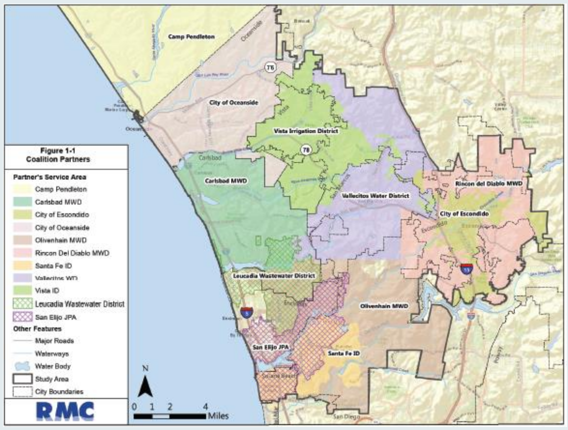
Definition: Project solutions can be implemented to support several different beneficial uses. For more information about beneficial uses as defined in the *Water Quality Control Plan for the San Diego Basin*, please refer to *Chapter 3, Region Description.*

As described in *Section 9.4*, the method by which this integration criterion is assessed for IRWM projects is based upon the number of beneficial uses that are addressed by the project. Beneficial uses are defined in the *Water Quality Control Plan for the San Diego Basin*, which is discussed in *Chapter 3, Region Description* and available online:

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/

Example: North San Diego County Recycled Water Project

The *North San Diego County Regional Recycled Water Project* included in the Region's Proposition 84 Implementation Grant – Round 1 and Round 2 is an example of a project that uses beneficial use integration, because its implementation will support several beneficial uses. The project will integrate urban and agricultural-based recycled water systems of ten partner water agencies located in the North County region to maximize the use of recycled water in the area. Through integration of recycled water systems across a variety of agency service areas, the project maximizes the beneficial uses served by the project by providing recycled water for industrial, municipal, and agricultural beneficial uses. Because this project involves the integration of many agencies across the North County region, the project will increase economic efficiencies, which will facilitate the support of more beneficial uses than could be supported by each agency's recycled water system on an individual basis.



The ten agencies of the North San Diego Water Reuse Coalition

9.2.4 Geographical Integration

Definition: Implementing watershed-or regional-scale projects that may benefit from economies of scale. For more information on the IRWM region and watersheds within the region, please refer to *Chapter 3, Region Description* and *Chapter 5, Watershed Characterizations*.

As described in *Section 9.4*, the method by which this integration criterion is assessed for IRWM projects is based upon the level of integration that the project achieves across multiple watersheds.

Example: Implementing Nutrient Management in the Santa Margarita River Watershed

The *Implementing Nutrient Management in the Santa Margarita River Watershed* project, included in Proposition 84 Implementation Grant – Round 2, is an example of a project that uses geographical integration. This project is a watershed-scale project that is being jointly implemented by San Diego County on behalf of the San Diego IRWM Region in coordination with the Upper Santa Margarita Watershed IRWM Region. In addition to increasing inter-regional communication, the partnership that resulted from this project enables the regions to share financial, technical, and knowledge resources and ensure the project's success. This will also serve to reduce conflict over resources and ideology. By using a watershed-scale approach, this project benefits from economies of scale and will provide greater benefits than if each individual IRWM Region were to attempt to address issues within the Santa Margarita River Watershed on an individual basis.

Photo credit: Project Clean Water

9.2.5 Hydrological Integration

Definition: Addressing multiple watershed functions within the hydrologic cycle. *Chapter 5, Watershed Characterizations,* contains information on the watersheds within the IRWM region.

As described in *Section 9.4*, the method by which this integration criterion is assessed for IRWM projects is based upon whether or not a project provides watershed services. For purposes of the IRWM Plan, watershed services are considered based upon the Watershed Management Area Analysis described in Provision B.3.b.(4) of the San Diego Municipal Separate Storm Sewer Systems Permit (Order No. R9-2013-0001, as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100).

As such, IRWM projects meet this integration criterion if they:

- Address dominant hydrologic processes, such as infiltration
- Address existing streams in a watershed, including those that are perennial or ephemeral
- Address current or anticipated future land uses that may impact the hydrologic cycle
- Address sedimentation or sediment yield areas
- Address existing flood control structures or channel structures and associated hydromodification

Photo Credit: Jacobs Center for Neighborhood Innovation

Example: Chollas Creek Integration Project

The *Chollas Creek Integration Project* included in Proposition 84 Implementation Grant – Round 2 represents an example of hydrological integration. The project addresses flooding and water quality issues through creek realignment, physical flood control, and habitat restoration. Flood control efforts like reducing impervious surfaces or bank stabilization, will help to improve water quality, while water quality improvements and habitat restoration efforts, such as removal of invasive species and planting native species, will help reduce flooding. By simultaneously addressing different components of the hydrologic cycle, this project provides multiple benefits from a single activity.

9.2.6 Methods Used to Promote and Encourage Integration

A Strategic Integration Workshop was held for each round of implementation grants starting with Proposition 84 Round 2. Workshops were held on September 12, 2012 (Round 2), April 22, 2014 (Round 3), and April 1, 2015 (Round 4) to encourage and improve integration in and among projects submitted to the IRWM project database. The Strategic Integration Workshop was conceptualized by the Priorities and Metrics Workgroup, which was tasked with providing recommendations on how to increase project integration and promote development of projects that are aptly suited for IRWM funding due to their integrated components (as defined in *Sections 9.2.1 - 9.2.5* above).

In each grant cycle, prior to the Integration Workshops, the IRWM Program releases information on the upcoming funding opportunity and highlights the importance of integration. This information is released via the IRWM e-mail list and the IRWM website, and is also discussed at RAC meetings. At the workshops, breakout groups are held during which project proponents describe preliminary project ideas to other stakeholders with similar project types or in similar geographies. At some past workshops, potential project partners submitted project partner forms describing potential services that could be provided to support other projects. At others, potential partners either announced their potential services or approached project sponsors after hearing about potential project concepts. The format of the Integration Workshops are adjusted in response to feedback on past workshops and the specific goals of a given funding opportunity.

During the Integration Workshops, local project sponsors and potential project partners discussed the preliminary project concepts and partnering opportunities. The purpose of these workshops was to bring stakeholders together to provide information about projects being considered within the Region and to encourage sponsors and project partners to discuss ways in which their project concepts could be elaborated upon or potentially combined to increase integration. Through this process, many of the projects ultimately included in the Proposition 84 – Rounds 2, 3, and 4 funding proposals were conceived or improved.

Based on discussion with the RAC on April 3, 2013, the first Strategic Integration Workshop was considered a success and incorporated into the formal project solicitation process. Stakeholders appreciated the opportunity to learn about other projects being considered and to integrate their projects with similar or complementary projects. Integration Workshops or similar integration-based forums will continue to be held in advance of future IRWM implementation funding opportunities, to further understanding of integration and improve project integration throughout the Region. An Integration Workshop for Proposition 1 – Round 1 is planned for October 2018.

In addition to activities such as the Integration Workshop, the San Diego IRWM Program encourages integration through its project selection process because integrated projects are scored higher, making them more likely to be included in funding proposals, than non-integrated projects (refer to *Section 9.4.2* for more information on the project scoring process). Further, watershed coordination groups, such as watershed council or coalitions, are an effective means by which to promote community dialogue on water issues and can provide a basis for coordinating IRWM project development, integration, and implementation.

Discussing projects at the Strategic Integration Workshop

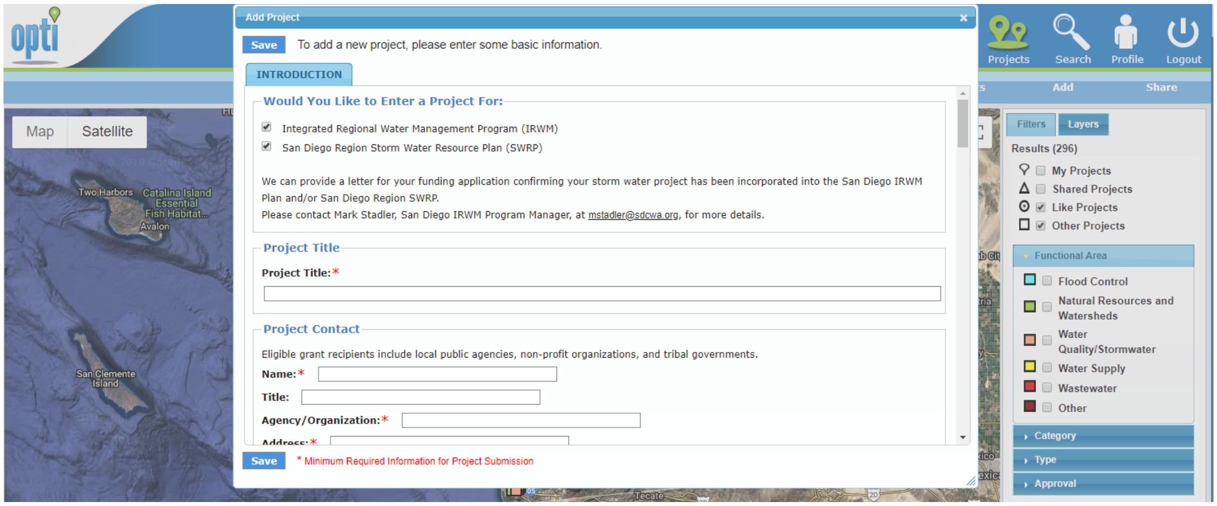
Photo Credit: Rosalyn Prickett, Woodard & Curran

9.3 Including Projects in the IRWM Plan

Projects that meet at least one Plan Objective are eligible for inclusion in the San Diego IRWM Plan as soon as they are entered into the San Diego IRWM Project Database, which is hosted through the San Diego IRWM Website (www.sdirwmp.org). The San Diego IRWM Program has updated the online project database periodically to incorporate the evolution of the project selection process, the IRWM Program, funding opportunities, and accommodate the Storm Water Resource Plan (SWRP) project list.

The project database was updated to expand its functionality and use, and in particular to allow the database to function as a means for data and information-sharing. For example, the database includes a mapping feature that allows users to view all projects included in the database on a map (to view their location in the Region), allows users to sort projects by functional area (i.e., natural resources projects vs. water supply projects, etc.), and provides a scoring and ranking system of stormwater projects consistent with the SWRP. The inclusive nature of this process was established to encourage stakeholders to enter projects into the database even in times when there are not active IRWM grant cycles occurring, so as to provide a comprehensive list of water resources projects across the Region and to maintain eligibility for a variety of non-IRWM funding programs. During IRWM grant cycles, a call for projects is put out through the stakeholder outreach channels in place for the San Diego IRWM Program (RAC meetings, stakeholder e-mail list, outreach meetings, etc.).

While stormwater projects should be added to the project database for inclusion in the IRWM Plan and/or SWRP, the SWRP has a separate project scoring process from the IRWM Plan. Information on the SWRP's scoring process can be found in Section 5.4 of that document and emphasizes multiple benefits and the quantification of such benefits. An overview of that process is provided in *Chapter 7 Regional Coordination* in this IRWM Plan. The SWRP is available on the San Diego IRWM Program website, here: http://sdirwmp.org/2017-swrp.



Screenshot of the San Diego IRWM Project Database

9.4 IRWM Project Review

IRWM projects are a fundamental component of the 2019 IRWM Plan, and are considered the primary venue through which to implement IRWM Objectives. Project review and prioritization for the 2019 IRWM Plan has two fundamental components: 1) the project review process and 2) project scoring content. The project review process refers to the specific actions taken to review and prioritize projects, while the project scoring content refers to the quantitative and qualitative criteria that are applied to the projects in order to complete scoring and ranking. The IRWM Plan is a living document, and the projects included in the IRWM Plan may be updated as necessary. Because of this, the addition or removal of a project from the IRWM Plan's online list of projects does not require the IRWM Plan to be amended or re-adopted. For inclusion in the Plan, a project must first be submitted to the online IRWM Project Database, available at: http://irwm.rmcwater.com/sd/login.php. Once submitted to the database, projects may be included in the IRWM Plan if they meet at least one IRWM Plan Objective (see *Chapter 2, Vision and Objectives*). Further, projects seeking funding from non-IRWM sources frequently score higher when included in their local IRWM Plan. The online project database allows all projects that meet at least one IRWM Plan Objective to be added to the IRWM Project List. The RWMG provides confirmation letters of inclusion in the San Diego IRWM Plan upon request that project sponsors may include in their funding applications to other programs.

As described in *Chapter 6, Governance and Stakeholder Involvement,* the Priorities and Metrics Workgroup was convened for the 2013 IRWM Plan and tasked with developing recommendations for the project prioritization process and project scoring content for IRWM funding opportunities. Based on these recommendations, a Project Selection Workgroup is convened for each funding cycle to evaluate submitted projects based on the scoring criteria, funding cycle priorities, and other considerations identified by the Region's stakeholders for a given cycle. The basic scoring and project selection process has since been used successfully for Proposition 84 - Rounds 3 and 4, and the Proposition 1 Disadvantaged Community Involvement grant applications. Following each project selection process, the Project Selection Workgroup holds a debriefing session to identify opportunities for refining the process that can be incorporated for the next cycle.

The following sections describe how the IRWM project review and selection process and project scoring content for IRWM funding opportunities will be conducted and structured for future rounds of IRWM funding.

9.4.1 IRWM Project Review and Selection Process

During consideration of projects for IRWM funding programs, the San Diego IRWM Program uses a multi-step process for project review that relies heavily on stakeholder input. Note that a project must be included in the IRWM Plan to be eligible for IRWM funding, and submitted prior to the Call for Projects deadline. As outlined in the steps below, project selection is initially done through an objective, automatic scoring system, with scores confirmed by a third party. These scores are used to develop a ranked and tiered list of projects that are numerically scored based upon their ability to meet pre-defined criteria such as the ability to address multiple IRWM Plan objectives. Detailed information on scoring criteria is provided in *Section 9.4.2*.

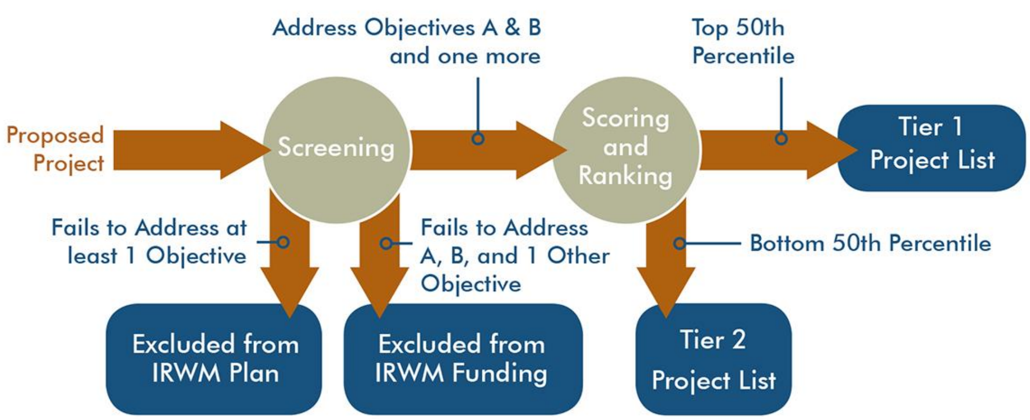
The Strategic Integration Workshop allows project sponsors to connect prior to opening of the Call for Projects.

Photo credit: Rosalyn Prickett, Woodard & Curran

Stakeholder input is solicited following the scoring process, which allows stakeholders to elevate projects to the Tier 1 list (funding-eligible) based on merit, importance to IRWM Program, and other factors. During a grant proposal solicitation phase, only projects in Tier 1 are considered for funding. A Project Selection Workgroup, selected by the RAC, is convened to review database submittals and recommend projects to include in the San Diego IRWM Region's proposal package. The RAC considers the package of projects for inclusion in a funding proposal and votes whether to recommend the package to the RWMG governing bodies. Per the RWMG's MOU, the Water Authority is the applicant for the region, and its governing body – the San Diego County Water Authority Board of Directors – must vote to approve the grant application, including the package of projects, before it may be submitted to DWR.

The recommended process to be implemented by the San Diego IRWM Program from project submittal through compilation of a grant proposal package is outlined in the following steps. Figure 9-1 shows an overview of IRWM project selection, while Figure 9-2 provides a step-by-step account of the project review and selection process.

Figure 9-1: Overview of IRWM Project Selection



Please note that the following steps are recommendations regarding the project selection process, and therefore may be amended as appropriate by the RWMG or the RAC:

1. RWMG to propose modifications to Scoring Criteria in Table 9-1 based on Proposal Solicitation Package priorities. RAC amends modifications and votes on final Scoring Criteria to use for a given funding cycle.
2. Hold an outreach meeting such as a Strategic Integration Workshop or a Watershed Workshop before the formal Call for Projects to allow stakeholders to interact and potentially integrate projects and project concepts. The scoring process and criteria will be explained, and tutorial given on how to use the online Project Database.
3. Issue a Call for Projects that provides enough time to reasonably allow project sponsors to ask questions regarding the database, complete database forms, and revise previously submitted projects.
4. Use the IRWM Project Database to score and rank projects according to the numeric scoring criteria described in *Section 9.4.2*.
5. Partial credit may be applied if projects only result in indirect benefits. Table 9-3 (located at the end of this chapter) provides an overview of how partial scoring may be applied to projects with respect to the IRWM Plan Objectives.
6. Have a third party review the project database scoring and ranking, and review each project to consistently apply scoring across all projects ("ground-truthing").
7. Sort projects into Tier 1 and Tier 2 lists – approximately the top 50% and bottom 50%, respectively.
8. Make the Tier 1/Tier 2 scored project list available to all IRWM stakeholders and allow IRWM stakeholders to contest any scoring changes based on the ground-truthing exercise.
9. Present the Tier 1/Tier 2 scored project list to the RAC and allow the RAC to vote on the list. The RAC may vote to recommend elevating projects from the Tier 2 list to the Tier 1 list.
10. Convene a Project Selection Workgroup (selected by the RAC), which consists of RAC members or other qualified stakeholders representing each caucus.
11. Have the Project Selection Workgroup review all projects (Tier 1 and Tier 2). The Workgroup is provided the tiered list that includes recommendations from the RAC for elevating projects from Tier 2 to Tier 1.
12. Allow Project Selection Workgroup members to nominate elevation of projects from the Tier 2 list to the Tier 1 list. Decisions to elevate projects from the Tier 2 list to the Tier 1 list must be done by a 2/3 super-majority vote.
13. Have the Project Selection Workgroup discuss the overall grant budget and determine the appropriate process through which to split available funds among projects during one of the initial Project Selection Workgroup meetings.
14. Funnel any questions about projects posed by the Project Selection Workgroup members through a third party, who will report back to the Workgroup.
15. Have the Project Selection Workgroup discuss and evaluate projects based on the project- and proposal-level criteria, using the criteria to eliminate projects from consideration. As appropriate, the Workgroup may hold private votes to conduct the post-scoring evaluation.
16. When the Project Selection Workgroup is applying the project-level and proposal-level criteria, they may break up by caucus and rate each project on how they meet the criteria.

17. Have the Project Selection Workgroup select projects for interviews and provide proponents with presentation guidelines and standard format.
18. Have the Project Selection Workgroup conduct interviews of selected projects. Ask all proponents the same questions and give the same amount of time to present. Project-specific questions may be asked depending on additional clarification requested by the Workgroup.

    Do not allow Project Selection Workgroup members to participate as interviewees if their projects are included for consideration in the grant proposal.
19. Re-convene the Project Selection Workgroup after interviews to further eliminate/evaluate projects. Ultimately, the Workgroup will evaluate projects and budgets to reach consensus on a grant proposal.
20. Discuss final Project Selection Workgroup recommendation with the RAC. A formal vote of the RAC is required to recommend the package of proposed projects for inclusion in an IRWM grant application to the RWMG governing bodies.
21. Water Authority Board of Directors vote to approve the grant application, including the package of projects.

9.4.2 IRWM Project Scoring Content

As described in *Section 9.4.1*, projects undergo a scoring process in order to be classified as Tier 1 or Tier 2. This section provides an overview of the scoring criteria that are used in determining which projects will be considered for funding opportunities. In order to increase transparency in the project selection process, these scoring criteria are also made available to IRWM stakeholders before the Call for Projects so that they may use the criteria to decide if their projects may be appropriate for funding through the IRWM Program, or to enhance their projects to better meet the program objectives.

Table 9-1 shows the numeric project scoring criteria that are used to rank projects and sort them into the Tier 1 and Tier 2 project lists (refer to *Section 9.4.1*). Please note that each category in which a project is scored will be weighted to reflect the preferences of a given grant opportunity. This weighting will vary depending on the opportunity and will be determined by the RAC in coordination with the RWMG. Following project tiering, the Project Selection Workgroup evaluates projects on a project-level and on a proposal-level to consider the difficult-to-quantify merits of the projects, and determine how well the projects fit together into a strong proposal that meets the preferences and requirements of the DWR grant solicitation (the grant guidelines, or Proposal Solicitation Package). Those criteria to be evaluated by the Project Selection Workgroup are included in Table 9-2.

Figure 9-2: Step-by-Step Project Review and Selection Process

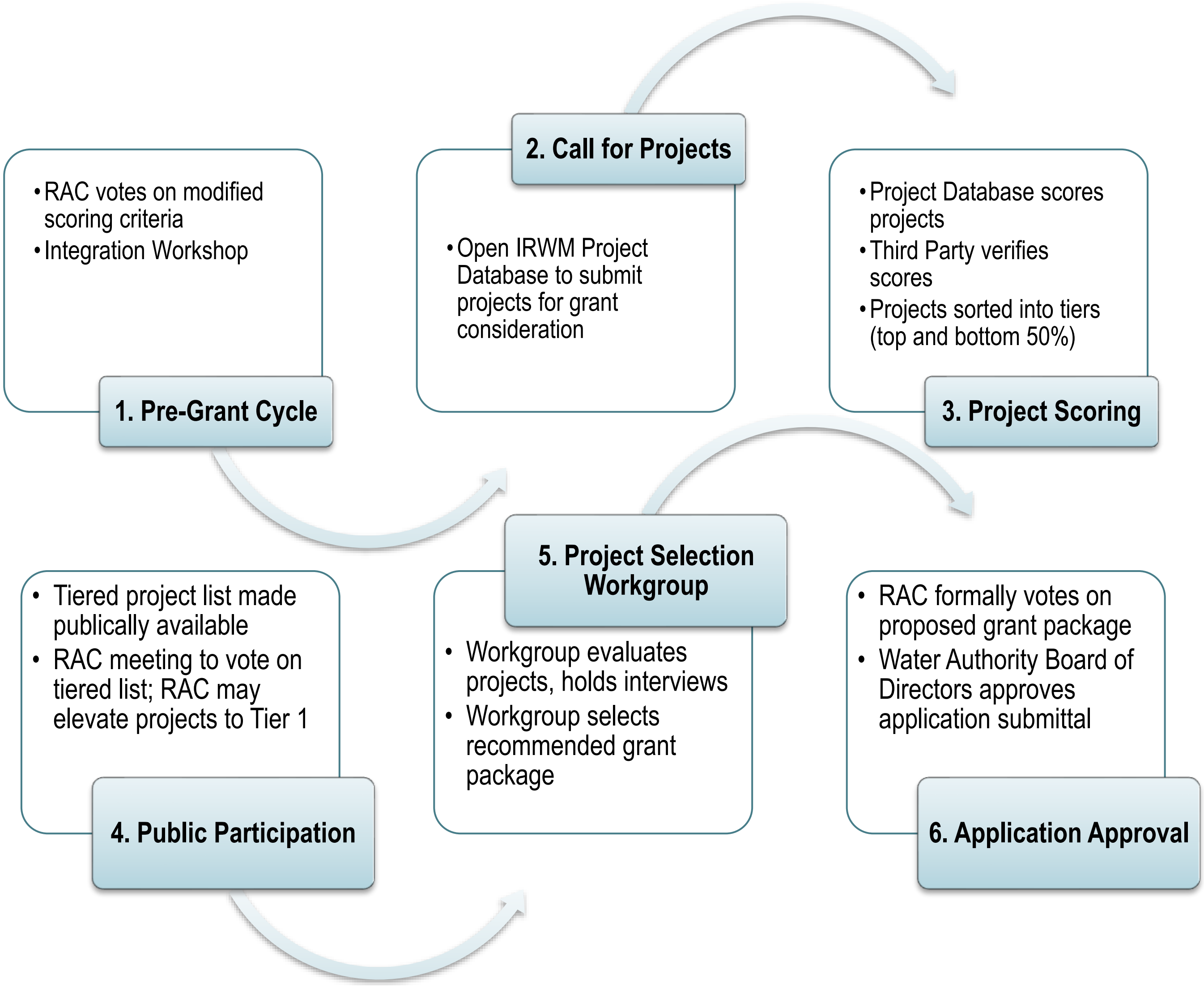


Table 9-1: Scoring Criteria for IRWM Grant Opportunities

Criterion	Scoring Procedure	Points Assigned	Percent of Total Score[2]
Addresses Multiple Objectives[1]	Score is based on # of objectives addressed[2]	6+ objectives = 4 pts 5 objectives = 3 pts 4 objectives = 2 pts 3 objectives = 1 pt	TBD
Spans Multiple Watersheds	Score is based on the level of integration between watersheds	Multiple Watersheds = 4 pts Integration within a single Watershed = 2 pts	TBD
Addresses Multiple Beneficial Uses (BUs)	Score is based on # of beneficial uses addressed	4+ BUs = 4 pts 3 BUs = 3 pts 2 BUs = 2 pts 1 BUs = 1 pt	TBD
Sustainable Water Development: Creates New Applied Water or Offsets Potable Demand[3]	Score is based on yield of water created or offset	Creates new source of reliable, local, drought-proof supply or reduces demands – consistent yield in average and dry years = 4 pts Creates new water or reduces demands – average conditions only = 2 pts Interconnections/ redundancy in supply but no additional yield created = 1 pt	TBD
Involves More than One Entity[4]	Score is based on degree of partnership	2 project partners working jointly on a task = 4 pts 2 project partners not engaged in same activity; or multiple financial sponsors = 2 pts	TBD
Invest in Disadvantaged / Environmental Justice Communities and Systems	Score is based on the degree of benefit (direct vs. indirect)	Directly invests in DAC-EDA-URC-EJ water systems, consolidation, OR training = 4 pts Other direct benefits that improve overall conditions in DACs (e.g. habitat improvement) = 2 pts Indirect benefits = 1 pt	TBD
Resiliency to Climate Change	Score is based on extent of climate change adaptation or mitigation activity (Climate Change Conceptual Model[5])	Reduces very high or high priority vulnerability to climate change[6] AND improves knowledge and capacity AND implements climate change mitigation = 4 pts Reduces medium, low, or very low priority vulnerability to climate change[6] AND either 1) improves knowledge and capacity OR 2) implements climate change mitigation = 3 pts Improves knowledge and capacity AND implements climate change mitigation = 2 pts Improves knowledge and capacity OR implements climate change mitigation = 1 pt	TBD
Stormwater as a Resource	Score is based on benefit provided	Utilizes stormwater as a resource (e.g., environmental, source water replenishment) = 4 pts Implements onsite capture = 2 pts	TBD
Enhance Infrastructure	Score is based on the degree of benefit (regional vs local)	Enhances regional infrastructure (improved use of existing infrastructure)[7] = 3 pts Enhances local infrastructure (improved use of existing infrastructure) = 2 pts Indirectly improves use of existing infrastructure = 1 pt	TBD
Other[8]	TBD	TBD	TBD

1. ½ points may be applied if the project indirectly meets this criterion (see Table 9-3 example for 2019 IRWM Plan Objectives).

Criterion	Scoring Procedure	Points Assigned	Percent of Total Score[2]

2. Note that to be considered for IRWM funding, Objectives A and B and one other must be addressed. RAC may be asked to prioritize the IRWM Plan Objectives prior to each grant cycle. Weighting will be determined by the RAC once a funding cycle has begun, and prior to the Call for Projects.

3. Prior to each round of funding, percentages will be applied as appropriate to determine applicable weighting of each criterion in accordance with direction provided by the RAC and the RWMG. Please note that percentages may be set at 0 for any given criteria, indicating that any of these criteria may be removed from consideration for a specific funding opportunity. Conversely, the "Other" category provided in this table indicates that any number of new criteria may be added by the RAC and the RWMG to reflect new or modified funding priorities.

4. Partnership under this criterion is financial or physical support (active partnership). Passive support, such as letters of support, are not considered partnerships. Partners must be from different organizations (e.g., two departments in a single large organization would not be considered partners for the purposes of this scoring criterion).

5. Climate Change Conceptual Model is included in *Chapter 2 Section 2.7*.

6. Refer to Table 7-16 for prioritized climate change vulnerabilities.

7. For the purposes of project scoring, "regional infrastructure" is defined as infrastructure serving more than one agency of the same type (e.g., serves two water districts) and "local infrastructure" is defined as infrastructure serving a single agency.

8. "Other" scoring shall consider contribution of project to reducing greenhouse gas emissions, how the project will reduce dependence on Delta Supply, and how the project is related to resource management strategies (see *Chapter 8*).

Table 9-2: Framework for Scoring Guidelines for IRWM Grant Opportunities

Criteria	Suggested Workgroup Guidelines
PROJECT-LEVEL CRITERIA	
IRWM Plan Objectives	Select projects that contribute to the attainment of IRWM Plan objectives.
Legal, Scientific, and Technical Feasibility	Select projects that are well supported from a technical standpoint based on supporting studies and data.
Budget	Select projects that have well-developed budgets and exhibit reasonable costs. Note that DAC projects are exempt from the 25% funding match requirement.
Readiness to Proceed	Select projects that will be ready to proceed by Deadline established in PSP or within 3 months of LPS contract execution
Realization of Benefits	Consider timing of project benefit realization compared to project completion date (e.g., when water meter will begin recording deliveries vs completion of the pipeline).
Cost-Effectiveness – Water Supply, Water Quality, Flood Damage Reduction	Select projects that are cost-effective on both the short- and long-term, and provide quantifiable benefits to the region.
Benefits Tribes	Select projects that address the water resources needs of San Diego area tribes.
Integration	Review integration potential using pre-defined types of integration – Partnerships, Management strategies, Beneficial uses, Geographic, Hydrologic
Climate Change	Contributes to climate change adaptation or mitigation
PROPOSAL-LEVEL CRITERIA	
IRWM Plan Objectives	Proposal to include a suite of projects that addresses all IRWM Plan objectives.
Linkages to Other Projects	Proposal to include projects with synergies and linkages among them.
Funding Match	Proposal to achieve an overall 50% funding match.
Schedule	Proposal must include at least one project that will begin implementation by deadline established in PSP or within 1 month of LPS contract execution.
	Proposal to include majority of projects that realize benefits within 3 years of project completion.
Economic Analysis – Water Supply, Water Quality and Other Expected Benefits, and Flood Damage Reduction	Proposal to include projects that realize quantifiable water supply benefits.
	Proposal to include projects that realize quantifiable water quality and other expected benefits.
	Proposal to include projects that realize quantifiable flood damage reduction benefits.
Geographic Parity	Proposal to include a suite of projects that will benefit watersheds across the Region.
Benefits Disadvantaged Communities	Proposal to include at least one project that addresses the critical water supply or water supply quality needs of disadvantaged communities.
Implementing Agency	Proposal to include a balance of projects sponsored by non-governmental organizations and agencies.
	Proposal to include a balance of projects that include known successful project sponsors and projects that include partnerships with organizations who have not previously been awarded funding through the IRWM Program
Cost Effectiveness	Compare cost effectiveness of projects within each functional area ($/level of benefit)
IRWM Integration	Compare integrated aspects of each project in accordance with the definition of integration established by the San Diego IRWM Program
Cutting-Edge Technology	Proposal to highly consider projects that implement cutting-edge or next-generation technologies that can effectively address water management issues

Table 9-3: Potential Partial Credit for 2019 IRWM Plan Objectives

Objective	1 point *Direct; active*	0.5 points *Indirect; passive*	0 points *Not applicable*
Objective A| Encourage the development of integrated solutions to address water management issues and conflicts.	Active project partnerships (working together on a task or splitting the work between multiple organizations); multiple resources management strategies; project provides multiple beneficial uses; project is implemented across multiple watersheds; Addresses multiple watershed functions (water quality, stormwater management, ecosystem services, etc.); project enhances sustainability of systems for the future.	N/A – Project must meet Objective A to be considered for funding	No specific activities in work plan
Objective B│ Maximize stakeholder/community involvement and stewardship of water resources, emphasizing education and outreach.	Workshops/educational meetings; interpretive signage w/ IRWM principles; Hands-on events such as cleanups or water quality monitoring; Fliers/mailers; Surveys; Community events; School-based educational programs *Note: legally required outreach does not meet Objective B (e.g., CEQA meetings; Customer meetings)*	N/A – Project must meet Objective B to be considered for funding	No specific activities in work plan
Objective C| Effectively obtain, manage, and assess water resource data and information.	Collect, manage, assess and share data (online, database, plan); Data must inform decision-making	Used for project-purposes only; Not shared beyond project team	No specific activities in work plan
Objective D| Further scientific and technical foundation of water management.	Research and development; pilot projects with shared results; Scientific analysis must inform decision-making; Regulation development/revisions with regulatory agencies	Used for project-purposes only; Not shared beyond project team; Standard permitting with regulatory agencies	No specific activities in work plan
Objective E| Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies.	Produces and uses recycled water, seawater desalination, local surface water, or groundwater; Water transfers; Water conservation; Stormwater capture if beneficially used; Habitat preservation or treatment to protect supplies	Produces water but not uses; Stormwater capture not used; Incidental recharge; Incidental reduction in environmental demands (invasive removal); Upland preservation	No specific activities in work plan
Objective F| Construct, operate, and maintain a reliable and resilient water management infrastructure system.	Construction, rehabilitation, or replacement of aging/ inadequate infrastructure; Emergency/redundant facilities; Natural systems (creeks) if offloads constructed system	Energy efficiency for conveyance/treatment systems; Infrastructure built but not connected to customers; Pilot project infrastructure; Mitigation for infrastructure	No specific activities in work plan
Objective G| Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage integrated flood management.	Hydromodification BMPs and LID; Retention basins in floodplain; Structural flood improvements; Floodplain widening or realignment; Managed habitat restoration for flood purposes (needs technical doc); Reduced flood risk; Acquisition and protection of floodplain	Incidental flood benefits from habitat restoration; Retention basins with other primary purpose (recharge or water quality); Monitoring only; Pilot project only	No specific activities in work plan; Data collection only

Objective	1 point *Direct; active*	0.5 points *Indirect; passive*	0 points *Not applicable*
Objective H| Effectively reduce sources of pollutants and environ-mental stressors to protect and enhance human health, safety, and the environment.	Salinity management; Stormwater BMPs and LID; Point-source treatment; Reduces wastewater discharges to ocean outfalls; Water and wastewater treatment; Erosion/ sedimentation control; Contaminant uptake via habitat restoration if changing from impermeable to permeable; Retention basins for water quality treatment	Incidental water quality benefits from habitat restoration (currently permeable); Monitoring only; Pilot project only	No specific activities in work plan; Data collection only
Objective I| Protect, restore and maintain habitat and open space.	Habitat acquisition or restoration w/nexus to water resources; Removal of aquatic/riparian barriers (check dams); Invasive species management; Habitat creation	Agricultural land protection (as wildlife corridors); Monitoring only; Incidental habitat protection due to sediment control	No specific activities in work plan; Data collection only
Objective J| Advance water-based enriching experiences.	Access points to water-based recreation; Trails; Fishing/boat launches; Picnic areas; Overlooks; Bacteria reduction that directly reduces beach closures; Water quality improvements at reservoirs; Quagga control at reservoirs	Incidental water quality benefits from habitat restoration; Acquiring land for future trails	No specific activities in work plan

9.5 References

California Department of Water Resources (DWR). 2016. *2016 Integrated Regional Water Management Grant Program Guidelines*. July 2016. Available: https://www.water.ca.gov/LegacyFiles/irwm/grants/docs/p1Guidelines/2016Prop1IRWMGuidelines_FINAL_07192016.pdf

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10 Data and Technical Analysis

This chapter addresses requirements set forth in the Data Management Standard included in the 2016 IRWM Program Guidelines (DWR, 2016).

10.1 Overview

The intent of this chapter is to document various aspects of data management and technical analysis that were completed for the 2019 IRWM Plan and will continue for the IRWM Program. Specifically, this chapter includes information regarding:

- The process of data collection, storage, and dissemination of information to IRWM stakeholders, participants, members of the public, and the State.
- The data and technical analyses that were used to develop the 2019 IRWM Plan.

10.2 Data Management

A considerable variety of water and environmental resource data are collected throughout the Region. The overall intent of the Region's IRWM data management strategy is to augment these existing efforts in a way that allows regional leaders, stakeholders, and the public to effectively use data and information to support planning, decision-making, and public education and involvement.

The 2019 IRWM Plan builds upon existing data management systems in the Region to provide efficient use of and access to available data. The Region's online project database, OPTI, in conjunction with its Geographic Information System (GIS) database, will act as the regional Data Management System (DMS) to manage the Region's data in a way that is consistent with DWR's Data Management Standard. The DMS as originally envisioned in the 2013 IRWM Plan is no longer a viable option for the Region. A feasibility study was completed using a Proposition 84-Round 1 Implementation Grant with the intent to provide a framework for how to implement the DMS as envisioned in the 2013 IRWM Plan. The feasibility study concluded the Region's limited resources could not support the development, implementation, and ongoing maintenance of a new DMS that proposed to include a federated database management system. However, an updated version of OPTI, coupled with the WaterGIS section of the San Diego IRWM Program's website, can meet the Region's DMS needs without building a costly new federated database.

To understand the framework for the DMS, it is important to understand existing data and information available in the Region. The following sections provide an overview of existing regional data needs and data collection efforts and data sources, which provide the information necessary to develop the DMS.

10.2.1 Data Needs

Despite the extensive ongoing water resources monitoring and data-collection efforts within the Region, opportunities exist for additional data gathering to close data 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 over the next several years.

Data gaps will continue to be identified through IRWM planning efforts, primarily through the implementation of the planned IRWM DMS. A single, consolidated location for data – the San Diego IRWM website (www.sdirwmp.org) – will make identification of data gaps easier and reduce occurrences of unnecessary overlap or duplication of efforts. The DMS will also make it easier to direct users to a comprehensive source of information, increasing the likelihood of knowledge sharing across groups.

Support for addressing data gaps exists in the form of projects included in the 2019 IRWM Plan (refer to Chapter 9, *Project Evaluation and Prioritization* for information about project selection). Projects that have been funded through the IRWM Program seek to address some of the data gaps relating to monitoring. Further, given the adaptable nature of the project selection and evaluation process, it is possible that the RAC and the RWMG will amend project selection criteria to prioritize future projects that address identified data needs. Additional support is provided through the IRWM Plan Objectives, which include Objective C: Effectively obtain, manage, and assess water resource data and information, and Objective D: Further scientific and technical foundation of water management (see Chapter 2, *Vision and Objectives).* These two objectives address the need for increased science-based management as identified by IRWM stakeholders. The project scoring criteria gives preference to projects that address multiple objectives, and together with Objectives C and D, serve to increase the likelihood that projects included in funding proposals will also contribute to addressing data gaps. Through implementation of the 2013 IRWM Plan, some data gaps have begun to close, and the Region's priorities have been revised to reflect progress made in addressing Regional needs.

The following sections summarize the specific data gaps that have been identified throughout the 2019 IRWM Plan development process. These data gaps fall into four general categories: sustainable water development; valuing stormwater as a resource; investing in underserved water systems; and enhancing infrastructure. Through an extensive stakeholder process, the 2019 IRWM Plan identified these key Technical Development Areas (TDAs) on which to focus. Although the 2019 IRWM Plan development process revealed specific data gaps, several stakeholders have also noted that there is a need for data that can be used to facilitate effective decision-making. Stakeholders have noted that general data collection is not always preferable given that more data does not necessarily lead to effective or efficient conclusions. Therefore, the focus of the DMS for the IRWM Program will focus on collecting specific data that can be efficiently used to improve water management.

As part of the 2019 IRWM Plan development process, a series of stakeholder and RWMG meetings was conducted to focus the IRWM Program's priorities, or TDAs. Regional needs, priorities, and data gaps were used to create four TDAs: 1) Sustainable Water Development, 2) Value Stormwater as a Resource, 3) Invest in DAC-EDA-EJ-URC Water Systems, and 4) Enhance Infrastructure.

Sustainable Water Development

A major component of increasing the sustainability of the Region's water portfolio is emphasizing the importance of local water supplies. The reliability of imported water through the State Water Project (SWP) and the Colorado River Aqueduct (CRA) is expected to decrease, as impacts of climate change such as drought and changing precipitation patterns are more likely to occur in the future. Additionally, the distance between the Region and its major supply sources presents risks associated with threats to the conveyance system, including seismic events and pipeline failures, while the energy demands of imported water conveyance contribute to the causes of climate change. The

Region seeks to increase the availability and reliability of local water supplies, such as groundwater and seawater desalination. In addition, a greater emphasis on water conservation and reuse will help to manage demands for water in the Region. The implementation of potable reuse within the Region has become a high priority, and information sharing about the effectiveness of new technologies will help inform policies and decision making, potentially allowing agencies to implement new solutions to local supply development sooner and more sustainability.

Addressing issues relating to knowledge-sharing within sustainable water development will increase collaboration between agencies or organizations and will enable more efficient use of water management resources. Communication and knowledge-sharing will be improved through implementation of the updated OPTI database and WaterGIS. Sharing technical data, approaches, and results of projects is essential for expanding the knowledge base of water resource managers within the Region, particularly related to new and emerging technologies such as advanced water treatment for potable reuse.

Value Stormwater as a Resource

Stormwater (water that either falls as precipitation or enters the Municipal Separate Storm Sewer System [MS4]) is becoming an increasingly valuable water resource to the Region. The Region contains 24 reservoirs with a combined capacity of approximately 744,000 acre-feet that have long collected stormwater, several dating to the 19th century. These reservoirs also serve an important flood management function. Some of the reservoirs are connected to the Water Authority's imported water pipelines; the amount of water in the reservoirs that are not connected varies widely depending on recent rainfall totals. The Region now is exploring ways to leverage stormwater as a more reliable local water supply. The completion of the 2017 *Storm Water Resources Plan* (SWRP*)* and the 2018 *Stormwater Capture and Use Feasibility Study* (SWCFS) is considered an initial step to furthering the understanding of stormwater as a viable water resource. Data surrounding the economic feasibility and potential habitat and environmental benefits of stormwater projects remain the biggest gaps around stormwater. The Region also recognizes that there is a disconnect with the public about the importance of stormwater management and surface water quality. The County of San Diego has conducted two surveys in the last ten years to improve its understanding of public awareness of the value of stormwater. While the public increasingly understands the value of stormwater, there remains room for additional outreach.

Sharing information on actual benefits of stormwater projects included in the SWRP and SWCFS will provide the basis for improving on regional stormwater solutions. Allowing more stormwater data to be accessible to the public will help to increase public knowledge of stormwater for both water resource management and watershed and water quality protection. As part of the SWRP, stormwater projects must identify and quantify their proposed benefits. These quantified benefits are entered into the OPTI system when stormwater projects seek inclusion in the SWRP and the IRWM Plan.

Several data gaps have been identified within the Region's programs to monitor pollutants and sources. These data gaps pertain to: characterization of nonpoint sources, characterization of agricultural runoff and sources, characterization of pathogen impacts and loading, and evaluation of source load reductions.

Invest in DAC-EDA-URC-EJ Water Systems

Politically, economically, and socially underserved areas of the Region – Disadvantaged Communities (DACs), Economically Distressed Areas (EDAs), Underrepresented Communities (URCs), and communities experiencing Environmental Justice issues (EJ) – are in need of critical water system improvements, even in some communities that receive municipal water and wastewater services.

Identifying these water systems and their specific needs will be necessary to understanding how the Region can best invest and/or assist in these improvements. There is also a need for knowledge building within the underserved areas. Identifying key competency areas in which to focus (i.e. financial, technical, or managerial knowledge) will help facilitate the transfer of information. Expanding knowledge sharing to these communities will help to improve water resource management in the Region and increase effectiveness of water resource management programs. Building capacity of small system operators, improving understanding of DAC water system needs, and targeting DAC investments are key goals of the Water Needs Assessment that is currently underway and anticipated for completion in 2019.

Enhance Infrastructure

Asset management across the Region can be fragmented and siloed. Infrastructure projects funded through the IRWM Program have been selected to encourage cross-agency and regional coordination. For example, several Hodges Reservoir projects are designed to improve water quality so that the water can be distributed through the regional supply system, rather than limiting use to only a few local agencies. Continued monitoring of the Region's reservoirs can identify uses with multiple benefits and integrated solutions to water quality and water supply management. In addition, a hazard risk assessment of the Region's water infrastructure is needed to understand the impacts of climate change, particularly sea level rise and changes in precipitation patterns.

These data gaps could be addressed through modifications to existing monitoring and assessment approaches. For instance, monitoring approaches that focus more on water quality or environmental "risk," rather than static regulatory benchmarks such as chemical concentrations, could more effectively and 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.

10.2.2 Data Collection and Sources

Many of the Region's monitoring programs and activities provide data that are useful to IRWM planning and management in the Region. Data collected to support the 2019 IRWM Plan will facilitate the development of local water management programs in a manner that ensures consistency with the standards established through statewide data management systems.

Water quality monitoring is conducted by citizens through San Diego CoastKeeper's Water Pollution Source Tracking Program.

Photo credit: Travis Prichard, San Diego CoastKeeper

Water quality monitoring data collection site at the Biofiltration Wetlands (San Diego Zoo Safari Park), partially funded through the IRWM Program.

Photo credit: Rosalyn Prickett, Woodard & Curran

Table 10-1 provides an overview and description of efforts thought to be of particular importance to IRWM planning, but is not intended as a comprehensive survey of all programs and activities. In addition, a substantial amount of data is collected pertaining to stormwater for purposes of theMS4 permit.

The IRWM Program will support statewide data activities by serving as a repository for regional compilation of water resources data and information, in the form of project reports, and by requiring that data collected to support project performance assessment is collected in a manner consistent with continuing statewide data collection programs. Consistency with Statewide monitoring programs is critical to ensuring that regional projects contribute to efficient, uniform, and comprehensive study design and data collection. Data collected as part of Plan implementation will be required to be comparable with applicable statewide data collection programs such as the Surface Water Ambient Monitoring Program (SWAMP) and Groundwater Ambient Monitoring and Assessment (GAMA) Program. All projects implemented with IRWM funding must follow state mandated protocols for data collection and reporting, and must also send regular reports to DWR. Through IRWM funding, the IRWM Program will facilitate data collection in accordance with statewide standards, and can also help to encourage project proponents and other stakeholders to contribute data to statewide databases.

10.2.2.1 Typical Collection Techniques

Data are collected using common, standard techniques appropriate to the type of data collected, collection site conditions, resource availability, and how the data will be analyzed. Data collection techniques are typically described in reports associated with each dataset. Methodology will be the responsibility of the individual organizations, but are expected to be described in proposed Project Monitoring Plans required by DWR under the IRWM Implementation Grants. Substantial concerns relating to appropriateness of methodology may be addressed through removal from DMS, at the discretion of the RAC and the RWMG.

Table 10-1: List of Potential Data Sources for IRWM Planning

Monitoring	Collected by	Reported to	Notes
Various GIS datasets	San Diego Association of Governments (SANDAG)	San Diego Geographic Information Source (SanGIS)	SanGIS, a joint project of the County of San Diego and SANDAG, is a publicly-available regional geographic information system (GIS) data warehouse. The data provided by SanGIS includes a variety of sources of information from local, statewide, and federal databases, and ranging from landbase information (lots, parcels, roads, etc.) to demographic data, and specific water resources data such as impaired water bodies, groundwater basin locations, floodplains and flood zones, and more. SanGIS: http://www.sangis.org/
Real-time or recent surface-water, groundwater, or water-quality data	U.S. Geological Survey (USGS)	National Water Information System (NWIS)	The NWIS is a comprehensive and distributed application that supports the acquisition, processing, and long-term storage of water data. NWIS: http://waterdata.usgs.gov/nwis
Routine monitoring of public water systems	Operators of public water systems	State Board's Division of Drinking Water (DDW)	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 DDW's Detection Limits for Purposes of Reporting (e.g., color, corrosivity, and odor). For more information on DDW's Drinking Water Program, visit https://www.waterboards.ca.gov/drinking_water/programs/
Routine monitoring of small water systems (i.e., community water systems that serve 199 connections or less from groundwater supply wells)	There are over 150 small water systems within the Region.	San Diego County Department of Environmental Health (DEH)	DEH Land Use Program staff inspects small water systems and monitors the reporting of water samples to ensure that they comply with Safe Drinking Water Act and EPA requirements for supplying potable water. Monitoring results are reported monthly to CDPH. Monitoring for the constituents described above for all water suppliers is conducted every three years, and more frequent monitoring is conducted for bacteria and nitrates. For more information on DEH's Small Drinking Water Systems program, visit https://www.sandiegocounty.gov/content/sdc/deh/lwqd/lu_sws.html
Chemical contaminants in oysters and mussels and in sediments	National Oceanic and Atmospheric Administration (NOAA)	National Oceanic and Atmospheric Organization (NOAA) Status and Trends Program, Mussel Watch Project	NOAA collects and analyzes samples of bivalve tissue biennially and sediments every decade to track long-term trends in organic and inorganic contaminants along the coast. These data are used to assess changes in water quality and provide context for local regulators. Tissue banks are maintained from all sampling efforts to allow retrospective analyses for new or emerging contaminants of concern. For more information on the Mussel Watch program, visit http://ccma.nos.noaa.gov/about/coast/nsandt/musselwatch.aspx
Streamflow data at 94 stations in the County; Depth to groundwater at 20 stations in the County	United States Geological Survey (USGS) monitoring stations	United States Geological Survey (USGS) National Water Information System	USGS collects streamflow data across the nation, as well as monitors water quality. USGS also partners with local agencies to produce studies and reports on the status of surface and groundwater. For more information about the National Water Information System or to access data, visit http://waterdata.usgs.gov/nwis

Monitoring	Collected by	Reported to	Notes
"Ambient" surface water monitoring in all County watersheds	San Diego Water Board and organizations collecting water surface water quality data using funding from Propositions 13,40,50, and 84	State Water Resources Control Board (State Board) Surface Water Ambient Monitoring Program (SWAMP)	The main functions of SWAMP are to accept, manage and store SWAMP data and to share this data within SWAMP and among stakeholders. The database is designed to transfer data into larger data exchange networks. Water quality, toxicity, sediment chemistry, microbiological, habitat, biological, fish and shellfish tissue data and metadata are managed within a central database that is fed from peripheral databases. SWAMP is designed to support and expand water quality assessments, to determine 303(d) listings and de-listings, and help prioritize or support site-specific actions. SWAMP works closely with the California Water Quality Monitoring Council (CWQMC). For more information on SWAMP, visit http://www.waterboards.ca.gov/water_issues/programs/swamp/
Water quality monitoring to assess receiving water conditions (surface and groundwater) and verify that targeted load reductions are occurring	Dischargers as named in permits, the Water Quality Control Plan for the San Diego Basin (Basin Plan), and San Diego Water Board Orders	Total Maximum Daily Loads (TMDLs), Waste Discharge Requirements (WDRs), and Investigation Orders	Water quality monitoring is conducted as part of TMDL assessments. Additional monitoring by dischargers is at the discretion of the San Diego Water Board, and is often required in support of TMDLs or possible future TMDLs. For more information on the San Diego Water Board's TMDL program, visit http://www.swrcb.ca.gov/rwqcb9/water_issues/programs/tmdls/index.shtml
Water quality monitoring to verify compliance with permit conditions	Permitted parties	San Diego Water Board Point-Source Discharge Permit Compliance Monitoring	San Diego Water Board regulates point-source discharges through WDR or NPDES permits. Both of these permits require monitoring to verify compliance with standards associated with applicable conditions. Data in this category also includes permitting required for ocean dischargers (outfalls). For more information the point-source discharge monitoring via WDR permits visit: http://www.swrcb.ca.gov/sandiego/water_issues/programs/ground_water_basin/recycled_subsurface/recycledwater_subsurfacedisposal_programs.shtml For more information on monitoring through NPDES permits visit: http://www.waterboards.ca.gov/water_issues/programs/npdes/
Extensive monitoring of urban runoff discharges and receiving waters	Permitted parties	San Diego Water Board MS4 Program	As part of the MS4 permit issued by the San Diego Water Board, the Copermittees have implemented runoff monitoring programs. Monitoring has been conducted since the 1993-94 wet season, but evolved to address monitoring goals and management questions. For more information about the MS4 permit, visit: http://www.swrcb.ca.gov/sandiego/water_issues/programs/stormwater/sd_stormwater.shtml For information regarding stormwater management in the IRWM Region, visit: http://www.projectcleanwater.org/html/copermittees.html
Beach water quality at 110 locations as part of AB411 requirements	Cities, wastewater agencies, DEH	DEH Ocean and Bay Recreational Water Program and individual city/wastewater agency programs	Water quality samples are collected at 78 beaches (110 locations) weekly from April through October every year. Samples are collected from a smaller number of beaches from November through March commensurate with beach use and budget. For more information, visit http://www.sdcounty.ca.gov/deh/water/beach_bay.html

Monitoring	Collected by	Reported to	Notes
Watershed sanitary surveys of public water systems	Water agencies with surface reservoirs	CDPH	Per Title 22, § 64665 of the California Code of Regulations, CDPH requires watershed sanitary surveys be conducted every 5 years to identify sources of contamination or other factors which might adversely affect quality of water used for domestic drinking water. These surveys are conducted by individual water agencies using surface water reservoirs. More information can be found on agency and city websites. An example from the City of San Diego can be found here: http://www.sandiego.gov/water/quality/environment/sanitarysurvey.shtml
Marine environmental research	Member agencies	Southern California Coastal Water Research Project (SCCWRP)	SCCWRP is a joint powers agency for marine environmental research on the Southern California Bight. Its mission is to gather data so that agencies can effectively protect the Southern California marine environment. It focuses on Publicly Owned Treatment Works (POTWs), urban runoff, and surface water quality monitoring. For more information, visit: www.sccwrp.org
Areas of Special Biological Significance (ASBS) information management	Scripps Institution of Oceanography (SIO), City of San Diego, San Diego Coastkeeper	SIO Coastal Observing Research and Development Center (CORDC)	CORDC is the lead for ASBS information management. The CORDC system includes automatic data transfer and ingestion, data archiving and backup, public display of data and historical data download. It uses a modified SWAMP template, and allows for users to query and view data. The goal is to establish infrastructure needs and generate conceptual design required for long-term assessment of ASBS performance and management decisions. For more information, visit: https://cordc.ucsd.edu/projects/asbs/
Characteristics of Southern California Bight	Research organizations, such as SIO	Southern California Coastal Ocean Observing System (SCCOOS)	SCCOOS maintains databases of surface currents, satellite imagery, wave condition and forecasts, meteorological conditions and forecasts, water quality, ocean temperature, salinity, chlorophyll, and density. It also presents and manages data in various data interfaces and products, utilizing web-based mapping to provide localized interactive data displays. For more information on SCCOOS or to access data, visit: http://sccoos.org/
Citizen-based volunteer surface water quality monitoring	Citizen scientists working under the supervision of various non-governmental organizations(NGOs)	San Diego Stream Team; San Diego CoastKeeper Water Quality Monitoring Program; San Diego River Park Foundation's RiverWatch Team	Citizen science provides significant, important data sets. Most of these efforts are supervised by local NGOs. More information on citizen monitoring efforts can be found on these organizations' websites: San Diego CoastKeeper has a data portal that contains field screening data collected by volunteers. The data portal contains field screening data collected by volunteers that were trained in accordance with State Water Resources Control Board and EPA field methods. CoastKeeper: http://www.sdcoastkeeper.org/learn/swimmable/san-diego-water-qualityThe Common Grounds Project is conducted by the City of San Diego, San Diego State University and San Diego CoastKeeper to incorporate data from regional water quality monitoring programs and integrate the data on a watershed level using a web-based interactive application. Common Grounds: www.sdbay.sdsu.edu The San Diego River Watershed Data Portal is an online resource for citizen-based monitoring programs. Currently the Data Portal has compiled data for the San Diego River Park Foundation's RiverWatch program. These data have been collected at 15 sites on a monthly basis since 2004. San Diego River Watershed Data Portal: http://www.ecolayers.biz/sdrpf-riverwatch/
Groundwater monitoring as part of compliance with underground storage tank regulations	County of San Diego	DEH and San Diego Water Board	Groundwater monitoring is required as part of regulating compliance with underground tank regulations, and is normally limited to near underground tanks to check for leaks. Where leaks have been detected, more extensive monitoring is required. More information can be found on the San Diego Water Board's Underground Storage Tank (UST) Program Website, at http://www.waterboards.ca.gov/sandiego/water_issues/programs/ground_water_basin/ust_program.shtml Or at the County of San Diego's UST Program site at http://www.sdcounty.ca.gov/deh/hazmat/ust.html

Monitoring	Collected by	Reported to	Notes
Biological resource/habitat surveys and biological monitoring programs	Wildlife agencies	Multiple Species Conservation Program (MSCP) Databases	The programs developed as part of the MSCP typically include general habitat monitoring, species specific monitoring and surveys, and other tools such rapid assessment protocol surveys, vernal pool inventories, photo monitoring, and post-fire recovery surveys. The County of San Diego is developing a comprehensive database to track and more efficiently manage monitoring activities. When complete, the database will provide information such as past monitoring activities, future monitoring requirements, locations of preserved lands within the County's MSCP Subarea, and locations of monitoring sites. For more information on the MSCP, visit: http://www.sdcounty.ca.gov/pds/mscp/ The City of San Diego (www.sandiego.gov) has also developed an integrated Management and Monitoring Database that tracks their MSCP biological monitoring and management activities. It includes a GIS component, field data collection using a pocket personal computer, and field and office demonstration to other agencies. Future phases may include a web-based internet application made available to the public for education and information.
Status and distribution of bird populations	Local birders	San Diego Audubon Society's Christmas Bird Counts	The annual Christmas Bird Count, conducted by the Audubon Society through its local chapters, monitors the status and distribution of bird populations in the Western Hemisphere. The results are compiled into the longest running database in ornithology. Trends seen in these data can indicate habitat fragmentation or signal an environmental threat. More information about the Christmas Bird Count can be found at http://birds.audubon.org/christmas-bird-count
Outdoor research and education activities	Field Station Program staff, visiting researchers	San Diego State University (SDSU) Biological Field Stations	The SDSU Field Stations Program supports outdoor research and education activities. Three of the Program's sites are located within the IRWM Region. The field stations are established as reserves, totaling over 5,000 acres, and provide visitor access, education and outreach, and sites for scientific research. More information can be found at http://fs.sdsu.edu
Natural resources data	Varies	California Environmental Resources Evaluation System (CERES)	CERES is an information system to facilitate access to natural resource data. CERES' goal is to improve environmental analysis and planning by integrated natural and cultural resource information from multiple contributes and making it available and useful to a variety of users. CERES: http://ceres.ca.gov/
Variety of water data	Varies	Water Data Library (WDL)	The WDL contains data from monitoring stations across state. Allows users to easily query areas of interest. Includes groundwater levels, water quality, surface water flow, rainfall/climate and well logs. Links to other data resources. WDL: http://www.water.ca.gov/waterdatalibrary/
Groundwater elevation data	Local water suppliers overlying groundwater basins	California Statewide Groundwater Elevation Monitoring Program (CASGEM)	CASGEM is a collaboration between local organizations and DWR to collect groundwater elevations statewide. Tracks seasonal and long-term trends in groundwater elevations. Data available on the CASGEM Online System. CASGEM: http://www.water.ca.gov/groundwater/casgem/
Variety of data	California Natural Resources Agency	California Environmental Information Catalog (CEIC)	CEIC is a library of existing data and where to find it. CEIC facilitates identification and access to data and improves efficient use of data. CEIC: http://ceic.resources.ca.gov/

Monitoring	Collected by	Reported to	Notes
Variety of data	Various entities, compiled by State Board	California Environmental Data Exchange Network (CEDEN)	CEDEN is a cooperative data exchange program for organizations involved in water and environmental resources in California. Scores of programs have been connected into CEDEN. Projects are underwater to extend data exchange to additional standards. CEDEN: http://www.ceden.org/
Variety of data	Various entities, compiled by State Board	Surface Water Ambient Monitoring Program (SWAMP)	SWAMP is a statewide monitoring effort to assess the conditions of surface waters throughout California. Some state funding sources require reporting to SWAMP if projects involve surface water monitoring. SWAMP: http://www.waterboards.ca.gov/water_issues/programs/swamp/
Variety of data	Various entities, compiled by State Board	Groundwater Ambient Monitoring and Assessment program (GAMA)	GAMA was created to improve statewide ambient groundwater quality monitoring and assessment and increase the availability of groundwater quality information to the public. It consists of the California Aquifer Susceptibility (CAS) assessment and the Voluntary Domestic Well Assessment Project. GAMA: http://www.waterboards.ca.gov/water_issues/programs/gama/
Variety of data	Various entities, compiled by DWR	Integrated Water Resources Information System (IWRIS)	IWRIS is a data management tool for water resources data. It utilizes databases such as WDL, CDEC, USGS Streamflow, Local Groundwater Assistance Grants, and local agency data to allow users to access and visualize multiple sets of data simultaneously. It was designed to support IRWM efforts. IWRIS: http://www.water.ca.gov/iwris/
Variety of data	Various entities, compiled by The Climate Registry (TCR)	TCR	The California Climate Action Registry has been integrated into TCR, which collects GHG emissions data from members. Data are verified by third-party organizations before being submitted. All three RWMG member agencies and the Metropolitan Water District of Southern California (Metropolitan) are TCR members. TCR: http://www.theclimateregistry.org/
Variety of data	Various entities, compiled by California Department of Fish and Wildlife	California Bio-Geographic Information and Observation System (BIOS)	BIOS is a statewide data management system that allows DFG and partner organizations to manage, exchange, and geographically visualize a variety of environmental/biological data BIOS: http://bios.dfg.ca.gov/
Variety of data	Various entities, compiled by California Department of Fish and Wildlife	California Natural Diversity Data Base (CNDDB)	CNDDB is a database of rare species and communities. It is maintained and updated by the California Department of Fish and Wildlife, and data can be accessed either directly or through BIOS. CNDDB: http://www.dfg.ca.gov/biogeodata/cnddb/

10.2.3 IRWM Data Management System

Rather than duplicate existing data management systems in the Region, the 2019 IRWM Plan proposes to build on them through the augmentation of the San Diego IRWM website (http://www.sdirwmp.org). The San Diego IRWM data management system comprises three primary components:

- San Diego IRWM website (www.sdirwmp.org)
- WaterGIS, accessible through website
- OPTI project database, accessible through website

As part of the 2019 IRWM Plan development process, the San Diego IRWM website will be comprehensively updated such that it contains up-to-date information about workgroups, workshops, and other meetings held in relation to the planning process. The website also contains work products from the various planning studies and technical efforts undertaken for the IRWM Plan, as well as information about project selection and solicitation associated with IRWM grant opportunities. Finally, the website also contains updated information about projects that have been funded through the IRWM Program (Proposition 50, Proposition 84, and Proposition 1), including project overviews, budgets, and major project amendments. The San Diego IRWM website provides a venue through which stakeholders can learn about IRWM Plan implementation and progress.

WaterGIS, accessible through the San Diego IRWM website, provides GIS-based maps and datasets specific to the Region. These datasets were used in development of this 2019 IRWM Plan, are used during development of the Region's grant applications, and are uploaded for use by citizens into the web-based GIS map within the OPTI project database. Anyone interested in water management can download these datasets.

The OPTI project database is also accessible through the San Diego IRWM website. The Region is currently in the process of updating OPTI to better fit the needs of a regional DMS. In addition to providing users with basic project information, OPTI will be updated to include information about the implemented projects, their associated benefits, and annual monitoring reports. Project completion reports, which summarize the analysis of project data, will also be accessible on the OPTI project database. Projects submitted to the SWRP are also housed on the OPTI database.

In 2011, a Report Card was created to assess progress on implementation of the 2007 IRWM Plan. As discussed in Chapter 11, *Implementation,* the Report Card is available on the San Diego IRWM website for review by stakeholders and other interested parties.

Future IRWM Program activities will include further updates to the San Diego IRWM website, as needed.

10.2.4 Data Management Objectives and Goals

The Region's DMS is intended to address three primary data and information management goals, which are described below. Data and information management is an essential element of the IRWM planning and management process. An effective data management strategy must address several key objectives:

- *Support for IRWM Planning* – Data and information must support ongoing IRWM planning and decision-making processes. Through the planning process, a basis can be established for evaluating the performance of individual projects, programs, the 2019 IRWM Plan, and the IRWM Program as a whole, as well as for supporting statewide data needs and integration with regional and statewide programs.
- *Evaluation of Project, Program, and Plan Performance* – Projects and programs must be periodically evaluated according to established criteria to monitor their progress and evaluate their success. Collective 2019 IRWM Plan progress and performance must also be evaluated, and the results of these evaluations used to provide feedback into the ongoing planning process.
- *Facilitation of Public Participation* – Dissemination of data and information to stakeholders and the public is critical to ensuring their ongoing participation in IRWM planning and implementation activities.

In support of these objectives, three data management goals have been developed for the IRWM Program. These goals and details regarding how these goals will be implemented are discussed in below.

Goal 1 – Provide Simplified Access to Existing Sources of Data and Information

A considerable amount of water management data and information is provided through numerous existing monitoring and research efforts. Although many agencies and organizations have developed useful web-based resources for disseminating data and information, users often lack the specific knowledge necessary to find and effectively use this information. The IRWM Program gathers data relevant to its direct activities (planning and funding efforts). The Region's DMS is comprised of three components:

- IRWM website provides a central location for users looking for IRWM-related data,
- WaterGIS provides easy access to downloadable region-specific GIS data, and
- OPTI project database provides narrative and geographic project information.

Written and electronic work products will also continue to be a key part of the data and information dissemination process. In addition to providing contact information for obtaining these products in the 2019 IRWM Plan, documents and reports will be posted or linked through the San Diego IRWM website. Examples of such documents and reports include project completion reports, annual monitoring reports, and studies and plans developed as part of project deliverables.

Goal 2 – Provide Direct Access to IRWM-Generated Data and Information

As described in Chapter 11, *Implementation*, performance data will be tracked to allow the RWMG to assess the progress of implementation and the success of individual IRWM projects and programs, as well as the 2019 IRWM Plan and IRWM Program as a whole. Through the San Diego IRWM website, stakeholders can directly access data and information on all IRWM initiatives. The San Diego IRWM website hosts detailed information about the IRWM planning process such as meeting dates, agendas, and notes for workshops, workgroup meetings, Regional Advisory Committee (RAC) meetings, and other public/outreach meetings. The website will also continue to provide information on the 2019 IRWM Plan development process and relevant documents such as the Report Card that was produced to comprehensively assess IRWM Program implementation and progress.

Plan stakeholders and the general public will continue to be informed of the IRWM planning process and online data availability through email announcements and in-person announcements made during regular RAC and other stakeholder meetings. Local press will also continue to be informed as future work is completed and data become available online. Specifically, newspaper announcements will continue to be made, as necessary, in accordance with requirements set forth in California Water Code §10541.

In addition, it is anticipated that future work will continue to build upon the extensive public outreach that was conducted for the 2013 and 2019 IRWM Plans. For additional information on existing and anticipated future stakeholder outreach and involvement activities, please refer to Chapter 6, *Governance and Stakeholder Involvement*.

Goal 3 – Provide User-Defined Interactive Access to Key Data Sets

Selected data sets are available through WaterGIS, a centralized GIS database of key georeferenced data specific to the San Diego IRWM Region. This feature is intended to increase the overall access and utility of water resource and planning data for the Region.

WaterGIS provides a central repository for data related to water management. Such data may include monitoring activities from IRWM projects, water agency jurisdictional boundaries, planning boundaries, population information, and water-related infrastructure, among others.

OPTI project database provides information on projects submitted to the IRWM Plan. Once users are logged it, it is possible to view a map of submitted projects, which can be filtered by type. The map also has different layers that may be turned on or off, such as watershed boundaries and location of DACs. As part of the 2019 IRWM Plan Update cycle, the database will be updated to show which projects have been funded through the IRWM Program, as well as house data reported by the funded projects as part of their project deliverables and monitoring under the terms of the funding agreement with DWR. These data will be available to all database users.

Entity Responsible for Maintaining DMS

The San Diego RWMG, with leadership from the Water Authority, is responsible for implementing and maintaining the DMS as described in this 2019 IRWM Plan. The RWMG's current Memorandum of Understanding commits to maintaining the San Diego IRWM website and available data through June 2019, but is currently being revised to extend services through 2020.

Stakeholder Contribution to DMS

Stakeholders are welcome to send updated data layers to the IRWM Program at any time for upload to WaterGIS. All members of the public are free to download WaterGIS layers at any time. Stakeholders are expected to submit materials to populate the OPTI project database with project submittal, completion, and monitoring data. The process by which stakeholders contribute data to the DMS will involve automated submittal process through the OPTI website, and stakeholders can download project information from OPTI through the OPTI website. Available data layers on WaterGIS are listed in Table 10-2 above.

QA/QC Measures

Quality Assurance/Quality Control (QA/QC) measures will primarily be the responsibility of the party that collects the data or requires the collection of data. Project monitoring data reported by the project sponsors in post-project annual reports will be consistent with the Project Monitoring Plan (or its equivalent) submitted to DWR as a deliverable under the IRWM grant agreements. Potential concerns with proposed monitoring mechanisms are anticipated to be identified during review and approval of the Project Monitoring Plans. It is also anticipated that DMS users who identify problems with data will be able to report these problems to the IRWM Program Manager. It is not anticipated that any of the likely data suppliers will present QA/QC problems, given their long history of data collection and analysis, their frequent need to report data to various regulatory agencies, and the use of standard sampling methodologies.

Sharing Data

The purpose of the DMS is to provide a central clearinghouse for regionally-relevant water data to facilitate data sharing and increased integration of data collection and analysis. The DMS will be advertised through the San Diego IRWM website. The DMS is be designed for public access, and is anticipated to be user-friendly, with clear instructions for use readily available. Included in the OPTI project database will be data collected through IRWM funded projects. This is a requirement for all projects included in IRWM funding packages, as legally appropriate.

Data will be transferred and shared with stakeholders through downloadable GIS-based data layers. The purpose of WaterGIS is to provide public access to water resources datasets and to support the RWMG's efforts to share collected data with all interested stakeholders.

Table 10-2: Data Layers Available on WaterGIS (www.sdirwmp.org)

Data Layer	Original Data Source
Integrated Flood Management Data	Potential flood hazard zones developed for the 2013 IRWM Plan (refer to *Chapter 7, Regional Coordination* for more information)
Watershed boundaries	Compiled by IRWM Program
Water agency boundaries	Compiled by IRWM Program
Sanitation district boundaries and sewersheds	Compiled by IRWM Program
Municipal boundaries	County Assessor via SanGIS Data Warehouse: www.sangis.org
Groundwater basins	DWR via SanGIS Data Warehouse: www.sangis.org
Impaired water bodies	State Board 303(d) List: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml
Disadvantaged communities and economically distressed areas	Processed by IRWM Program using 2011-2015 American Community Survey data (February 2017)
Community Planning Areas	City of San Diego, County of San Diego; via SanGIS Data Warehouse: www.sangis.org
Land uses in Region	SANDAG, County of San Diego, Cleveland National Forest, Bureau of Land Management, State Parks, compiled by SANDAG; via SanGIS Data Warehouse: www.sangis.org; U.S. Fish and Wildlife Service: http://www.fws.gov/gis/data/national/index.html#NWRS BOUNDARY ; BLM: http://www.geocommunicator.gov/ARCGIS/REST/services/SMA/MapServer ; California State Parks: http://projects.atlas.ca.gov/projects/calstprksbndys. Land uses consolidated by IRWM Program
Precipitation in Region	SanGIS Data Warehouse: www.sangis.org
Water infrastructure	Compiled by IRWM Program; County Assessor via SanGIS Data Warehouse: www.sangis.org
Tribal Nations	SanGIS Data Warehouse: www.sangis.org
Natural Resources	U.S. Fish and Wildlife Service: http://criticalhabitat.fws.gov/; State Board: http://www.swrcb.ca.gov/water_issues/programs/oceans/asba_areas.shtml; ArcGIS Baselayers (waterbodies)
Integrated Flood Management Data	Compiled by IRWM Program
IRWM Boundaries (Regions and Funding Area)	Compiled by IRWM Program
IRWM-Funded Projects	Compiled by IRWM Program

10.3 Technical Analysis

The 2019 IRWM Plan is based on sound technical information reviewed by the RWMG, members of the RAC, and other interested SDIRWM stakeholders. Published documents such as regional plans, studies, and technical reports were reviewed, experts were consulted, and meetings with various interest groups were held to understand the short-term and long-range needs of the Region. Stakeholder outreach efforts are detailed in Chapter 6, *Governance and Stakeholder Involvement*, and include soliciting input on the water needs of the Region. Descriptions of the technical information reviewed during development of the 2019 IRWM Plan are provided in the following sections.

10.3.1 Technical Information

The needs identified in the 2019 IRWM Plan were developed through an extensive review of literature, consultation with experts and interest groups, assessment of 2013 IRWM Plan Implementation Actions, the 2016 IRWM Program Summit, and an assessment of IRWM-funded projects. Examples of literature reviewed for IRWM Plan development and updates include regional plans such as urban water management plans, groundwater management plans, and land use plans. Many of the sources are themselves reviews of literature or studies, such as the *California Water Plan Update 2013*. Wherever possible, the source of data analyzed in relevant portions of these plans, reports, or studies are noted in Table 10-3.

Whenever possible, regional data, reports, or studies were used to build the foundation for the needs and management direction in the 2019 IRWM Plan. This improves the ability of the IRWM Plan Update to identify and address the unique water needs of the Region, and provides for a more accurate and thorough analysis of the Region. Primary sources of data are the San Diego Water Board, the Water Authority, the County of San Diego, the City of San Diego, the CDFW (previously the California Department of Fish and Game), and other local agencies. Utilizing data from these sources ensures reliable, consistent, and complete information that has been collected and analyzed following accepted standards. Data were also frequently provided by SANDAG, the regional transportation planning agency in San Diego, which is led by a Board of Directors comprised of representatives from the eighteen cities that lie within the Region, and the County of San Diego. This emphasis on local and regional data supports the ability of the IRWM Plan Update to address region-specific needs.

Data gaps identified during IRWM Plan Update development and update are described in *Section 10.2.1*, above. *Section 10.2.3* details how the IRWM Program activities will work towards bridging the identified data gaps.

10.3.2 Technical Analysis and Methods

Table 10-3 represents a selection of the primary technical sources used during the writing of the IRWM Plan Update, though may not include every study used. In addition to detailing the type of data used, Table 10-3 also describes how the data were analyzed, the relevant results from the analysis, how the data were used in the IRWM Plan Update, and the source of the data. Much of the technical information used in the creation of the 2019 IRWM Plan stems from UWMPs and other similar planning documents. These documents are updated frequently (every five years), and undergo extensive public review. The SWRP and SWCFS, which also went through extensive public review, have helped to broaden the discussion around stormwater as a resource in the Region. A Water Needs Assessment, currently underway, is identifying regional DAC, EDA, URC, and EJ community water resource needs through an intensive stakeholder process. These processes, along with the local and regional focus of these documents, helps to ensure an accurate source of information for local and regional planning. While it is not always possible to identify how data were analyzed in order to write these planning documents, an effort has been made to further define the data that were used in preparation of the documents that form the basis for the planning decisions made in this IRWM Plan Update.

Table 10-3: Technical Analysis and Methods Used in the 2013 and 2019 IRWM Plans

Data Used to Support Plan				
Data or Study	**Reference or Source**	**Analysis Method**	**Results/Derived Information**	**Use in IRWM Plan**
Region Description – Boundaries, Jurisdictions, etc.				
2050 Regional Growth Forecast	SANDAG	Existing demographic and economic trends; local land use plans; forecast model utilizing existing development, future land use plans, proximity to existing job centers, past development patterns, travel times to project location of future growth; consultation with local land use planners	Future land use; future population	Used to determine existing and projected land use, also used to discuss water use and demand
Western U.S. Climate Summaries	Western Regional Climate Center	NOAA coop stations –average annual total rainfall	Rainfall pattern in Region over 150+ years	Used to describe climate, local water source from precipitation
2015 Urban Water Management Plan	Water Authority	SANDAG 2050 Regional Growth Forecast vetted through the Water Authority and the Water Authority's member agencies	Future population within Water Authority service area	Used to determine how many people are served by Water Authority, and in discussion of future water demand
San Diego IRWM Region Acceptance Process (RAP)	RWMG in association with the RAC	Analysis of the Region's unique water management issues to determine an appropriate boundary	Water agency jurisdictional boundaries; Wastewater agency service areas; County boundaries; Physical/hydrologic characteristics	Used to describe appropriate Region boundaries as approved of by DWR in the RAP
San Diego Regional Municipal Separate Storm Sewer System Stormwater Permit (2007)	San Diego Water Board	Permit terms	Duties of Copermittees and principal Copermittee required by MS4 permit	Description of stormwater and urban runoff management responsibilities – this guides how the plan addresses urban runoff and stormwater, and affects project selection, 2013 IRWM Plan objectives, and the Resource Management Strategies Used to determine appropriate Region boundaries
Region Description – Water Supply				
2016 Annual Financial Report	Water Authority	Review of existing records	Water supply volumes or purchases	Used to describe source of water supplied to or by Water Authority member agencies

Data Used to Support Plan				
Data or Study	**Reference or Source**	**Analysis Method**	**Results/Derived Information**	**Use in IRWM Plan**
Bulletin 118	DWR	Review of all Bulletin 118 documents for the Region's groundwater basins	Groundwater yield data, and groundwater balance data (as applicable)	Used to determine groundwater basin locations, limitations of groundwater availability outside Water Authority service area, and establish potential need for protection of groundwater supplies through groundwater management or project selection
2015 Urban Water Management Plan	Water Authority	IWR-MAIN computer model modified to meet Region's parameters and renamed CWA-MAIN	Uses SANDAG 2050 Regional Growth Forecast for input data; Water demand related to income, water prices, and weather	Used to discuss water demand in Region in the context of use type and volume. Also used to link population growth/development with increased water demand.
	Water Authority	Review of information presented in the UWMP	Location of groundwater resources for municipal supply, demineralization treatment capacity for groundwater	Used to discuss groundwater resources used for municipal supply
	Water Authority	Review of information presented in the UWMP	Reservoir capacity	Used to discuss capacity of water storage in reservoirs
	Water Authority, City of San Diego	Review of information presented in the UWMP for the Water Authority and the City of San Diego	Water treatment capacity	Used to discuss potable water production capacity, as well as identify source of raw water for treatment facilities
	Water Authority	Review of projected water supply information	Projected surface water supply, reservoir capacity	Projected Water Supply Table: used to determine water supply reliability in various weather years, provides information in order to develop plan to minimize impacts of drought-related water shortages. Used to produce the California Water Plan Update 2013
2003 Colorado River Quantification Settlement Agreement (QSA)	Water Authority	Terms of the QSA agreement	Volume of water transferred from the Imperial Irrigation District	Used to describe source of imported water in Region
Streamflow monitoring	United States Geological Survey (USGS)	Streamflow gauges	Streamflow information	Used to calculate streamflow volume annually, monthly, to demonstrate availability and timing of surface water from streams, as well as influence of urbanization on streamflow
California Water Plan Update 2013	DWR, Water Authority	Review of Resource Management Strategies (RMS) and information pertaining to water supply availability	Identifies short-term and long-term issues that may impact water supply availability	Used to inform *Strategic Plan* that emphasizes diversification of Region's water portfolio. This priority is used in project selection, BMPs, RMS and other parts of the 2019 IRWM Plan

Data Used to Support Plan				
Data or Study	**Reference or Source**	**Analysis Method**	**Results/Derived Information**	**Use in IRWM Plan**
Region Description – Recycled Water				
2015 Urban Water Management Plan	Water Authority and member agencies	Review of recycled water supply and demand information Water use records; permits	Projected recycled water supply and demand Volume of recycled water use; capacity of recycled water facilities	Used to describe recycled water demand and projected future demand in the Region. Also used to describe the recycled water capacity in the Region
Tertiary treatment capacity permits	San Diego Water Board	Permit language	Permitted recycled water capacity in million gallons per day	Used to locate existing recycled water capacity
Recycled water discharge permits	San Diego Water Board	Permit language	Permitted discharge flows	Used to discuss discharge of recycled water through existing outfalls
Region Description – Water Quality				
California Toxics Rule	San Diego Water Board	US EPA methodologies to protect human health and aquatic life (as referenced in US EPA 40 CFR Part 131, Derivation of Criteria)	Water quality criteria for cyanide, metals, toxic organics	Used to establish water quality standards
Water Quality Control Plan for Ocean Waters of California	State Board	Review of established objectives for ocean waters	Water quality objectives for ocean waters	Used as reference for information on receiving water standards
303(d)-Listed Waters	San Diego Water Board, State Board	Review of 303(d)-listed water bodies in the Region	List of 42 impaired inland waters in Region, 40 impaired coastal waters	Used to discuss water impairment, provide context for priorities, opportunities for improvements, etc. Used to establish constituents of concern for the Region
TMDL studies	San Diego Water Board	Review of TMDLs in the Region	Adopted and initiated studies	Used to discuss progress on establishing TMDLs for impaired waters in the Region.
2004-2005 Regional Urban Runoff Monitoring Program Update	San Diego County Municipal Stormwater Copermittees	Core monitoring, baseline long-term effectiveness assessments	Constituents of concern in the Region	Used to describe constituents of concern for Region, by watershed
1997 San Diego County Groundwater Report	Water Authority	Review of information presented on the Region's groundwater basins	Water quality issues within groundwater aquifers	Used to establish constituents of concern in the Region's principal groundwater aquifer
2017 Regional Stormwater Resource Plan	County of San Diego	Review of information related to stormwater in the Region.	Supplemented existing stormwater understanding.	Used to expand discussion of stormwater issues and water quality.

Data Used to Support Plan				
Data or Study	**Reference or Source**	**Analysis Method**	**Results/Derived Information**	**Use in IRWM Plan**
Region Description – Beneficial Use Protection				
Water Quality Control Plan for the San Diego Basin	San Diego Water Board	Review of Areas of Special Biological Significance	ASBS designation and impact	Determination of 2 ASBSs in Region, which must be protected from change due to human activity
Water Quality Control Plan for the San Diego Basin	San Diego Water Board	Review of Beneficial Uses	Beneficial Use designation	Used to explain the designated beneficial uses for water in the Region
Water Quality Control Plan for the San Diego Basin	San Diego Water Board	Review of water quality objectives	Water quality objectives (surface and groundwater)	The water quality objectives from the Basin Plan are designed to protect beneficial uses. Used to describe surface water quality standards.
Region Description – Flood Management				
Multi-Hazard Mitigation Plan	County of San Diego, Rancho Santa Fe Fire District, all incorporated cities in the Region, FEMA, California Emergency Management Agency	Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) data, Base flood elevations in the HAZUS-MH model	Location and extent of flood hazard areas	Used to discuss areas at risk from flooding in the Region.
Region Description – Stormwater Management				
Region Storm Water Resource Plan (2017)	County of San Diego	Review of water quality issues in each of the Region's 11 watersheds.	Identification of opportunities to enhance utilization of stormwater	Used to discuss high priority water quality issues in the Region. Information from the SWRP also helped to inform the broader discussion of stormwater as a resource.
Stormwater Use and Capture Feasibility Study (2018)	County of San Diego	Review of 303(d)-listed water bodies in the Region	Quantification of potential stormwater capture and prioritization of potential stormwater projects	Used to inform the broader discussion regarding efforts to leverage stormwater resources in the Region.
San Diego Regional Municipal Separate Storm Sewer System Stormwater (MS4) Permit (2007)	San Diego Water Board	Permit terms	Duties of Copermittees and principal Copermittee required by MS4 permit	Description of stormwater and urban runoff management responsibilities – this guides how the plan addresses urban runoff and stormwater, and affects project selection, 2019 IRWM Plan objectives, and RMS

Data Used to Support Plan				
Data or Study	**Reference or Source**	**Analysis Method**	**Results/Derived Information**	**Use in IRWM Plan**
Tentative San Diego Regional Municipal Separate Storm Sewer System Stormwater Permit (2013)	San Diego Water Board	Permit terms	Changes to the 2007 MS4 permit, requirement of the Water Quality Implementation Plans	Used to discuss potential changes in stormwater management that will occur during the life of the 2019 IRWM Plan.
Region Description – Climate Change				
Climate Change Planning Study	Climate Change Workgroup, San Diego IRWM RAC.	Review of scientific literature. A selection of key sources used in this study is provided below.	Study provides climate change data analysis relevant to the Region, describes relevant policies and legislation, provides a vulnerability analysis for the Region, describes the effects of climate change on the Region, and provides management strategies and recommendation for addressing climate change and its likely impacts.	Used to develop recommendations for the Plan to include regarding climate change mitigation and adaptation.
Regional Focus 2050 Study	San Diego Foundation	Review of scientific literature, consultation with climate change experts and local scientists	Effects of climate change on San Diego region. Key impacts: Climate hotter and drier, sea level rises 12-18 inches, water shortage in County, more frequent and intense wildfires, increased public health risks, loss of native species, inability to meet energy needs.	Used in Climate Change Planning Study as a primary source of information on local impacts of climate change as well as local efforts to address climate change.
Focus 2050 White Paper	Coastal Data Information Program	LIDAR for elevation mapping, and projected sea level rise	Maps of projected inundation levels for mean sea level in 2050.	Used to show the impact of sea level rise on beaches and low-lying coastal communities, as well as the risks they face from inundation levels.
Climate Change Handbook for Regional Planning	DWR	Review of scientific literature	Summary of climate change impacts, methods for assessing climate change in individual regions	Used to describe the threats to local and regional water resources from climate change in the Climate Change Planning Study. Methodologies used to assess climate change vulnerabilities in Region.
Energy Aware Planning Guide	California Energy Commission	Review of scientific literature	Links between energy and water use, strategies to reduce energy use in the water sector	Used in the Climate Change Planning Study to discuss the role water use in the Region plays in GHG emissions. It provides the basis for claims of emissions reductions from Plan actions.

Data Used to Support Plan				
Data or Study	**Reference or Source**	**Analysis Method**	**Results/Derived Information**	**Use in IRWM Plan**
California Water Plan Update 2013; Progress on Incorporating Climate Change into Management of California's Water Resources	DWR	Review of scientific literature	Summary of probable climate change impacts	Used to identify which changes may impact the Region and how these impacts may be felt. This provides a selection of needs that the plan addresses through its objectives, project selection, and management plans.
4th Climate Assessment – San Diego Regional Report and San Diego County Ecosystems: Ecological Impacts of Climate Change on a Biodiversity Hotspot	Climate Science Alliance	Review of scientific literature and research on climate change.	Information on potential impacts of climate change specific to the San Diego region, using updated science and new data.	Expanded climate change discussion to describe specific impacts to the region and consequences of water resources and water resource management.
Region Description – DACs				
Median Household Income	American Community Survey, US Census Bureau	Review of census tracts within the Region	Median Household Income (MHI)	Used to determine location of DACs in the Region
Water Needs Assessment (2019)	American Community Survey, US Census Bureau, U.S. EPA EJSCREEN; CalEPA EnviroScreen	Review of census tracts, and environmental justice areas within the Region	Median Household Income (MHI), areas of potential environmental quality issues	Used to determine location of DACs, EDAs, URCs, and EJ communities in the Region and correlate with water resource needs
Region Description – Wildlife and Habitat				
Multiple Habitat Conservation Program (MHCP) and Multiple Species Conservation Program (MSCP)	County of San Diego	Review of location of sensitive resources in the Region, particularly those within relation to water resources	1,075 square miles covered, additional 2,907 square miles to be covered in MSCPs being developed	Conservation plans to protect sensitive resources Habitat linkages
San Diego County Multiple Species Conservation Plan EIR/EIS	United States Fish and Wildlife Service , California Department of Fish and Wildlife (DFW)	Review of vegetation communities within the Region	Information about vegetation communities in the Region, particularly those associated with water resources	Used to describe Vegetation communities in the Region
San Diego County Multiple Species Conservation Plan EIR/EIS	USFWS, DFW	Review of wildlife and threatened species within the Region	Information about wildlife and threatened species in the Region, particularly those associated with water resources	Wildlife and threatened species

10.4 References

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11 Implementation

This chapter addresses requirements set forth in the Impact and Benefit Standard, the Plan Performance and Monitoring Standard, and the Finance Standard in the 2016 IRWM Program Guidelines (DWR, 2016).

11.1 Overview

The intent of this chapter is to document various aspects associated with implementation of the 2019 San Diego IRWM Plan. Specifically, this chapter includes information regarding:

- Progress made on actions identified in the 2013 IRWM Plan that were taken to implement priorities established in the planning studies associated with the 2013 IRWM Plan.
- Potential impacts and benefits that may result from implementation of the 2019 IRWM Plan, including impacts and benefits within the Region, between regions (inter-regional), and those directly affecting disadvantaged communities (DACs), environmental justice-related concerns, and Native American Tribal communities.
- Performance measures and monitoring that will document progress that is being made towards meeting the objectives set forth in the 2019 IRWM Plan.
- Actions that will be taken to ensure that the projects listed in the 2019 IRWM Plan are being implemented.
- Necessary monitoring to ensure that the projects included in the 2019 IRWM Plan comply with applicable rules, laws, and permit requirements.
- Financing information that demonstrates how the 2019 IRWM Plan will be adequately funded, and therefore implemented.

11.2 Implementation Action Plan

The following section provides detailed information regarding implementation actions that may be taken for various priorities identified in the previous 2013 IRWM Plan. Implementation of these priorities serves as a benchmark against which to assess how well the IRWM Plan has been implemented.

11.2.1 Implementation Action Plans for Regional Priorities

As described in detail in *Chapter 2*, *Vision and Objectives*, the workgroup that was convened to evaluate the vision, mission, goals, and objectives for the 2013 IRWM Plan (the Priorities and Metrics Workgroup) did not establish short-term and long-term priorities for the 2013 IRWM Plan. Instead, updated priorities were established based on technical work (planning studies) completed for the 2013 IRWM Plan. Each planning study conducted as part of the 2013 IRWM Plan (refer to *Chapter 7, Regional Coordination*) – the Regulatory Workgroup Report, the Land Use and Water Management

Planning Study, the Climate Change Planning Study, and the Integrated Flood Management Planning Study – include specific recommendations that were determined by and vetted through the stakeholder groups convened for each planning study. In the 2019 IRWM Plan, *Chapter 7, Regional Coordination,* has been updated with additional studies completed in the Region since the 2013 IRWM Plan, including climate change studies. The priority action items developed for the 2013 IRWM Plan were revisited and updated to incorporate these changes and Regional priorities.

The planning study recommendations, while aimed at addressing priority action items specific to each study, can also be considered priorities for the IRWM Program itself because they can be implemented through the IRWM Program. The recommendations may also be implemented through the IRWM projects included in and potentially financed through the IRWM Program. A complete list of the recommendations from the planning studies was presented to the RAC at a joint RAC Meeting/Public Workshop held on April 3, 2013. During this meeting, RAC members and members of the public were asked to review the list of planning study recommendations and take one month (April 10 to May 10, 2013) to identify which actions they would be willing to either 1) take responsibility as lead organization for accomplishing the task, or 2) provide support and involvement.

A final list of recommendations to include in the 2013 IRWM Plan was presented to the RAC at the June 5, 2013 meeting. Table 11-1 provides an overview of the recommendations for the planning studies, the party or parties that have committed to implementing the recommendation(s), and the specific action that will be implemented (specific party commitment). Please note, that as indicated in Table 11-1, some of the commitments made by interested parties are not the same as the full recommendation action included in the planning studies. Further, Table 11-2 includes a list of the planning study recommendations that did not receive implementation commitments.

Since adoption of the 2013 IRWM Plan, substantial progress has been made on the 40 implementation actions with commitments that were identified in Table 11-1. So far, 34 actions have been completed, are underway as on-going efforts, partially completed through other efforts, or attempted (but ultimately abandoned due to lack of interest from other parties). The remaining six actions have not begun at the time of this writing. A summary of progress made is provided here.

Regulatory Workgroup Report

The Regulatory Workshop Report recommended improved coordination between IRWM and regulatory entities, and the use of science-based standards for the San Diego Basin Plan. Since the 2013 IRWM Plan, coordination between the San Diego IRWM Program and the San Diego Water Board has improved, with City of San Diego staff attending San Diego Water Board meetings on behalf of the IRWM Program and a San Diego Water Board representative invited to attend each RAC meeting. At the RAC meetings, the San Diego Water Board representative provides announcements and updates on San Diego Water Board activities that may be of interest to stakeholders and encourages participation in San Diego Water Board programs. During the San Diego Water Board's Triennial Review of the San Diego Basin Plan, IRWM stakeholders provided comments on the Basin Plan's Triennial Review. The San Diego Water Board has also spoken to the RAC about alternate funding opportunities available through their programs.

Land Use Planning Study

The Land Use Planning Study recommended collaborative water resource and land use planning efforts, as well as ongoing communication and information sharing between water resource and land use managers. Since the 2013 IRWM Plan, a model sustainable landscape guide, a model stormwater management ordnance, and conservation plans and guidelines for community and backyard gardens were developed to support efforts to conserve water resources and reduce water quality impacts. The second IRWM Summit, held February 29, 2016, also served as a forum to bring together managers from different fields, including water resources and land use. At the summit, one speaker acknowledged the relationship between water resources and land use planning, the importance of a coordinated planning effort, and the value of encouraging relationships between different resource managers.

Two of the recommended actions from the Land Use Planning Study were ultimately dropped after efforts to engage additional organizations failed to result in a response. These actions were preparation of a model grey water ordinance and professional organization workshops with informal "meet & greets". Based on the lack of participation by stakeholders when implementation of these actions was initiated, they are no longer considered to be regional priorities.

Climate Change Planning Study

The Climate Change Planning Study recommended that the IRWM Plan include a climate change objective and associated targets. These were first incorporated into the 2013 IRWM Plan. As identified in *Chapter 2, Vision and Objectives*, the climate change objective has since been elevated to a goal in the 2019 IRWM Plan, which uses a climate change framework to help characterize how the IRWM Program addresses the Region's climate change vulnerabilities, adaptation, and mitigation. Climate change science and understanding of impacts to the region has been incorporated in more depth in the 2019 IRWM Plan, as compared to the 2013 IRWM Plan.

Integrated Flood Management (IFM) Planning Study

The IFM Planning Study recommended increased collaboration between floodplain managers and agencies to develop a better understanding of regional flood risks and a watershed database to assist in flood management planning, as well as to identify common agency and flood management issues and constraints, improve awareness of IFM, and define watershed flood management goals. Flood Management Association, an active participant in the San Diego IRWM Program that is represented on the RAC, holds regular luncheons and an annual conference that incorporates many of the recommendations for increased collaboration and improved understanding of regional flood risks.

Since the 2013 IRWM Plan, there have been changes to the State's approach to stormwater management, as agencies increasingly move towards treating stormwater as a resource. Since publication of the 2013 IRWM Plan, development of the Water Quality Improvement Plans (WQIPs), the Stormwater Resources Plan (SWRP), and the upcoming Stormwater Capture and Use Feasibility Study (SWCFS) have helped to improve regional understanding of stormwater management and opportunities. As a result, some of the recommendations in the IFM Planning Study are no longer relevant to the Region as envisioned. Updated understanding of stormwater in the Region is being incorporated in the 2019 IRWM Plan.

Table 11-1: 2013 Implementation Commitments from 2013 Planning Study Recommendations

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment	Status
Regulatory Workgroup Report[1]	Improve communication between IRWM Program and the San Diego Regional Water Quality Control Board (San Diego Water Board)	R-1	Assign IRWM liaison to San Diego Water Board	City Public Utilities	City will assign Senior Staff to be IRWM liaison to San Diego Water Board	Complete or Underway
		R-2	Provide periodic IRWM progress reports to San Diego Water Board	City Public Utilities	City's commitment will involve assigning existing staff to: 1) attend monthly meetings of the Water Board, 2) review agendas and proposed Board Actions ahead of each meeting, 3) report out at RAC meetings on Water Board actions, and 4) once or twice per year make a presentation to the Water Board about the status of the San Diego IRWM Program.	Complete or Underway
	Ensure consistency between IRWM Plan and San Diego Water Board Practical Vision	R-3	Monitor development of San Diego Water Board Practical Vision[2]	RWMG	Same as Recommendation Action	Complete or Underway
		R-4	Incorporate priority themes from San Diego Water Board Practical Vision into IRWM Plan	RWMG	Same as Recommendation Action	Complete or Underway
		R-5	Coordinate with San Diego Water Board for consistency in IRWM Plan and Practical Vision	RWMG	Same as Recommendation Action	Complete or Underway
	Identify science-based Basin Plan modifications that may warrant higher priority than provided in 2011 triennial review	R-6	Convene IRWM stakeholders to (1) review Basin Plan review priorities, resources, and schedules, (2) identify additional priorities of interest to IRWM stakeholders, (3) determine IRWM stakeholder interest in supporting San Diego Water Board to address additional priorities	RWMG IEA- Support[3]	RWMG will obtain input from IRWM Stakeholders regarding the three actions identified in the Recommendation Action	Complete or Underway
		R-7	Convene workshop with San Diego Water Board and IRWM stakeholders to discuss priorities identified by IRWM stakeholders	RWMG	Same as Recommendation Action	Complete or Underway

[1] Recommendations not prioritized
[2] The Regional Water Quality Control Board Draft Practical Vision is described in *Chapter 7, Regional Coordination*
[3] IEA is an abbreviation for the Industrial Environmental Association, a non-governmental organization

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment	Status
	Identify research, data collection, data management, data assessment, and resources required to support San Diego Water Board's process for science-based evaluation of the prioritized Basin Plan objectives	R-8	Convene workshop with San Diego Water Board and IRWM stakeholders to discuss research, data collection, management and assessment, and resources required to address objectives that warrant scientific update or development of site-specific objectives	RWMG IEA- Support	RWMG will provide a forum for the San Diego Water Board and IRWM stakeholders to convene, and will share outcomes with the RAC	Complete or Underway
Regulatory Workgroup Report[4]	Identify existing 303(d) listings that may warrant reevaluation or reclassification	R-9	Convene IRWM stakeholders to (1) review 303(d) listings of the Region's reservoirs, (2) identify 303(d) listings of reservoirs that may warrant reevaluation or reclassification, (3) determine IRWM interest in supporting San Diego Water Board reassessment or reclassification of 303(d) reservoir listings of concern	Water Authority IEA- Support[5]	Water Authority will obtain input from IRWM Stakeholders regarding the three actions identified in the Recommendation Action	Not Begun
		R-10	Convene workshop with San Diego Water Board and IRWM stakeholders to discuss 303(d) waters that may warrant reevaluation or reclassification to better support IRWM goals and Practical Vision priorities	RWMG	RWMG will provide a forum for the San Diego Water Board and IRWM stakeholders to convene, and will share outcomes with the RAC	Not Begun
	Identify projects or actions that could improve water quality of 303(d) listed waters and attain water quality objectives	R-11	Convene workshop with San Diego Water Board and IRWM stakeholders to identify (1) projects that could improve water quality of 303(d) waters and (2) alternate means to traditional TMDLS to achieve water quality objectives	RWMG City Stormwater - Support	RWMG will provide a forum for the San Diego Water Board and IRWM stakeholders to convene, and will share outcomes with the RAC	Complete or Underway
	Identify research, data collection, data management, data assessment, and resources required to support the San Diego Water Board's process for science-based evaluation of the prioritized 303(d) listings	R-12	Convene workshop with San Diego Water Board and IRWM stakeholders to discuss data collection, management, and assessment, and required resources to reevaluate or reclassify 303(d) listings	RWMG City Stormwater - Support	If needed, the RWMG will convene a workshop to discuss actions included in the Recommendation Action, and will share outcomes with the RAC	Complete or Underway

[4] Recommendations not prioritized
[5] IEA is an abbreviation for the Industrial Environmental Association, a non-governmental organization

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment	Status
	Develop and maintain a list of wetlands and riparian habitat restoration needs and opportunities	R-13	Convene regulators and IRWM stakeholders to discuss (1) means of identifying, coordinating, and prioritizing restoration needs and opportunities and (2) potential action plan for developing and maintaining habitat restoration needs and opportunities priorities list	RWMG	RWMG will assist regulators and IRWM stakeholders in discussing the actions included in the Recommendation Action	Complete or Underway
	Evaluate potential opportunities for coordination of San Diego Water Board SEP process and other compensatory mitigation programs to support and promote habitat restoration and recovery	R-14	Convene meeting with San Diego Water Board to assess means for coordinating IRWM Program support with San Diego Water Board SEP process and other mitigation programs	RWMG	Same as Recommendation Action	Complete or Underway
Land Use Planning Study[6]	Support or facilitate collaborative preparation of various joint water resources and land use planning efforts and work in the Region	L-2	Prepare model grey water ordinance	Zoo[7]	Same as Recommendation Action	Abandoned
		L-3	Prepare guidelines for distribution outside agencies to encourage “watershed friendly” design, construction, and maintenance of development	City Public Utilities	City’s commitment will involve: 1) updating the Source Water Protection (SWP) Guidelines for New Development that the Water Department published in 2004, and 2) embarking on an outreach effort to have land use agencies put the SWP Guidelines to use, which would include informational documents.	Not Begun
		L-4	Prepare information sheets on potential water resource impacts of various land uses for land use planners to refer when evaluating proposals	City Public Utilities	Same as commitment for Recommendation Action L-3	Complete or Underway
		L-5	Prepare model sustainable landscape guidelines	Water Authority	Same as Recommendation Action	Complete or Underway

[6] Recommendations prioritized within each objective
[7] Zoo is an abbreviation for the Zoological Society of San Diego, a non-governmental organization

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment	Status
	Support or facilitate collaborative preparation of various joint water resources and land use planning efforts and work in the Region	L-6	Incorporate broader range of water resources goals which support IRWM Plan into SANDAG's Regional Comprehensive Plan	Water Authority	Same as Recommendation Action	Complete or Underway
		L-7	Prepare model stormwater management ordinance	City Stormwater	Same as Recommendation Action	Complete or Underway
		L-9	Prepare conservation or resource management plans/guidelines for community and backyard gardens	Water Authority	Same as Recommendation Action	Complete or Underway
	Provide opportunities for information sharing, regular communication, and meaningful collaboration for water resources and land use managers	L-15	Build relationships and share information through workshops, webinars, lunch sessions, etc. hosted by various professional associations (AEP, APA, APWA, etc.) Informal "meet & greet" preceding each event.	Zoo	Same as Recommendation Action	Abandoned
		L-16	Provide annual forum on topics of mutual interest and importance to water resources and land use agencies	Zoo Water Authority	Same as Recommendation Action	Complete or Underway
Climate Change Planning Study[8]	Include recommended objectives and targets in the Plan	C-2	Objective: Effectively address climate change through adaptation and mitigation in water resource management	Incorporated in 2013 IRWM Plan	Same as Recommendation Action	Complete or Underway
	Include recommended objectives and targets in the Plan	C-3	Target 1: Encourage development of cost-effective carbon-efficient strategies for water management projects	Incorporated in 2013 IRWM Plan	Same as Recommendation Action	Complete or Underway
		C-4	Target 2: Incorporate adaptation strategies to respond to sea-level rise, rainfall variability, and temperature variability in planning for water and wastewater management	Incorporated in 2013 IRWM Plan IEA- support	Same as Recommendation Action	Complete or Underway
		C-5	Target 3: Reduce or neutralize GHG emissions in all areas of water resource management	Incorporated in 2013 IRWM Plan	Same as Recommendation Action	Complete or Underway

[8] Recommendations not prioritized

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment	Status
Integrated Flood Management Planning Study[9]	Increase regional floodplain manager and agency collaboration	F-1	Develop framework and process for different level of communication for floodplain managers	County	Same as Recommendation Action	Not Begun
		F-2	Engage watershed stakeholders in workshop forum which brings together the regulators and floodplain managers to discuss different competing watershed issues (1) roadblocks to flood management, (2) regulatory constraints	FMA[10]	Same as Recommendation Action	Complete or Underway
		F-3	Provide basis for regional working forum of floodplain managers that allows increased collaboration and future regular meetings	County FMA	Same as Recommendation Action	Complete or Underway
	Increase regional floodplain manager and agency collaboration	F-4	Promote communication across jurisdictional boundaries and within watershed	County FMA	Same as Recommendation Action	Complete or Underway
	Improve understanding of regional flood risks	F-5	Develop understanding of the different types of flooding from both regional level, watershed level, and local level included specific flood problems for the different areas.	City Stormwater– Support FMA	Same as Recommendation Action	Complete or Underway
Integrated Flood Management Planning Study[11]	Improve understanding of regional flood risks	F-6	Provide methodology to define the magnitude of flood risks in order to better prioritize the level of flood risk which integrates potential flood damage	City Stormwater– Support FMA- Support	Same as Recommendation Action	Complete or Underway
	Improve understanding of regional flood risks	F-7	Review common recurring flood damage losses	City Stormwater - Support	Same as Recommendation Action	Not Begun
	Develop watershed database to assist in flood management planning	F-8	Collect and compile watershed mapping information related to flood hazards and watershed information in a GIS format, as well as developing a schema for managing the data to benefit future watershed planning	City Stormwater - Support	Same as Recommendation Action	Complete or Underway

[9] Recommendations not prioritized
[10] FMA is an abbreviation for the Floodplain Management Association, a non-governmental organization
[11] Recommendations not prioritized

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment	Status
	Identify common agency flood management issues and constraints	F-9	Develop background from stakeholder information on the common problems implementing flood hazard mitigation projects and the different constraints.	City Stormwater - Support	Same as Recommendation Action	Complete or Underway
	Define different watershed flood management goals	F-10	Develop understanding of the different priority goals of the watershed stakeholders based on the common recurring flooding issues/problems/hazards	City Stormwater - Support	Same as Recommendation Action	Complete or Underway
	Initiate understanding and awareness of “integrated flood management” (IFM)	F-11	Prepare educational material and information on background of IFM to encourage better understanding of the required thought process	City Stormwater - Support FMA- Support	Same as Recommendation Action	Complete or Underway
	Initiate understanding and awareness of “integrated flood management” (IFM)	F-12	Provide examples of IFM projects to assist in understanding how to apply and the basis of the key planning principles which are different from conventional watershed planning	City Stormwater - Support	Same as Recommendation Action	Complete or Underway
	Identify applicable IFM strategies on global and watershed basis	F-13	Define common types of IFM strategies which integrate different planning principles through different scales (1) watershed level, (2) city level, and (3) neighborhood/local level	IEA-Support[12]	Same as Recommendation Action	Complete or Underway

[12] IEA is an abbreviation for the Industrial Environmental Association, a non-governmental organization

Table 11-2: 2013 Planning Study Recommendations without Commitments

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment
Land Use Planning Study[13]	Support or facilitate collaborative preparation of various joint water resources and land use planning efforts and work in the Region	L-1	Distribute model water resources policies for use by municipalities	No responsible parties or commitments have been identified.	
		L-8	Prepare model guidelines for green infrastructure for public agencies and for private development		
		L-10	Coordinate BMPS in municipal codes when water agency is not the municipality		
		L-11	Prepare conservation or resource management plans/guidelines for agricultural operations		
		L-12	Prepare model green building standards		
	Provide opportunities for information sharing, regular communication, and meaningful collaboration for water resources and land use managers	L-13	Create GIS-based Resource Guide of all agencies, organizations, and stakeholders responsible for or involved in water management and land use planning for region. Host Guide on IRWM website. See study for details on what Guide would contain.		
		L-14	Expand SANDAG's emphasis on smart growth to encompass strategies that improve reliability and quality of water resources		
		L-17	Develop meeting template that includes all entities involved in land use planning and water resource planning and management for each jurisdiction.		
	Provide opportunities for information sharing, regular communication, and meaningful collaboration for water resources and land use managers	L-18	Utilize existing groups to disseminate key information and support integrated approach to water resources management and land use decision making		
		L-19	Include examples of viable land use practices that can improve reliability and quality of water resources on IRWM website		
		L-20	Develop a guide for engaging tribal nations in land use planning and water management		
		L-21	Utilize social media, pertinent websites, etc. to share key information with officials, planners, and water resources managers		
Climate Change Planning Study[14]	Use of adaptive management[15]	C-1	Encourage consideration of DWR's *Climate Change Handbook* recommendations on developing adaptive management plans: 1) Identify risk triggers 2) Quantify impacts and uncertainties 3) Evaluate strategies and define flexible implementation paths 4) Monitor performance and critical variables 5) Implement or reevaluate strategies when triggers are reached	No responsible parties or commitments have been identified.	

[13] Recommendations prioritized within each objective
[14] Recommendations not prioritized
[15] The process of adaptive management includes: 1) data gathering and analysis of vulnerabilities when determining triggers and 2) evaluating if triggers have been met. It is further anticipated that climate change vulnerabilities will be reassessed during future IRWM Plan updates.

Planning Study	Objective	#	Recommendation Action from Planning Study	Responsible Party	Party Commitment
Integrated Flood Management Planning Study[16]	Identify applicable IFM strategies on global and watershed basis	F-14	Develop background on specific types of "opportunities" within the watershed that facilitate the application of IFM	No responsible parties or commitments have been identified.	
		F-15	Develop regional mapping of both opportunities and constraints related to flood management		
	Develop watershed planning guidance program implementing IFM	F-16	Develop watershed planning process framework with key planning principles for implementing IFM that focuses on linking sustainability, water resource management, and land use planning to flood management and the entire hydrologic cycle.		
		F-17	Prepare guidance on integrating "land use planning" as central element of IFM and define how it can be utilized for different type of floodplain hazards issues		
		F-18	Develop overall guidance document that provides stakeholders the basis for watershed planning with IFM		
	Create watershed planning tools to facilitate IFM project development	F-19	Develop a specialized GIS based tool which assists in the defining locations of IFM projects at a regional scale and can provide maximum multiple benefits and provides method for prioritizing flood management projects		

[16] Recommendations not prioritized

11.2.2 Implementation Issues for Priority Projects

Some action items listed in Table 11-1 and Table 11-2 above may be implemented through projects that are designed to address Regional priorities. These projects may be implemented through the IRWM Program and subsequently funded through IRWM-related funding mechanisms, or may be implemented independently of the IRWM Program through other programs and funding mechanisms. Other priorities for the Region may be implemented by projects designed to address the Technical Development Areas developed for the 2019 IRWM Plan (see *Chapter 10, Data and Technical Analysis*): 1) Sustainable Water Development, 2) Stormwater as a Resource, 3) Invest in DAC-EDA-EJ Systems, and 4) Enhance Infrastructure.

If the programs are implemented independently of the IRWM Program, implementation issues may occur as a result of funding priorities. In other words, given that independent implementation would occur at the discretion of the implementing entities, those entities may experience prioritization shifts, budget changes, or other unforeseen funding issues that could delay or stall implementation.

If projects that are implemented to address the action items listed Table 11-2 are funded by the IRWM Program, there could be potential implementation issues associated with IRWM Program funding. Potential IRWM Program-related implementation issues that have been experienced to date and are anticipated to continue given the current status of the statewide IRWM Program include: 1) the ability to fund pilot projects and studies, 2) the amount of technical information required by IRWM grant applications, 3) regulatory requirements, and 4) potential lack of IRWM funding in the future. Those issues are described further below.

Funding Pilot Projects and Studies

Proposition 84 and Proposition 1 Implementation Grants administered through the California Department of Water Resources (DWR) emphasize the construction/implementation phase of projects, and therefore are best-suited to fund projects that are shovel-ready. This emphasis on implementation means that the IRWM Program provides limited funding for other types of projects, such as pilot projects and studies. While funding may be limited for pilot projects and studies, these types of projects are often necessary in order to assess alternatives and develop projects that can be successfully implemented to achieve desired benefits. The City of San Diego's Advanced Water Treatment Demonstration Project was partially funded by and IRWM grant, and played a critical role in development of the City's Pure Water San Diego project. Without pilot projects and studies, projects may be shelved, or money may be wasted implementing projects that encounter unexpected obstacles that could have been revealed and avoided through implementation of a pilot project or study. Encouragingly, DWR has proposed under the Proposition 1 Implementation Grant process to consider the use of innovative technology, though how DWR will use this when evaluating projects remains unknown at the time of this writing.

Technical Requirements

While anticipated to be less burdensome than previous Proposition 84 Implementation Grants, Proposition 1 Implementation Grant applications are anticipated to still require a substantial amount of technical information to complete and successful enter into a funding agreement, particularly with respect to environmental documentation, permitting, and alternatives analyses. The technical information required for IRWM Implementation Grants is often so involved that it is beyond the ability of project partners (local project sponsors) to provide in sufficient detail at the time of the proposal solicitation. This is especially true for small non-profit organizations, disadvantaged communities (DACs), economically distressed areas (EDAs), underrepresented communities (URCs), environmental justice (EJ) communities, and tribes, which may not have the resources necessary to gather or generate this information. The technical requirements of IRWM-related grant opportunities have been noted by San Diego IRWM stakeholders as a barrier that prevents some stakeholders from seeking out IRWM funding; therefore, the technical requirements of IRWM-related grant opportunities may also be a potential barrier to implementation of priorities included in Table 11-1.

Regulatory Requirements

Proposition 1 Implementation Grants require grantees to comply with all applicable California regulations to be eligible for funding. Tribal nations in the Region have expressed concern that DWR may inappropriately apply California Environmental Quality Act (CEQA) requirements to tribal projects submitted to the IRWM Program. Tribal reservations are subject to the National Environmental Protection Act (NEPA), not CEQA. This requirement may be a significant barrier to tribal participation in the IRWM Program since it would require tribes to give up their tribal sovereignty in order to use State funding for a project on tribal land. In addition, DWR's Concept PSP for the Proposition 1 IRWM Implementation Grant – Round 1, which will occur in 2018 and 2019, included a requirement that CEQA be completed for all non-DAC and non-Tribal projects prior to grant agreement execution, which is expected to occur no later than six months after final grant award notification. This means that many project sponsors would need to begin the CEQA process prior to knowing whether the project received IRWM grant funding, and that IRWM funding may not be available to pay for development of CEQA documents. This represents a substantial financial barrier, especially for smaller agencies and non-profits.

Potential Lack of Future IRWM Funding

Funding support for DWR's IRWM Grant Program has resulted from voter-approved water bond measures in 2002, 2006, and 2014. A new water bond measure (Proposition 3) on the November 2018 state ballot offers no grant funding for IRWM projects, although it does contain a one-time allocation of $5 million to support planning and implementation activities by RWMGs that have been approved by DWR. There are 49 such approved RWMGs in California. The San Diego RWMG has played a leadership role in legislative advocacy as it relates to IRWM funding. The City of San Diego and Water Authority both actively participate in the Roundtable of Regions (a stakeholder-led group of RWMG practitioners) and the IRWM Stakeholder Focus Group established by DWR to help develop an IRWM Strategic Plan (renamed Stakeholder Perspectives upon release in March 2017). The RWMG agencies have also worked with the local legislative delegation in Sacramento to propose legislation to address IRWM grant funding issues that discouraged participation in IRWM by DACs. One such bill, SB 208, signed into law in 2015, provided advanced payment of the first 50 percent of grant funding to projects that benefit DACs and meet certain other requirements. Another bill, AB 2064, was introduced in 2018 to extend advanced payment to 100% of grant funds. Multiple RAC members and other stakeholders have also engaged with the San Diego delegation to support expanded IRWM funding and ease the burden of funding applications and project administration.

All of Proposition 1's IRWM funding is expected to be awarded by 2022. With no future IRWM funding on the horizon, implementing projects that address regional needs and priorities in the IRWM Plan may be more difficult. Many of the projects that have been funded by the San Diego IRWM Program to achieve goals established in the San Diego IRWM Plan would not have been implemented or would have been implemented in a non-integrated fashion without IRWM funding. Should IRWM funding no longer be available in the future, the San Diego IRWM Region anticipates a scaled-down IRWM Program moving forward, which will further increase the challenges of addressing the Region's needs.

11.3 Benefits and Impacts

Advanced Water Purification Facility is leading to future supply reliability that will be achieved through the PureWater Program.

Photo credit: Marsi Steirer, City of San Diego

The purpose of this section of the 2019 IRWM Plan is to document potential impacts and benefits associated with implementation of the Plan, and to clearly communicate those potential impacts and benefits to IRWM stakeholders. Implementation of the 2019 IRWM Plan involves both implementation of the IRWM Program itself and implementation of water management projects. As such, the following sections contain information regarding potential impacts and benefits of IRWM Plan implementation within the Region, between IRWM regions (inter-regional), and those that may directly affect DACs, EDAs, URCs, EJ-related concerns, and Native American Tribal communities. Table 11-3 includes a synthesis of this information, and also includes examples of potential projects that could be implemented to address each objective.

One of the central features of the 2019 IRWM Plan is the San Diego IRWM Objectives that were revised by stakeholders as part of the 2019 IRWM Plan development process (refer to *Chapter 2, Vision and Objectives* for more information). Due to the importance of the IRWM Objectives, the objectives were used to determine potential impacts and benefits associated with implementation of the 2019 IRWM Plan.

Projects that are implemented through the IRWM Program undergo an impact/benefit analysis during the project selection and vetting process as the project selection workgroup determines and weighs the benefits and impacts of each project. This benefit/impact evaluation process, including the numeric scoring criteria assigned to each project, is described in *Chapter 9, Project Evaluation and Prioritization.*

11.3.1 Potential Benefits and Impacts

Regional Benefits and Impacts

Implementation of the 2013 IRWM Plan (and achievement of the San Diego IRWM Objectives) has resulted in substantial benefits to the Region. As the 2019 IRWM Plan is implemented through projects, benefits to the Region derived from IRWM Program activities are expected to increase. Due to the wide-ranging nature of the San Diego IRWM Objectives, potential water resources benefits are anticipated to be diverse and extensive. Collectively, the San Diego IRWM Objectives would result in the regional benefits described in Table 11-3 below. The benefits associated with the IRWM Program and IRWM Projects are anticipated to address issues and concerns of stakeholders and interested parties within the Region and within the San Diego Funding Area. The Region's Proposition 50 IRWM Implementation Grant's projects have all been completed. Figure 11-1 demonstrates the primary physical benefits provided to the Region as a result of those projects. Because the figure only shows the primary benefits, additional benefits to the Region were realized but not captured in the figure.

Figure 11-1: Primary Benefits to the Region from the Proposition 50 Implementation Grant-Funding Projects

Projects awarded grant funding through Prop 50 realized a multitude of benefits. A total of 59,061 AFY of water was saved or created through Prop 50 projects. In addition, Prop 50 projects were able protect or restore 2,754 acres of natural land. Of this total, 767 acres of protected/restored land came from reservoir restoration projects. During Prop 50, $25 million was awarded to fund 19 projects in the Region, of which 18 were ultimately implemented.

Implementation of the 2019 IRWM Plan could also potentially result in impacts to the Region. Potential impacts associated with the IRWM Program generally include time and costs associated with implementing the program. Potential impacts associated with IRWM projects would be similar to those impacts associated with any other water resources-related planning, design, or construction projects. Impacts may include short-term, site-specific impacts related to construction, and long-term impacts associated with project operation. Table 11-3 below provides a summary of potential impacts that could occur due to implementation of the 2019 IRWM Plan.

Inter-Regional Benefits and Impacts

Implementation of the San Diego IRWM Objectives is expected to result in benefits and impacts that extend beyond the IRWM Region. Collectively, the San Diego IRWM Objectives will result in the inter-regional benefits and impacts described in Table 11-3 below.

Benefits and Impacts to DACs, EDAs, URCs, EJs, and Native American Tribal Communities

Due to the diverse nature of benefits associated with the IRWM Program and with IRWM Projects, benefits are anticipated to span throughout the IRWM Region, and even potentially beyond the IRWM Region. As described in detail in *Chapter 3, Region Description,* DACs, EDAs, URCs, and EJ communities are dispersed throughout the Region. Further, Native American Tribal communities are also located throughout the Region, albeit more heavily concentrated in the eastern portion of the Region. Due to both the dispersed nature of potential benefits from the IRWM Program and IRWM projects and the dispersed nature of DACs, EDAs, URCs, EJ communities, and Native American Tribal communities, benefits provided to the aforementioned communities as a result of IRWM Program or IRWM project implementation are likely to be similar to those that would occur throughout the Region as a whole. Table 11-3 highlights in italics how implementation of the IRWM Program and IRWM projects may specifically and directly benefit DACs, EDAs, URCs, EJs, and Tribal communities.

Similarly, impacts that would occur to the aforementioned communities as a result of IRWM Program or IRWM project implementation are not anticipated to be acute, and are likely to be similar to those that would occur throughout the Region as a whole.

Table 11-3: Summary of Potential Impacts and Benefits

San Diego IRWM Objectives		IRWM Program	IRWM Projects - Regional	IRWM Projects - Interregional	Project Examples
A. Encourage the development of integrated solutions to address water management issues and conflicts	**Benefits**	• Encourages development of integrated projects • Communication and trust-building among IRWM stakeholders enables partnerships for addressing water management issues	• Integrated solutions can be more cost-effective, saving the Region time and money • Integration can reduce conflicts, which can result in faster implementation and therefore faster accrual of project-related benefits • Integration may include a variety of sponsors, who can add expertise to a project and increase the overall benefits provided by the project • *Integration can potentially partner DACs, URCs, EDAs, EJ, and Tribal communities with other partners that can facilitate project implementation. This is especially true of Tribal communities that may find contracting with DWR difficult without a non-Tribal partner*	• Integration can result in more benefits than single-purpose projects. Such benefits could extend beyond the IRWM Region and directly benefit other IRWM regions • Provide guidance to the priorities and issues facing each sub-region	Any IRWM project that includes partnership integration (multiple partners), resource management integration, beneficial use integration, geographic integration, or hydrologic integration. Due to the importance of integration, projects are required to include a form of integration to be considered for IRWM Program funding (refer to *Chapter 9, Project Evaluation and Prioritization*)
	Impacts	• Will require an expenditure of public funds and/or staff time to accomplish	• Integration can require additional time and effort to implement as compared to single-agency, single-use projects • Integration may be difficult for projects that are shovel-ready	• Integrated projects within the San Diego IRWM Region could potentially detract from implementation of inter-regional projects	
B. Maximize stakeholder/ community involvement and stewardship of water resources, emphasizing	**Benefits**	• Enhance stakeholder participation • *May benefit DACs, EJ, and Tribes by connecting these groups with other IRWM stakeholders that they*	• Target resources to projects meeting urgent needs from different communities. Streamline prioritizing process with regional stakeholder meetings	• Address interregional water resource management issues with stakeholders, optimize resource allocation	Any IRWM project that directly involves stakeholder or community involvement could result in the benefits or impacts associated with this objective. Due to the

San Diego IRWM Objectives		IRWM Program	IRWM Projects - Regional	IRWM Projects - Interregional	Project Examples
education and outreach		*would generally not engage or partner with*			importance of stakeholder involvement, projects are required to meet this objective to be considered for IRWM Program funding (refer to *Chapter 9, Project Evaluation and Prioritization*)
	Impacts	• Increased coordination among the region's water resource managers could increase competition for limited State and federal grant funding • Increased stakeholder involvement could result in conflicting missions between stakeholders leading to increased difficulty in decision making	• Increased stakeholder involvement could lead to more projects requesting funding, making project selection more difficult, expensive, and time consuming	• Increased stakeholder participation could make interregional efforts more challenging	
C. Effectively obtain, manage, and assess water resource data and information	**Benefits**	• Collect and assess water resource management data for decision making and future resource management activities	• Active sharing of most current understanding on water management issues and alternative solutions	• Contributes accessible data for improved resource management within the San Diego Funding Area and throughout California	Any IRWM project that works to provide centralized public access to water management data or involves the collection and evaluation of water resources data to support decision-making or problem-solving
	Impacts	• Data requirements may reduce willingness to participate in IRWM efforts	• *Could increase costs to collect and manage data*	• Could contribute to interregional decisions based on regional data that may not apply to other regions	
D. Further scientific and technical foundation of water management	**Benefits**	• Obtain valid and empirical knowledge of water resource management • Active sharing of most current understanding on water management issues and alternative solutions	• Would help projects identify effective or efficient solutions • Increase project ability to receive funding by providing scientific support and justification	• Develop water management techniques and strategies applicable to other regions for improved resource management in California	Any IRWM project that works to collaborate with regulatory agencies to resolve water management issues; projects may include pilot projects or studies

San Diego IRWM Objectives		IRWM Program	IRWM Projects - Regional	IRWM Projects - Interregional	Project Examples
	Impacts	• Could lead to stakeholder conflict if perceived as only addressing a few management goals, rather than all management goals	• Science may not support the methods or goals of projects that stakeholders wish to pursue	• May result in conflicts between regional management.	
E. Develop and maintain a diverse mix of water resources, encouraging their efficient use and development of local water supplies	**Benefits**	• Can help water suppliers to coordinate management activities related to supply diversification	• Can help to increase water supply reliability for the region • Improve irrigation and landscaping efficiency • Development of local projects provides more local control over implementation and management of resource • Potential for improved water quality from local seawater and groundwater demineralization projects • *Could potentially increase the reliability of water pricing, which would directly benefit all water customers, but would specifically benefit DACs that are more heavily impacted by steep water rate increases*	• Could reduce dependence on imported water supplies that are ultimately sourced from outside the Region, thereby making those imported water supplies available for other users outside of the IRWM Region	Any IRWM project that increases local water supplies within the region. These projects may include recycled water supply projects (non-potable or potential potable projects) or projects that provide additional groundwater supplies
	Impacts	• Potential issues may arise between water suppliers if there are conflicts or disagreement regarding how water supplies should be diversified	• Some local water supply sources may be of lower water quality than existing sources, which could exacerbate water quality issues • Construction related impacts including dust, noise, and traffic generation associated with large-scale water supply projects • Alternative water supplies may be more expensive than existing	• Local water supply development in the San Diego Region may differ from water supply provisions and planning efforts in other regions, creating conflicts with other IRWM Regions	

San Diego IRWM Objectives		IRWM Program	IRWM Projects - Regional	IRWM Projects - Interregional	Project Examples
			water supplies from the perspective of end-users (water rate payers)		
F. Construction, operate, and maintain a reliable and resilient infrastructure system	**Benefits**	• Provide awareness and support for regional water-related infrastructure needs, and provide a forum for stakeholders to discuss infrastructure issues	• Provide infrastructure for water and wastewater treatment and conveyance to maintain supply reliability and improve water quality. • Provide infrastructure for stormwater treatment and conveyance to protect and restore water quality • *Will help address critical water supply and water quality needs of DACs and Tribes, which may suffer from unreliable or unsafe water infrastructure due to lack of funds or technical capacity*	• Improve interregional water supply reliability and water quality • Reduce risk to water supply and water delivery from natural or man-made disaster	Any IRWM project that directly or indirectly involves water-related infrastructure. These projects may include regional construction-related infrastructure projects that attempt to address emergency and carry-over water deliveries or site-specific habitat-related projects that attempt to maintain natural water resources functions
	Impacts	• Support for certain infrastructure projects and improvements may be controversial, potentially hampering stakeholder relations and outreach efforts	• Construction related impacts including dust, noise, mitigation, and traffic generation associated with large-scale infrastructure projects • Large-scale infrastructure projects can be costly to implement and could potentially cause rate increases.	• Local infrastructure development in the San Diego Region may detract from interregional infrastructure investments, such as those associated with imported water supplies. Such projects could potentially create conflicts with other IRWM Regions	
G. Enhance natural hydrologic processes to reduce the effects of hydromodification and encourage	**Benefits**	• Provide a forum for coordination of flood management efforts across various jurisdictions, and increase coordination between flood managers	• Protect and improve regional water quality downstream of areas with significant erosion • Alleviate flood protection requirements in downstream watersheds	• Promote collaboration on integrated flood management with adjacent regions • Enhancing flood protection in upstream	Any IRWM project that addresses hydromodification, either directly by enhancing or restoring natural hydrologic processes, or indirectly by promoting planning efforts

San Diego IRWM Objectives		IRWM Program	IRWM Projects - Regional	IRWM Projects - Interregional	Project Examples
integrated flood management		and other functional areas such as water quality and stormwater		regions is more cost-effective	to reduce hydromodification and related impacts
	Impacts	• Increasing coordination between functional areas could result in increased conflict or time to resolve flood-related issues	• Can be costly to implement • Hydromodification may have altered the stream in such a way that removal may not result in the expected or desired outcome	• May lead to conflict between flood management goals for different regions	
H. Effectively reduce sources of pollutants and environmental stressors to protect and enhance human health, safety, and the environment	**Benefits**	• Provide a forum to increase awareness for impacts associated with pollutants and environmental stressors	• Protect and improve regional water quality downstream of discharge locations • Reduce human health threats and environmental stressors in downstream water bodies. • Reduce run-off and pollutant discharge • Improve water quality • *Protect EJs, which suffer from disproportionately poor water quality and will benefit more from reduction in pollutants than non-EJs.*	• Promote collaboration on water quality issues with adjacent regions, such as large groundwater basins and water bodies that encompass multiple regions	Any IRWM project that directly addresses/reduces pollution by removing pollutant sources, or those projects that indirectly address water quality and environmental stressors through mitigation activities
	Impacts	• Could be conflict over true source of pollutants or stressors or what constitutes a "safe" level of these constituents	• There may be trade-offs between other project benefits and potential pollutants/environmental stressors	• There may be interregional conflicts between the sources of pollutants/environmental stressors and those who are impacted by impacts associated with these constituents	
I. Protect, restore, and maintain habitat and open space	**Benefits**	• Can provide an opportunity for agencies and parties that manage habitat and open space to coordinate and collaborate with water	• Maintain habitat for natural riparian and aquatic species, improve water quality and flood control in natural channels • Could contribute to improved public health through reduced	• Promoting habitat integrity across regions will increase habitat for natural species and enhance resource stewardship	Any IRWM project that directly protects and restores habitat and open space, or indirectly contributes to habitat and open space via water

San Diego IRWM Objectives		IRWM Program	IRWM Projects - Regional	IRWM Projects - Interregional	Project Examples
		managers and other parties that can both impact and benefit habitat and open space	pollution and increased recreation opportunities	• Habitat restoration could improve air quality and contribute to statewide air quality goals	quality protection, flood management, etc.
	Impacts	• Increasing coordination between different groups could result in increased conflict or time to resolve issues, including regulatory issues across federal, state, and local jurisdictions.	• Implementing habitat restoration and open space projects may conflict with other land uses and be inconsistent with flood management goals and objectives to maintain flood conveyance capacity.	• Integrated projects within the San Diego IRWM Region could potentially detract from implementation of inter-regional projects	
J. Advance water-based enriching experiences	**Benefits**	• Provide awareness and support for water-based recreational opportunities, including recreational beneficial uses established in the Basin Plan	• Maximize beneficial use of available water resources within the Region for recreational purposes • Protect and enhance the serviceability of existing recreational sites and create additional resources for recreational purposes • Could increase recreation-based tourism	• Water-based recreational opportunities in the San Diego Region may be utilized by residents of other IRWM Regions, or may reduce demands for water-based recreation opportunities in other IRWM regions	Any IRWM project that directly or indirectly supports water-based recreational opportunities, such as those projects involving habitat restoration, flood control, and watershed protection
	Impacts	• Support for recreational beneficial uses could conflict with support for other beneficial uses	• Could lead to increased impacts associated with pollution, traffic, etc. that may result from recreation or tourism • Increased competition for limited water resources in the region for other potential beneficial uses	• Support for recreational beneficial uses in the San Diego IRWM Region may conflict with other beneficial uses in upstream water bodies, including those located within other IRWM regions	

11.4 Finance

This section of the 2019 IRWM Plan documents a strategy for implementation and financing of the IRWM Program and IRWM projects included in this plan. As per requirements established by DWR, this section includes the following items:

- Known and potential funding sources, programs, and grant opportunities for the development and ongoing funding of the IRWM Plan.
- Potential funding mechanisms for projects that implement the IRWM Plan.
- An explanation of the certainty and longevity of potential funding sources.
- An explanation of how operation and maintenance costs for IRWM projects could potentially be funded.

As explained in *Chapter 6*, *Governance and Stakeholder Involvement,* the Governance and Financing Workgroup that was convened for the 2013 IRWM Plan provided input regarding potential funding mechanisms for the IRWM Program and IRWM projects. As such, the sections below contain information provided by the IRWM stakeholders that comprised the Governance and Financing Workgroup, coupled with updates from the RWMG.

11.4.1 Plan Financing

The Governance and Financing Workgroup discussed a variety of potential financing options for the IRWM Program. Information provided by the workgroup and elaborated upon through development of the 2019 IRWM Plan is summarized in Table 11-4.

The Governance and Financing Workgroup discussed four potential funding sources for the IRWM Program, including:

- *Business as usual*: the IRWM Program is funded by the RWMG (San Diego County Water Authority, City of San Diego, and County of San Diego). This option is abbreviated at "business as usual" in the following table.
- *501(c)(3)*: The IRWM Program officially becomes a 501(c)(3) non-profit organization, and raises funds accordingly. This option is abbreviated as "501(c)(3)" in the following table.
- *Regional sales tax*: The Region could impose a regional sales tax to fund the IRWM Program. This option is abbreviated as "tax" in the following table.
- *Participation fee*: Each participating agency (potentially RAC members or all stakeholders) could pay a small fee to participate in the IRWM Program. This option is abbreviated as "fee" in the following table.
- *Joint Powers Authority (JPA)*: Formation of a JPA with participating agencies paying a fee for inclusion in the JPA.

The Workgroup also discussed potential barriers that may exist to financing for the IRWM Program, including:

- It may be difficult to raise funds for the IRWM Program, because program management items do not necessarily result in tangible results. Tangible results are often required or desired for various funding sources, especially from public funding sources.

- Precedent has currently been set by the RWMG to fund the IRWM Program. It may be difficult for regional stakeholders to understand the need for IRWM Program funding given this precedent.

Table 11-4 provides an overview of the costs associated with each of the existing program elements that are undertaken to manage the IRWM Program, as well as costs required to prepare and manage the IRWM grant (Proposition 50, Proposition 84, and Proposition 1) process. The table also outlines the certainty and longevity of each potential funding source that was identified by the Governance and Financing Workgroup and RWMG, and describes the potential responsible entity associated with each funding source. Please note that as operations and maintenance costs are not applicable to the IRWM Program efforts, those costs are not elaborated upon in the following table.

Table 11-4: Potential IRWM Plan Financing Components[1]

Program Element	Likely Annual Project Cost	Likely RWMG Staff Commitment		Possible Responsible Entity	Potential Funding Source	Certainty/Longevity of Funding Source
IRWM Program Management						
RWMG Meetings	$42,000	8 hrs pp/month		RWMG agencies	Business as usual	RWMG MOU funds the IRWM Program through 2019. After 2019 there is no certainty of funding.
RAC Meetings	$36,000	8 hrs pp/quarter		501(c)(3) Executive Director and/or Staff	501(c)(3)	Very uncertain. Region would need to determine who would form the non-profit, and this process could take years to establish. This funding source could potentially be sustainable in perpetuity once established.
Tri-County FACC Meetings	$5,000	2 hrs pp/quarter				
DAC Outreach	$18,000	4 hrs pp/quarter		Stakeholders - unknown	Fee	Very uncertain. Governance and Finance Workgroup noted that imposing a fee would potentially reduce involvement in the IRWM Program. The potential longevity of this fee would need to be determined by the implementing entity.
Tribal Outreach	$18,000	4 hrs pp/quarter				
Public Outreach	$36,000	8 hrs pp/quarter				
SDIRWM Report Card	$29,000	8 hrs pp		Stakeholders - unknown	JPA	Very uncertain. Governance and Finance Workgroup noted that a JPA would require interested agencies that would not only participate in the IRWM Program, but would also be willing and able to provide funding. The certainty and longevity of the funding source would, therefore, be dependent upon the status of each agency willing to participate in the JPA.
Data Management System Administration	TBD	96 hrs/ quarter				
Future Update of the IRWM Plan						
Future IRWM Plan Update, including Highlights	$133,000	8 hrs pp/quarter		RWMG agencies	Business as usual	Very uncertain. The next IRWM Plan Update is anticipated in 2024 (in five years), if funding becomes available. There is no RWMG MOU in place for 2024, so there is no certainty of funding for a future IRWM Plan Update/Highlights document.

Program Element	Likely Annual Project Cost	Likely RWMG Staff Commitment		Possible Responsible Entity	Potential Funding Source	Certainty/Longevity of Funding Source
				501(c)(3) Executive Director and/or Staff	501(c)(3)	Very uncertain. The Region would need to determine who would form the non-profit, and this process could take years to establish. Funding sustainability is also dependent upon the funding stream(s) used by the non-profit.
				Stakeholders - unknown	Fee	Very uncertain. It is highly unlikely that the Region could levy a fee to pay for a future planning document.
				Stakeholders - unknown	JPA	Very uncertain. The certainty and longevity of the funding source would, therefore, be dependent upon the status of each individual agency willing to participate in the JPA.
Grants						
Grant administration – currently covered through Implementation Grant funding				RWMG agencies	Grants	Uncertain until grants are awarded. If proposals are only partially funded, cost may be difficult to fund.
Grant applications	$120,000	16 hrs/mo during grant preparation		RWMG agencies	Business as usual	RWMG MOU funds development of grant applications through 2019. After 2019 there is no certainty of funding.
				501(c)(3) Executive Director and/or Staff	501(c)(3)	Very uncertain. The Region would need to determine who would form the non-profit, and this process could take years to establish. This funding source could potentially be sustainable in perpetuity once established.
				Stakeholders - unknown	Fee	Very uncertain. Governance and Finance Workgroup noted that imposing a fee for project proponents would potentially reduce involvement in the IRWM Program. The potential longevity of this fee would need to be determined by the implementing entity.
				Stakeholders - unknown	JPA	Very uncertain. Governance and Finance Workgroup noted that a JPA would require interested agencies that would not only participate in the IRWM Program, but would also be willing and able to provide funding. The certainty and longevity of the funding source would, therefore, be dependent upon the status of each agency willing to participate in the JPA.
TOTAL	**$437,000**					

1 Costs are estimated based on hours spent on these activities over the past four years, multiplied by an average rate for consultant team.

The Region agrees that the intrinsic value of IRWM (using an integrated water management approach) and the relationships built since the Program's inception in 2005 are worth maintaining, but recognizes that the expense of doing so presents a challenge. Given the uncertainty of IRWM funding availability and future support from the State for IRWM efforts, the San Diego IRWM Region is considering its options for the period after Proposition 1 funding is exhausted (anticipated around 2025). If the IRWM program is scaled back because of a lack of state funding for projects, it might include on-going grant administration and support to local project sponsors (LPS) through completion of grant agreement and monitoring requirements, on-going coordination between RWMG member agencies, and periodic notices to stakeholders of items that may be of interest. It may include fewer RAC meetings annually, reduced website updates (not including uploading project monitoring reports as described in *Chapter 10*, *Data and Technical Analysis*); ad-hoc workgroups of critical value to the Region may be eliminated. It would not include any IRWM-specific funding application preparation and may result in less frequent updates to the IRWM Plan itself.

The Region is in the process of identifying opportunities to engage with other programs being implemented or developed in the state, including efforts under the Sustainable Groundwater Management Act (SGMA), SWRCB's Stormwater Grant Program, the California Water Plan Update, and DWR's Water Atlas. Without additional State funding for IRWM, all costs incurred by the Region associated with maintenance of the San Diego IRWM Program would likely be borne by the RWMG member agencies alone, particularly because without the motivation of receiving project funding, it will be more difficult to secure stakeholder participation in alternative program funding opportunities such as a JPA or RAC membership fee.

11.4.2 Project Funding

IRWM planning provides an important first step in positioning the Region to secure the outside funding critical to allow the Region to implement much-needed water management projects and programs. An approved IRWM Plan is necessary for regions to be eligible for funding from the State of California under Propositions 50, 84, 1E, and 1. While there is potential for future funding opportunities to also require an approved IRWM Plan, currently such requirements are not included in any currently proposed bond language.

The Proposition 50 Chapter 8 IRWM Grant Program is a joint program between DWR and the State Board, which provides funding for projects that protect communities from drought, protect and improve water quality, and reduce dependence on imported water. The IRWM Grant Program includes two separate grant types - Planning Grants and Implementation Grants. The San Diego IRWM Region received $25 million under Proposition 50, to fund 19 projects. The San Diego IRWM Program closed its Proposition 50 grant in 2016, ultimately completing 18 projects over seven years. The $25 million grant helped fund projects totaling $72 million in work.

Proposition 84, consisting of four rounds of implementation funding, began in the summer of 2008, and provided approximately $64 million in funding for IRWM projects in the San Diego Region. As of this writing, 17 of the 38 implementation projects funded in the San Diego Region under Proposition 84 have either been completed or are at least 80 percent complete. Proposition 84 has exhausted all of its available IRWM funding.

Proposition 1E provided $300 million statewide for grants for stormwater and flood management projects that were consistent with an adopted IRWM plan. These funds are applied for by individual project sponsors, rather than the IRWM Program. Within the San Diego IRWM Region, the City of Escondido has received $15 million of Proposition 1E funds.

Proposition 1, passed by California voters in 2014, is expected to provide approximately $38 million to the San Diego Region for IRWM project implementation, planning, and DAC involvement. The San Diego Region opted to include project planning activities in its Proposition 1 DAC Involvement grant, which will support development of projects benefitting DACs, EDAs, URCs, and EJs, positioning them to apply for future implementation grants. The first round of Implementation Grants under Proposition 1 is anticipated to begin in the Fall of 2018.

Proposition 1 also provides $200 million for SWRCB's Stormwater Grant Program (SWGP). In 2016, three of the Region's stakeholders received SWGP funding:

- City of National City: $1.3 million for the Sweetwater River Park Bioretention project
- City of Imperial Beach: $1.9 million for the Low Impact Development Urban Runoff Control Projects for the Tijuana Estuary
- City of Vista: $2.8 million for the South Santa Fe Green Street Project

These projects are designed to improve stormwater quality using natural systems and low impact development.

Projects funded through inclusion in the IRWM Plan range from pilot projects for innovative water treatment technology, recycled water systems, water quality and supply for DACs, flood control and stormwater management, and water supply and reliability. Beyond Propositions 50, 84, 1E, and 1, a variety of future state and federal funding opportunities for water-related projects are expected. Those additional funding opportunities are elaborated upon in the following section.

11.4.3 Project Financing Options

The 2013 Governance and Financing Workgroup also discussed potential financing options for projects included in the 2013 IRWM Plan. Information provided by the workgroup and elaborated upon through development of the 2019 IRWM Plan is summarized in Table 11-5.

The Governance and Financing Workgroup discussed multiple potential funding sources for IRWM projects, including those at the local/regional, state, and federal levels. Further, due to the diverse nature of projects included in the IRWM Plan, the Workgroup discussed projects by functional area (water supply, wastewater, recycled water, groundwater, stormwater, flood control, and habitat/open space). Information regarding potential funding sources for projects within each of the aforementioned functional areas is provided in Table 11-5.

Table 11-5: Potential IRWM Project Financing Options

Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area							Funding Includes O&M?
		Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	
Local / Regional									
Capital Improvement Programs	A majority of the large infrastructure IRWM projects are included 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 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. Smaller scale CIP projects may be funded by the agencies with cash on hand, short-term lines of credit, or directly from water or sewer rates. Flood control CIPs may be funded through debt service (bonds) backed by agency general funds. CIP projects may also be funded, in part, by outside grants or financial assistance. Due to the varied nature of CIP budgets, the longevity and certainty of this funding source is highly variable.	x	x	x	x	x	x	x	No
Special Property Assessments	Special property assessments can provide funding for both capital projects and operations and maintenance. For example, monitoring Special Drainage Area fee is charged to development projects to fund new facilities or upsizing of old ones. Some districts pay special fees to maintain specific facilities, or a tax that contributes to flood control O&M. Note that a special property assessment would be subject to California Proposition 218 requirements.					x	x		Potentially
Water user rates	Water rates could be used to fund or partially fund IRWM Projects. These funds would likely be reserved for water supply, water supply quality, or wastewater projects, or those projects which have the potential to reduce future water rate inflation (e.g. projects that reduce dependence on imported water). These funds could potentially be used to fund operations and maintenance; however, the certainty and longevity of the funding source is dependent upon individual water users' willingness to pay.	x	x	x	x				Potentially
Local Water Supply Development (LWSD) Program	The Water Authority's LWSD program provides member agencies with financial incentives of up to $200 per acre-foot for the development of recycled water and groundwater projects capable of relieving imported demands on Water Authority facilities. This incentive contribution offsets projects costs, especially in the early years of project start-up. In order to continue to qualify for these incentives, project expenses must exceed project revenues. Incentives are available for up to 25 years based on continued financial need. As cost of imported water goes up, the need for financial incentives will diminish and this program will phase out.			x	x				No

Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area: Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	Funding Includes O&M?
Local Resources Program (LRP)	The LRP program features financial incentives from the Metropolitan Water District of Southern California (Metropolitan) for recycled water and groundwater development projects that offset demands for imported water. The LRP is designed to ensure the financial feasibility of local projects during the initial years of operation. The LRP provides incentives of up to $250 per acre-foot for up to 25 years for qualifying recycled water and groundwater projects. This funding source is not currently available to the San Diego Region, but could potentially become available again in the future.			x	x				Yes
NGO Funding or Endowments	Non-government organization (NGO) funds may be derived from endowments, contributions, fundraisers, membership dues, or other similar sources. Many NGO-sponsored projects include some funding from these sources. Additionally, if the San Diego IRWM Program were to establish itself as a 501(c)(3) organization, additional funding for IRWM projects could be garnered directly by the IRWM Program. Due to the diverse and uncertain nature of this funding source, its use and longevity are also highly uncertain at this time.	x	x	x	x	x	x	x	Potentially
Private Grants	Hundreds of foundations or businesses provide support for environmental projects through private grants. If the San Diego IRWM Program were to establish itself as a 501(c)(3) organization, private grant funding for IRWM projects could be garnered from multiple sources. Due to the diverse and uncertain nature of this funding source, its use and longevity are also highly uncertain at this time.	x	x	x	x	x	x	x	Potentially
State									
Flood Protection Corridor Program (FPCP)	The FPCP program, funded by both Proposition 84 and Proposition 1E, to provide grant funding for nonstructural flood management projects. Eligible projects seek to acquire, restore, enhance and protect real property for the purposes of flood control protection, together with agricultural land preservation and/or wildlife habitat protection. The program provides grant funding of up to $5,000,000 per project. DWR administers the FPCP program. (http://www.water.ca.gov/floodmgmt/fpo/sgb/fpcp/)						x	x	No
Urban Streams Restoration Program	The Urban Streams Restoration Program, administered by DWR, seeks to reduce property damage caused by flooding or erosion, restore or protect the natural ecological values of streams, and promote community involvement and stewardship. Eligible projects include creek cleanups, invasive removal, revegetation, channel reconfiguration, flood protection, and community involvement. Grant funding up to $1,000,000 is available to local agencies and NGOs (working together). (http://www.water.ca.gov/urbanstreams/)						x	x	No

Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area							Funding Includes O&M?
		Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	
Local Groundwater Assistance (LGA) Program	The LGA program, administered by DWR, provides funding for groundwater studies, management, and monitoring. The program provides grant funding of up to $250,000 per applicant. (http://www.water.ca.gov/lgagrant/)				x				No
Infrastructure State Revolving Fund (ISRF) Program	The Infrastructure State Revolving Fund (ISRF) program, through the California Infrastructure and Economic Development Bank, provides low-cost financing to public agencies for qualifying infrastructure projects. The ISRF program funding is available in amounts ranging from $250,000 to $10,000,000, with loan terms of up to 30 years. Interest rates are set on a monthly basis. Eligible project categories include drainage, water supply and flood control, environmental mitigation measures, parks and recreational facilities, sewage collection and treatment, and water treatment and distribution. (http://www.ibank.ca.gov/infrastructure_loans.htm)	x	x	x	x	x	x	x	Yes
Safe Drinking Water State Revolving Fund (DWSRF)	The DWSRF, through the California Department of Public Health (CDPH), provides agencies with low interest loans for projects that upgrade public drinking water infrastructure, including wells, pumps, storage tanks, treatment, surface water intakes, pipes, and other components. Prioritization is based on risk to public health. For construction, funding is available in amounts up to $20,000,000 per year per project and $30,000,000 per year per entity, with loan terms of up to 20 years. For planning, funding is available in amounts up to $500,000 per project, with loan terms of up to 5 years. These loans carry an interest rate equal to half of the State's general obligation bond interest rate. This below market interest rate can result in substantial savings on debt service. Further, a 0% interest rate and up to 80% grant (up to $3,000,000) is possible for projects serving DACs. (http://www.cdph.ca.gov/services/funding/Pages/SRF.aspx)	x			x				Yes
Clean Water State Revolving Fund (CWSRF)	The CWSRF, through the State Board, provides agencies with low interest construction loans for wastewater, water recycling, and nonpoint source projects. The CWSRF funding is available in amounts up to $50,000,000 per agency, with loan terms of up to 20 years. These loans carry an interest rate equal to half of the State's general obligation bond interest rate. This below market interest rate can result in substantial savings on debt service. Principal forgiveness may be made available to projects serving DACs. Applications are accepted continuously. (http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/index.shtml)			x	x	x			Yes

Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area							Funding Includes O&M?
		Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	
Water Recycling Funding Program	The Water Recycling Funding Program, through the State Board, provides agencies with low interest construction loans for water recycling projects, including treatment, distribution, and groundwater recharge. These loans carry an interest rate equal to half of the State's general obligation bond interest rate. This below market interest rate can result in substantial savings on debt service. Planning grants are also available to reimburse up to 50% of eligible costs, to a maximum of $75,000. Applications are accepted continuously. (http://www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/index.shtml)			x					Yes
Nonpoint Source Grant Program	The Nonpoint Source (NPS) Grant Program, through the State Board, annually allocates Clean Water Act Section 319(h) funding from the U.S. Environmental Protection agency to projects that address water quality problems in surface and ground water resulting from NPS pollution. The goal of these projects is to ultimately lead to restoring the impacted beneficial uses in these water bodies. Projects are required to be located in a watershed that has an adopted/nearly adopted Total Maximum Daily Load (TMDL) for the constituent of concern and has been identified in the NPS Program Preferences. A 25% funding match is required. (http://www.waterboards.ca.gov/water_issues/programs/nps/grant_program.shtml)					x			No
Groundwater Management Program Assessments	In areas where a Groundwater Management Program is established per requirements of the State of California Groundwater Management Act (AB 3030), the implementing agency may fund groundwater improvement projects through assessments levied against groundwater users (provided that voter approval of such assessments is granted).				x				Yes
California State Coastal Conservancy	The Coastal Conservancy provides funding for protection, public access, and restoration, and enhancement of coastal resources. There are no established minimum or maximum grant amounts; however, projects must be consistent with the purposes of available funding sources (e.g., Proposition 84). Applications are accepted continuously. (http://scc.ca.gov/category/grants/)							x	Potentially
Storm Water Grant Program	The State Water Resources Control Board provides funding under Proposition 1 for multi-benefit stormwater management projects that include green infrastructure, rainwater and stormwater capture projects, and stormwater treatment facilities. Project must be included in a SWRP.				x	x	x		No

Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area							Funding Includes O&M?
		Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	
Federal									
Title XVI Water Reclamation and Reuse – Construction **(Includes Water Infrastructure Improvements for the Nation [WIIN] projects)**	The Reclamation Wastewater and Groundwater Study and Facilities Act (Title XVI, Public Law 102-575) authorizes the federal government, via U.S. Bureau of Reclamation (USBR), to fund up to 25% of the capital cost of congressionally authorized recycling projects. Funding for construction is available in accordance to each project's authorization and the funding opportunity announcement (FOA). (http://www.usbr.gov/WaterSMART/title/)			x					No
Title XVI Water Reclamation and Reuse – Feasibility Study	USBR also releases FOAs for development of new feasibility studies for congressionally authorized recycling projects. Grant funding is available up to $150,000 per applicant with a 50% cost share. Studies must be completed by March 2014. (http://www.usbr.gov/WaterSMART/title/)			x					No
WaterSMART Water & Energy Efficiency Grants	Through the WaterSMART, USBR provides 50% cost share funding to irrigation and water districts, Tribes, States and other entities with water or power delivery authority. Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered species, or facilitate water markets. Projects must be completed within 24 months that will help sustainable water supplies in the western United States. (http://www.usbr.gov/WaterSMART/weeg/index.html)	x		x				x	No
WaterSMART System Optimization Review Grants	USBR provides grant funding for System Optimization Reviews, which are a broad look at system-wide efficiency focused on improving efficiency and operations of a water delivery system, water district, or water basin. The System Optimization Review results in a plan of action that focuses on improving efficiency and operations on a regional and basin perspective. This grant program provides 50% cost share, up to $300,000. Agencies must be able to complete the System Optimization Review within 24 months. (http://www.usbr.gov/WaterSMART/sor/index.html)	x							No

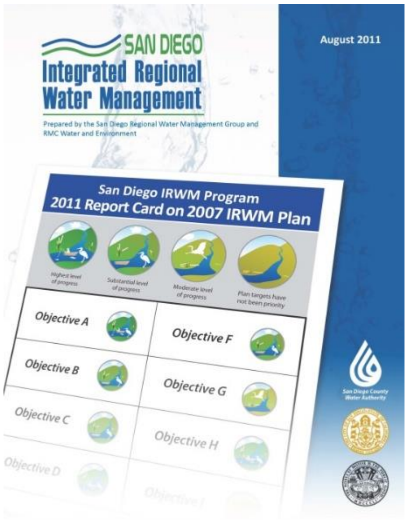
Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area							Funding Includes O&M?
		Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	
WaterSMART Advanced Water Treatment and Pilot and Demonstration Project Grants	USBR provides grant funding for pilot and demonstration projects that address the technical, economic, and environmental viability of treating and using brackish groundwater, seawater, impaired waters, or otherwise creating new water supplies within a specific locale. (http://www.usbr.gov/WaterSMART/awtg/index.html)			x	x				No
WaterSMART Grants to Develop Climate Analysis Tools	This program, through the USBR, is for research projects focused on the information gaps detailed in the joint USBR and United Stated Army Corps of Engineers (USACE) Report titled "Addressing Climate Change in Long-Term Water Resources Planning and Management: User Needs for Improving Tools and Information" (Section 3). This grant program provides 50% cost share. (http://www.usbr.gov/WaterSMART/cat/index.html)	x							No
WaterSMART Program for Basin Studies	This program, through the USBR, is for basin studies that complete work to evaluate and address climate change impacts. (http://www.usbr.gov/WaterSMART/bsp/)	x	x	x	x	x			No
Cooperative Watershed Management Program (CWMP)	The purpose of the CWMP, through the USBR, is to improve water quality and ecological resilience and to reduce conflicts over water through collaborative conservation efforts in the management of local watersheds. The CWMP will provide financial assistance to form new watershed groups, to expand existing watershed groups, and/or to conduct one or more projects in accordance with the goals of watershed groups. Establishment or expansion of a watershed group may be funded $100,000 for up to 3 years. Planning and implementation of a watershed projects may be 50% cost share. (http://www.usbr.gov/WaterSMART/cwmp/index.html)					x		x	No
Water and Waste Revolving Fund Grants	The U.S. Department of Agriculture (USDA) Rural Development assists communities with a population less than 10,000 with water and wastewater systems. The grant recipients will use the grant funds to establish a revolving loan fund. The loans will be made to eligible entities to finance pre-development costs of water and wastewater projects or short-term small capital improvement projects not part of the regular O&M of current water and wastewater systems. The amount of financing to an eligible entity shall not exceed $100,000 and shall be repaid in a term not to exceed 10 years. (http://www.rurdev.usda.gov/UWP-revolvingfund.html)	x	x		x				No

Potential Funding Source	Description of Funding Source and Potential Certainty/Longevity	Functional Area: Water Supply	Wastewater	Recycled Water	Groundwater	Stormwater	Flood Control	Habitat/Open Space	Funding Includes O&M?
Water and Waste Disposal Grants and/or Guaranteed Loans	USDA Rural Development assists communities with a population less than 10,000 with water and wastewater systems. To qualify, applicants must be unable to obtain the financing from other sources at rates and terms they can afford and/or their own resources. Funds can be used for design, construction, land acquisition, legal fees, equipment, and initial operations and maintenance. Projects must be primarily for the benefit of rural users. The rates that are used to calculate these loans are subject to change quarterly. Loans are made based on the applicant's authority and the life expectancy of the system's project, which may be up to the maximum of 40 years. (http://www.rurdev.usda.gov/UWEP_HomePage.html)	x	x		x				Yes

11.5 Plan Performance and Monitoring

11.5.1 Methods to Evaluate Plan Performance

The San Diego IRWM Program used a Report Card produced in August 2011 to evaluate IRWM Plan performance up to that time. The report card assessed the program's progress towards achieving IRWM Plan goals, objectives, and priorities, and implementing changes to improve performance. The Report Card provided an overview of the progress that had been made toward achieving the IRWM goals and objectives (see *Chapter 2, Vision and Objectives*), the IRWM priorities (established in *Section 11.2* of this chapter), and anticipated benefits associated with projects funded through the IRWM Program. The 2011 Report Card found that the Region had made substantial level of progress or greater towards meeting seven of the nine objectives of the 2007 IRWM Plan, and five of the seven short-term priorities identified in that plan. During this evaluation, the Impacts and Benefits section of the Plan will be revisited and updated, if necessary. The Report Card only assessed activities specific to the IRWM Program. A copy of the Report Card and supporting documents is available for download here: http://sdirwmp.org/2007-irwm-plan.



The IRWM Report Card assesses both Plan and Project performance for the San Diego IRWM Program.

Data used to assess progress related to the IRWM Plan were compiled to provide quantitative assessments when appropriate and possible. Because achievements were found to be difficult to quantify, a qualitative assessment of progress using graphic designations for four degrees of progress was developed. These degrees of progress were as follows:

- Highest level of progress has been made towards achieving IRWM Plan targets
- Substantial progress has been made towards achieving IRWM Plan targets but modest additional progress is needed to fully meet the goals
- Moderate progress has been made toward achieving IRWM Plan targets but moderate additional progress is needed to fully meet the goals
- Plan Targets have not been a priority for IRWM Plan implementation

Given that the IRWM Plan Targets have been substantially updated to ensure the measurability of the IRWM Objectives, future iterations of the Report Card should contain more quantitative assessments than the initial version.

In addition, IRWM Plan performance was measured, in part, by the progress made towards achieving the short-term priorities described in this chapter. Short-term priorities were assessed using the same qualitative degrees of progress used to assess the objectives. As described above, each of the short-term priorities in the 2013 IRWM Plan has the support of the RAC, and at least one RAC member organization has been assigned the lead on each of these priorities.

Information pertaining to how plan performance and monitoring will be tracked with a Data Management System, including who will be responsible for maintaining the Data Management System, is included in *Chapter 10, Data and Technical Analysis.*

11.5.2 Methods to Evaluate Project Performance

The Report Card may also assess the performance of projects funded by the IRWM Program (through Proposition 50, Proposition 84, and Proposition 1). Assessment of projects is done in two ways: contribution to IRWM Plan objectives and individual project targets and metrics. Table 11-6 shows projects that have been funded by the IRWM Program, and how they contribute to IRWM Plan objectives. Note that some projects included in the table were funded under Proposition 50 and Proposition 84-Round 1, and are therefore consistent with the 2007 IRWM Plan Objectives. In contrast, the Proposition 84-Round 2, Round 3, and Round 4 projects were evaluated using the objectives in the 2013 IRWM Plan. All projects funded through the IRWM Program are required to comply with applicable rules, laws, and permit requirements, as tracked through provision of appropriate deliverables under the funding agreements with DWR.

Future Report Cards would provide a discussion of project progress and achievements. Further, it will evaluate projects by the individual targets and metrics described for each project in the grant applications and contracts. These targets and metrics are increasingly designed to correspond with appropriate objectives, targets and metrics in the IRWM Plan. Though there may not always be an exact correlation between project targets established for the grant application and contracting process and IRWM Plan targets, the project targets generally support IRWM Plan objectives. Therefore, as projects achieve their individual targets and objectives, they also contribute towards attainment of the IRWM Plan objectives. As the IRWM Program evolves, closer correlation between project targets and IRWM Plan targets is expected.

Project targets and metrics are used to measure future project performance and will be included in the performance measures in future grant applications. Additionally, a Project Assessment and Evaluation Plan (PAEP), or its equivalent (e.g., a project monitoring plan), will be developed after contract execution for each project selected for funding through the IRWM Program. This Project Assessment and Evaluation Plan will define how projects will be assessed, evaluated, and reported.

11.5.3 Adaptive Management

The San Diego IRWM Plan is a living document. As such, it is expected that periodic updates will occur. The 2013 IRWM Plan is one such update to the original 2007 IRWM Plan, and reflects changes that have occurred in the IRWM Region since the development of the 2007 IRWM Plan. Similarly, the 2019 IRWM Plan is an update to the 2013 IRWM Plan and incorporates new understanding of water resources and outcomes from IRWM Program activities. In order to remain relevant, and to ensure that the water management needs of the Region are identified and the structure exists to address these needs, it is anticipated that this Plan will be updated every 5 years through the life of the IRWM Program, though this timeline may be extended under a scaled-down version of the IRWM Program due to funding restrictions. It should be noted that the RWMG MOU currently extends through 2020. As this MOU provides the basis for managing and funding the IRWM Program, future updates to the IRWM Plan are contingent upon either a renewal/extension of the RWMG MOU or the development of an alternative governance structure and funding mechanism to implement the IRWM Program.

In addition to the planned updates to the San Diego IRWM Plan designed to provide opportunities for adaptive management, the IRWM Plan incorporates adaptive management through its project selection process. As described in *Chapter 9, Project Evaluation and Prioritization*, projects submitted to the IRWM Program are initially scored using the Project Selection Criteria. These criteria reflect a way to assess how projects address the objectives and purpose of the IRWM Program. The Project Selection Workgroup weights each of these criteria to emphasize which criteria are most important to the IRWM Region at the time of project selection. This allows projects that address the most critical needs of the IRWM Region to be given priority, even as these needs change as they are addressed or as other changes affect the Region.

11.6 References

California Department of Water Resources (DWR). 2016. *2016 Integrated Regional Water Management Grant Program Guidelines*. July 2016. Available: https://www.water.ca.gov/LegacyFiles/irwm/grants/docs/p1Guidelines/2016Prop1IRWMGuidelines_FINAL_07192016.pdf

Table 11-6: Consistency of IRWM-Funded Projects with IRWM Plan Objectives

IRWM-Funded Projects	IRWM Plan Objectives Addressed**										
	A*	B	C	D	E	F	G	H	I	J	K*
Proposition 50 Projects											
Implementation of Integrated Landscape and Agricultural Efficiency Program		✓	✓	✓	✓						
Irrigation Hardware Giveaway and Dry Weather Runoff Reduction Demonstration		✓	✓	✓	✓						
Over-Irrigation/Bacteria Reduction		✓	✓	✓	✓			✓			
Santee Water Reclamation Facility Expansion Project		✓		✓	✓	✓				✓	
Recycled Water Retrofit Assistance Program		✓		✓	✓						
City of San Diego Recycled Water Distribution System Expansion, Parklands Retrofit, and Indirect Potable Reuse/ Reservoir Augmentation Project		✓		✓	✓	✓		✓		✓	
San Vicente Reservoir Source Water Protection through Watershed Property Acquisition and Restoration					✓	✓	✓	✓	✓	✓	
El Capitan Reservoir Watershed Acquisition and Restoration Program					✓		✓	✓	✓	✓	
Northern San Diego County Invasive Non-Native Species Control Program			✓		✓		✓		✓		
Santa Margarita Conjunctive Use Project					✓						
Carlsbad Desalination Project Local Conveyance		✓		✓	✓	✓			✓	✓	
San Diego Region Four Reservoir Intertie Project Conceptual Design		✓		✓	✓	✓				✓	
South County Water Supply Strategy		✓	✓	✓	✓						
El Monte Valley Groundwater Recharge and River Restoration Project - Phases 1 and 2		✓		✓	✓	✓	✓	✓	✓	✓	
San Diego Regional Pollution Prevention		✓	✓	✓				✓		✓	
Biofiltration Wetland Creation and Education Program		✓		✓			✓	✓		✓	
San Dieguito Watershed Management Plan Implementation		✓		✓				✓	✓	✓	
City of San Diego Green Mall Porous Paving and Infiltration - Phase 1		✓	✓	✓				✓		✓	
County of San Diego Chollas Creek Runoff Reduction and Groundwater Recharge			✓	✓			✓	✓		✓	

IRWM-Funded Projects	IRWM Plan Objectives Addressed**										
	A*	B	C	D	E	F	G	H	I	J	K*
Proposition 84 – Round 1 Projects											
Sustainable Landscapes Program		✓	✓	✓	✓		✓	✓			
North San Diego County Regional Recycled Water Project - Phase I		✓	✓		✓	✓					
North San Diego County Cooperative Demineralization Project		✓			✓	✓		✓			
Rural Disadvantaged Community (DAC) Partnership Project - Phase I		✓			✓	✓		✓			
Lake Hodges Water Quality and Quagga Mitigation Measures			✓	✓	✓	✓		✓			
Implementing Nutrient Management in the Santa Margarita River Watershed - Phase I		✓	✓	✓				✓			
Bannock Avenue Neighborhood Streetscape Enhancements for Tecolote Creek Watershed Protection		✓	✓	✓	✓					✓	
Pilot Concrete Channel Infiltration Project		✓	✓	✓	✓						
San Diego Regional Water Quality Assessment and Outreach Project		✓	✓	✓	✓			✓	✓		
Chollas Creek Integration Project - Phase I		✓	✓				✓	✓	✓		
Regional Water Data Management Program		✓	✓	✓							
Proposition 84 – Round 2 Projects											
North San Diego County Regional Recycled Water Project (NSDCRRWP) - Phase II	✓	✓	✓		✓	✓		✓			✓
Turf Replacement and Agricultural Irrigation Efficiency Program	✓	✓	✓		✓			✓			✓
Rural Disadvantaged Community (DAC) Partnership Project - Phase II	✓	✓	✓	✓	✓	✓		✓			✓
Failsafe Potable Reuse at the Advanced Water Purification Demonstration Facility	✓	✓	✓	✓	✓			✓			✓
Sustaining Healthy Tributaries to the Upper San Diego River and Protecting Local Water Supplies	✓	✓	✓	✓	✓		✓	✓	✓	✓	
Chollas Creek Integration Project - Phase II	✓	✓	✓				✓	✓	✓		
Implementing Nutrient Management in the Santa Margarita River Watershed - Phase II	✓	✓	✓	✓							
Proposition 84 – Round 3 Projects											
Reynolds Groundwater Desalination Facility Expansion	✓	✓	✓		✓	✓		✓			✓
Fallbrook Plant Nurseries Recycled Water Distribution System Extension	✓	✓			✓	✓		✓			✓
Carlsbad Recycled Water Plant and Distribution System Expansion	✓	✓			✓	✓		✓			✓
Regional Demand Management Program Expansion	✓	✓	✓		✓			✓	✓		✓
San Diego Water Use Reduction Program	✓	✓			✓	✓		✓			✓
Rincon Customer-Driven Demand Management Program	✓	✓	✓		✓			✓			✓
Regional Emergency Storage and Conveyance System Intertie Optimization	✓	✓		✓	✓	✓		✓	✓	✓	✓

IRWM-Funded Projects	IRWM Plan Objectives Addressed**										
	A*	B	C	D	E	F	G	H	I	J	K*
Proposition 84 – Round 4 Projects											
Regional Drought Resiliency Program	✓	✓	✓		✓			✓			✓
Conservation Home Makeover in the Chollas Creek Watershed	✓	✓	✓		✓			✓			✓
San Diego Water Conservation Program	✓	✓			✓			✓			✓
Ms. Smarty-Plants Grows Water-Wise Schools	✓	✓	✓		✓						✓
Rural Disadvantaged Community Partnerships – Phase III	✓	✓			✓	✓	✓	✓	✓	✓	✓
Integrated Water Resource Solutions in the Carlsbad Watershed	✓	✓	✓		✓	✓	✓	✓	✓		✓
UCSD Water Conservation and Watershed Protection	✓	✓	✓	✓	✓	✓	✓	✓			✓
Escondido Advanced Water Treatment for Agriculture	✓	✓	✓		✓	✓		✓			✓
Padre Dam Advanced Water Treatment – Phase IA Expansion	✓	✓	✓	✓	✓	✓					✓
Safari Park Drought Response and Outreach	✓	✓			✓	✓					✓
San Diego River Healthy Headwaters Restoration	✓	✓					✓	✓	✓		✓
Sweetwater Reservoir Wetlands Habitat Recovery	✓	✓	✓	✓			✓	✓	✓		✓
Hodges Reservoir Natural Treatment System	✓	✓				✓		✓	✓		

* New IRWM Objectives that were not established at the time of the Proposition 50 or Proposition 84-Round 1 grant applications.

** Only includes objectives directly addressed by the Project

SAN DIEGO
Integrated Regional Water Management

Appendix 3-A:
Designated Beneficial Uses for the San Diego Region

Excerpted from Basin Plan (Regional Board, Updated 2016)

Basin Plan Table 2-2 (Inland Surface Waters)
Basin Plan Table 2-3 (Coastal Waters)
Basin Plan Table 2-4 (Reservoirs and Lakes)
Basin Plan Table 2-5 (Groundwater)




Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Orange County Coastal Streams																
Moro Canyon	1.11	+	●						○	●		●		●		
unnamed intermittent coastal streams	1.11	+	●						○	●		●		●		
Emerald Canyon	1.11	+	●						○	●		●		●		
Boat Canyon	1.11	+	●						○	●	●	●		●		
Laguna Canyon	1.12	+	●						○	●		●		●		
Blue Bird Canyon	1.12	+	●						○	●		●		●		
Rim Rock Canyon	1.12	+	●						○	●		●		●		
unnamed intermittent coastal streams	1.13	+	●						○	●		●		●		
Hobo Canyon	1.13	+	●						○	●		●		●		
Aliso Creek Watershed																
Aliso Creek [3]	1.13	+	●						○	●		●		●		
English Canyon	1.13	+	●						○	●		●		●		
Sulphur Creek	1.13	+	●						○	●		●		●		
Wood Canyon	1.13	+	●						○	●		●		●		
Aliso Creek Mouth	1.13	See Coastal Waters – Table 2-3														

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

[3] Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives,* Bacteria –Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Dana Point Watershed																
unnamed intermittent coastal streams	1.14	+	●						○	●		●		●		
Salt Creek	1.14	+	●						○	●		●		●		
San Juan Canyon	1.14	+	●						○	●		●		●		
Arroyo Salada	1.14	+	●						○	●		●		●		
San Juan Creek Watershed																
San Juan Creek [3]	1.25	+	●	●					●	●		●	●	●		
Morrell Canyon	1.25	+	●	●					●	●		●	●	●		
Decker Canyon	1.25	+	●	●					●	●		●	●	●		
Long Canyon	1.25	+	●	●					●	●		●	●	●		
Lion Canyon	1.25	+	●	●					●	●		●	●	●		●
Hot Spring Canyon	1.25	+	●	●					●	●		●	●	●		●
Cold Spring Canyon	1.25	+	●	●					●	●		●	●	●		
Lucas Canyon	1.25	+	●	●					●	●		●	●	●		
Aliso Canyon	1.25	+	●	●					●	●		●	●	●		
Verdugo Canyon	1.25	+	●	●					●	●		●	●	●		
Bell Canyon	1.25	+	●	●					●	●		●	●	●		
Fox Canyon	1.25	+	●	●					●	●		●	●	●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

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[3] Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives,* Bacteria -Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Juan Creek Watershed – continued																
Dove Canyon	1.24	+	●	●					●	●		●	●	●		
Crow Canyon	1.25	+	●	●					●	●		●	●	●		
San Juan Creek	1.26	+	●	●					●	●		●	●	●		
Trampas Canyon	1.26	+	●	●					●	●		●	●	●		
Canada Gobernadora	1.24	+	●	●					●	●		●	●	●		
Canada Chiquita	1.24	+	●	●					●	●		●	●	●		
San Juan Creek	1.28	+	●	●					●	●		●	●	●		
San Juan Creek	1.27	+	●	●					●	●		●	●	●		
Horno Creek	1.27	+	●	●					●	●		●	●	●		
Arroyo Trabuco Creek	1.22	+	●	●					●	●		●	●	●		●
Holy Jim Canyon	1.22	+	●	●					●	●		●	●	●		●
Falls Canyon	1.22	+	●	●					●	●		●	●	●		
Rose Canyon	1.22	+	●	●					●	●		●	●	●		
Hickey Canyon	1.22	+	●	●					●	●		●	●	●		
Live Oak Canyon	1.22	+	●	●					●	●		●	●	●		
Arroyo Trabuco Creek	1.23	+	●	●					●	●		●	●	●		
Tijeras Canyon	1.23	+	●	●					●	●		●	●	●		

● Existing Beneficial Use

\+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Juan Creek Watershed – continued																
Arroyo Trabuco Creek	1.27	+	●	●					●	●		●	●	●		
Oso Creek	1.21	+	●	●					●	●		●	●	●		
La Paz Creek	1.21	+	●	●					●	●		●	●	●		
San Juan Creek Mouth	1.27	See Coastal Waters – Table 2-3														
Orange County Coastal Streams																
Prima Deshecha Canada	1.31	+	●						○	●		●		●		
unnamed intermittent coastal streams	1.30	+	●						○	●		●		●		
Segunda Deshecha Canada	1.32	+	●						○	●		●		●		
San Mateo Creek Watershed																
San Mateo Creek	1.40	+							○	●		●	●	●	●	●
Devil Canyon Creek	1.40	+							○	●		●	●	●		●
Cold Spring Canyon	1.40	+							○	●		●	●	●		
San Mateo Canyon	1.40	+							○	●		●	●	●	●	●
Los Alamos Canyon	1.40	+							○	●		●	●	●		●
Wildhorse Canyon	1.40	+							○	●		●	●	●		
Tenaja Canyon	1.40	+							○	●		●	●	●		●
Bluewater Canyon	1.40	+							○	●		●	●	●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Mateo Creek Watershed – continued																
Nickel Canyon	1.40	+							○	●		●	●	●		
Christianitos Creek	1.40	+							○	●		●	●	●		
Gabino Canyon	1.40	+							○	●		●	●	●		
La Paz Canyon	1.40	+							○	●		●	●	●		
Blind Canyon	1.40	+							○	●		●	●	●		
Talega Canyon	1.40	+							○	●		●	●	●		
San Mateo Creek Mouth	1.40	See Coastal Waters – Table 2-3														
San Onofre Creek Watershed																
San Onofre Creek	1.51	+	●						●	●		●	●	●		●
San Onofre Canyon North Fork	1.51	+	●						●	●		●	●	●		●
Jardine Canyon	1.51	+	●						●	●		●	●	●		
San Onofre Canyon	1.51	+	●						●	●		●	●	●		●
San Onofre Canyon South Fork	1.51	+	●						●	●		●	●	●	●	
San Onofre Creek Mouth	1.51	See Coastal Waters – Table 2-3														
unnamed intermittent coastal streams	1.51	+	●						●	●		●		●		
Foley Canyon	1.51	+	●						●	●		●		●		
Horno Canyon	1.51	+	●						●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Onofre Creek Watershed – continued																
Las Flores Creek	1.52	+	●						●	●		●	●	●	●	
Piedra de Lumbre Canyon	1.52	+	●						●	●		●	●	●	●	
unnamed intermittent coastal streams	1.52	+	●						●	●		●		●		
Aliso Canyon	1.53	+	●						●	●		●	●	●	●	
French Canyon	1.53	+	●						●	●		●		●	●	
Cockleburr Canyon	1.53	+	●						●	●		●		●		
Santa Margarita River Watershed																
Santa Margarita River	2.22	●	●	●					●	●		●	●	●	●	
Murrieta Creek	2.31	●	●	●	●				○	●		●		●		
Bundy Canyon	2.31	●	●	●	●				○	●		●		●		
Slaughterhouse Canyon	2.31	●	●	●	●				○	●		●		●		
Murrieta Creek	2.32	●	●	●	●				○	●		●		●		
Murrieta Creek	2.52	●	●	●	●	●			○	●		●		●		
Cole Canyon	2.32	●	●	●	●				○	●	●	●		●		
Miller Canyon	2.32	●	●	●	●				○	●		●		●		
Warm Springs Creek	2.36	●	●	●	●				○	●		●		●		
Diamond Valley	2.36	●	●	●	●				○	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
		BENEFICIAL USE														
Santa Margarita River Watershed - continued																
Goodhart Canyon	2.36	●	●	●	●				○	●		●		●		
Pixley Canyon	2.36	●	●	●	●				○	●		●		●		
Warm Springs Creek	2.35	●	●	●	●				○	●		●		●		
Domenigoni Valley	2.35	●	●	●	●				○	●		●		●		
Warm Springs Creek	2.34	●	●	●	●				○	●		●		●		
Warm Springs Creek	2.33	●	●	●	●				○	●		●		●		
French Valley	2.33	●	●	●	●				○	●		●		●		
Santa Gertrudis Creek	2.42	●	●	●	●	○			●	●		●		●		
Long Valley	2.42	●	●	●	●	○			●	●		●		●		
Glenoak Valley	2.42	●	●	●	●	○			●	●		●	●	●		
Tucalota Creek	2.43	●	●	●	●	○			●	●		●	●	●		
Willow Canyon	2.44	●	●	●	●	○			●	●		●	●	●		
Lake Skinner	2.41	See Reservoirs & Lakes – Table 2-4														
Tucalota Creek	2.41	●	●	●	●	○			●	●		●		●		
Crown Valley	2.41	●	●	●	●	○			●	●		●	●	●		
Rawson Canyon	2.41	●	●	●	●	○			●	●		●	●	●		
Tucalota Creek	2.42	●	●	●	●	○			●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Santa Margarita River Watershed - continued																
Santa Gertrudis Creek	2.32	●	●	●	●				○	●		●		●		
Long Canyon	2.32	●	●	●	●				○	●		●		●		
Temecula Creek	2.93	●	●	●	●	●			○	●		●		●		
Kohler Canyon	2.93	●	●	●	●	●			○	●		●	●	●		
Rattlesnake Creek	2.93	●	●	●	●	●			○	●		●	●	●		
Temecula Creek	2.92	●	●	●	●	●			○	●		●		●		
Chihuahua Creek	2.94	●	●	●	●	●			○	●		●		●		
Chihuahua Creek	2.92	●	●	●	●	●			○	●		●		●		
Cooper Canyon	2.92	●	●	●	●	●			○	●		●		●		
Iron Spring Canyon	2.92	●	●	●	●	●			○	●		●		●		
Temecula Creek	2.91	●	●	●	●	●			○	●		●		●		
Culp Valley	2.91	●	●	●	●	●			○	●		●		●		
Temecula Creek	2.84	●	●	●	●	●			●	●		●	●	●		●
Tule Creek	2.84	●	●	●	●	●			●	●		●	●	●		
Million Dollar Canyon	2.84	●	●	●	●	●			●	●		●	●	●		
Cottonwood Creek	2.84	●	●	●	●	●			●	●		●	●	●		●
Temecula Creek	2.83	●	●	●	●	●			●	●		●	●	●		●

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Santa Margarita River Watershed - continued																
Long Canyon	2.83	●	●	●	●	●			●	●		●	●	●		●
Vail Lake	2.81	See Reservoirs & Lakes – Table 2-4														
Wilson Creek	2.63	●	●	●	●	●			○	●		●		●		
Wilson Creek	2.61	●	●	●	●	●			○	●		●		●		
Cahuilla Creek	2.73	●	●	●	●	●			○	●		●		●		
Hamilton Creek	2.74	●	●	●	●	●			○	●		●		●		
Hamilton Creek	2.73	●	●	●	●	●			○	●		●		●		
Cahuilla Creek	2.72	●	●	●	●	●			○	●		●		●		
Cahuilla Creek	2.71	●	●	●	●	●			○	●		●		●		
Elder Creek	2.71	●	●	●	●	●			○	●		●		●		
Cahuilla Creek	2.61	●	●	●	●	●			○	●		●		●		
Wilson Creek	2.81	●	●	●	●	●			●	●		●	●	●		
Lewis Valley	2.62	●	●	●	●	●			○	●		●		●		
Arroyo Seco Creek	2.81	●	●	●	●	●			●	●		●	●	●		
Arroyo Seco Creek	2.82	●	●	●	●	●			●	●		●	●	●		●
Kolb Creek	2.81	●	●	●	●	●			●	●		●	●	●		
Temecula Creek	2.81	●	●	●	●	●			●	●		●	●	●		●

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Santa Margarita River Watershed - continued																
Temecula Creek	2.51	●	●	●	●	●			○	●		●		●		
Temecula Creek	2.52	●	●	●	●	●			○	●		●		●		
Pechanga Creek	2.52	●	●	●	●	●			○	●		●		●		
Rainbow Creek[3]	2.23	●	●	●					●	●		●	●	●		●
Rainbow Creek[3]	2.22	●	●	●					●	●		●	●	●		●
Sandia Canyon	2.22	●	●	●					●	●		●	●	●		●
Walker Basin	2.22	●	●	●					●	●		●	●	●		
Santa Margarita River	2.21	●	●	●					●	●		●	●	●	●	
DeLuz Creek	2.21	●	●	●					●	●		●	●	●	●	●
Cottonwood Creek	2.21	●	●	●					●	●		●	●	●		
Camps Creek	2.21	●	●	●					●	●		●	●	●		●
Fern Creek	2.21	●	●	●					●	●		●	●	●		●
Roblar Creek	2.21	●	●	●					●	●		●	●	●		
O'Neill Lake	2.13	See Reservoirs & Lakes – Table 2-4														
Santa Margarita River	2.13	●	●	●	●				●	●		●	●	●	●	
Wood Canyon	2.13	●	●	●	●				●	●		●		●		
Santa Margarita River	2.12	●	●	●	●				●	●		●	●	●	●	

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

[3] Rainbow Creek is designated as an impaired water body for total nitrogen and total phosphorus pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads (TMDLs) have been adopted to address these impairments. See Chapter 3, Water Quality Objectives for Biostimulatory Substances and Chapter 7, Total Maximum Daily Loads.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Santa Margarita River Watershed - continued																
Santa Margarita River	2.11	●	●	●	●				●	●		●	●	●	●	
Pueblitos Canyon	2.11	●	●	●	●				●	●		●		●	●	
Newton Canyon	2.11	●	●	●	●				●	●		●		●		
Santa Margarita Lagoon	2.11	See Coastal Waters – Table 2-3														
San Luis Rey River Watershed																
San Luis Rey River	3.32	●	●	●			●	●	●	●		●	●	●		
Johnson Canyon	3.32	●	●	●			●	●	●	●		●	●	●		
San Luis Rey River	3.31	●	●	●			●	●	●	●		●	●	●		
Canada Aguanga	3.31	●	●	●			●	●	●	●		●	●	●		
Dark Canyon	3.31	●	●	●			●	●	●	●		●	●	●		
Bear Canyon	3.31	●	●	●			●	●	●	●		●	●	●		
Cow Canyon	3.31	●	●	●			●	●	●	●		●	●	●		
Blue Canyon	3.31	●	●	●			●	●	●	●		●	●	●		
Rock Canyon	3.31	●	●	●			●	●	●	●		●	●	●		
Agua Caliente Creek	3.31	●	●	●			●	●	●	●		●	●	●		
unnamed Tributary	3.31	●	●	●			●	●	●	●		●	●	●		●
Canada Agua Caliente	3.31	●	●	●			●	●	●	●		●	●	●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Luis Rey River Watershed- continued																
Canada Verde	3.31	●	●	●			●	●	●	●		●	●	●		
Ward Canyon	3.31	●	●	●			●	●	●	●		●	●	●		
Lake Henshaw	3.31	See Reservoirs & Lakes – Table 2-4														
West Fork San Luis Rey River	3.31	●	●	●			●	●	●	●		●	●	●		●
Fry Creek	3.31	●	●	●			●	●	●	●		●	●	●		
Iron Springs Creek	3.31	●	●	●			●	●	●	●		●	●	●		●
Buena Vista Creek	3.31	●	●	●			●	●	●	●		●	●	●		
Cherry Canyon	3.31	●	●	●			●	●	●	●		●		●		
Bertha Canyon	3.31	●	●	●			●	●	●	●		●		●		
Hoover Canyon	3.31	●	●	●			●	●	●	●		●		●		
Buck Canyon	3.31	●	●	●			●	●	●	●		●		●		
Bergstrom Canyon	3.31	●	●	●			●	●	●	●		●		●		
San Ysidro Creek	3.31	●	●	●			●	●	●	●		●		●		
Matagual Creek	3.31	●	●	●			●	●	●	●		●	●	●		
Carrizo Creek	3.31	●	●	●			●	●	●	●		●	●	●		
Carrista Creek	3.31	●	●	●			●	●	●	●		●		●		
Kumpohui Creek	3.31	●	●	●			●	●	●	●		●		●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Luis Rey River Watershed - continued																
San Luis Rey River	3.31	●	●	●			●	●	●	●		●	●	●		
San Luis Rey River	3.23	●	●	●				●	●	●		●	●	●		●
Wigham Creek	3.23	●	●	●				●	●	●		●	●	●		
Prisoner Creek	3.23	●	●	●				●	●	●		●	●	●		
Lusardi Canyon	3.23	●	●	●				●	●	●		●	●	●		
Cedar Creek	3.23	●	●	●				●	●	●		●	●	●		
San Luis Rey River	3.22	●	●	●				●	●	●		●	●	●		
Bee Canyon	3.22	●	●	●				●	●	●		●	●	●		
Paradise Creek	3.22	●	●	●				●	●	●		●	●	●		
Hell Creek	3.22	●	●	●				●	●	●		●	●	●		
Horsethief Canyon	3.22	●	●	●				●	●	●		●	●	●		
Potrero Creek	3.22	●	●	●				●	●	●		●	●	●		
Plaisted Creek	3.22	●	●	●				●	●	●	●	●	●	●		
Yuima Creek	3.22	●	●	●				●	●	●		●	●	●		
Sycamore Canyon	3.22	●	●	●				●	●	●		●	●	●		
Pauma Creek	3.22	●	●	●				●	●	●		●	●	●		●
Doane Creek	3.22	●	●	●				●	●	●		●	●	●		●

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Luis Rey River Watershed - continued																
Chimney Creek	3.22	●	●	●				●	●	●		●	●	●		
French Creek	3.22	●	●	●				●	●	●		●	●	●		●
Lion Creek	3.22	●	●	●				●	●	●		●	●	●		●
Harrison Canyon	3.22	●	●	●				●	●	●		●	●	●		
Jaybird Creek	3.22	●	●	●				●	●	●		●	●	●		
Frey Creek	3.22	●	●	●				●	●	●		●	●	●		
Agua Tibia Creek	3.22	●	●	●				●	●	●		●	●	●		●
San Luis Rey River	3.21	●	●	●					●	●		●	●	●		
Marion Canyon	3.21	●	●	●					●	●		●	●	●		
Magee Creek	3.21	●	●	●					●	●		●	●	●		
Castro Canyon	3.21	●	●	●					●	●		●	●	●		
Trujillo Creek	3.21	●	●	●					●	●		●	●	●		
Pala Creek	3.21	●	●	●					●	●		●	●	●		●
Gomez Creek	3.21	●	●	●					●	●		●	●	●		
Couser Canyon	3.21	●	●	●					●	●		●	●	●		
Double Canyon	3.21	●	●	●					●	●		●	●	●		
Rice Canyon	3.21	●	●	●					●	●		●	●	●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC 1	REC 2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Luis Rey River Watershed – continued																
San Luis Rey River	3.12	+	●	●					●	●	●	●		●	●	
Live Oak Creek	3.12	+	●	●					●	●		●		●	●	
Keys Creek	3.12	+	●	●					●	●		●		●		
Moosa Canyon	3.15	+	●	●					●	●		●		●		
unnamed intermittent streams	3.16	+	●	●					●	●		●		●		
Moosa Canyon	3.14	+	●	●					●	●		●		●		
Moosa Canyon	3.13	+	●	●					●	●		●		●		
Turner Lake	3.13	See Reservoirs & Lakes – Table 2-4														
South Fork Moosa Canyon	3.13	+	●	●					●	●		●		●		
Moosa Canyon	3.12	+	●	●					●	●		●		●		
Gopher Canyon	3.12	+	●	●					●	●		●		●		
South Fork Gopher Canyon	3.12	+	●	●					●	●		●		●		
San Luis Rey River	3.11	+	●	●					●	●		●		●	●	
Pilgrim Creek	3.11	+	●	●					●	●	●	●	●	●	●	
Windmill Canyon	3.11	+	●	●					●	●		●	●	●		
Tuley Canyon	3.11	+	●	●					●	●		●		●		
Lawerence Canyon	3.11	+	●	●					●	●		●		●		
Mouth of San Luis Rey River	3.11	See Coastal Waters – Table 2-3														

● Existing Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Diego County Coastal Streams																
Loma Alta Creek	4.10	+							○	●		●		●		
Loma Alta Slough	4.10	See Coastal Waters – Table 2-3														
Buena Vista Lagoon	4.21	See Coastal Waters – Table 2-3														
Buena Vista Creek	4.22	+	●	●					●	●		●		●		
Buena Vista Creek	4.21	+	●	●					●	●		●		●	●	
Agua Hedionda	4.31	See Coastal Waters – Table 2-3														
Agua Hedionda Creek	4.32	●	●	●					●	●		●		●		
Buena Creek	4.32	●	●	●					●	●		●		●		
Agua Hedionda Creek	4.31	●	●	●					●	●	●	●		●		
Letterbox canyon	4.31	●	●	●					●	●		●		●		
Canyon de las Encinas	4.40	+							○	●		●		●		
Cottonwood Creek	4.51	+	●						●	●		●		●		
Moonlight Creek	4.51	+	●						●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Marcos Creek Watershed																
Batiquitos Lagoon	4.51	See Coastal Waters – Table 2-3														
San Marcos Creek	4.52	+	●						●	●		●		●		
unnamed intermittent streams	4.53	+	●						●	●		●		●		
San Marcos Creek	4.51	+	●						●	●		●		●		
Encinitas Creek	4.51	+	●						●	●		●		●		
Escondido Creek Watershed																
San Elijo Lagoon	4.61	See Coastal Waters – Table 2-3														
Escondido Creek	4.63	●	●	○				●	●	●		●	●	●		
Lake Wohlford	4.63	See Reservoirs & Lakes – Table 2-4														
Lake Dixon	4.62	See Reservoirs & Lakes – Table 2-4														
Escondido Creek	4.62	●	●	○					●	●		●	●	●		
Reidy Canyon	4.62	●	●	○					●	●		●	●	●		
Escondido Creek	4.61	●	●	○					●	●	●	●	●	●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Dieguito Creek Watershed																
Santa Ysabel Creek	5.54	●	●	●	●				●	●		●	●	●		●
Dan Price Creek	5.54	●	●	●	●				●	●		●	●	●		
Santa Ysabel Creek	5.53	●	●	●	●				●	●		●	●	●		
Witch Creek	5.53	●	●	●	●				●	●		●	●	●		●
Sutherland Lake	5.53	See Reservoirs & Lakes – Table 2-4														
Bloomdale Creek	5.53	●	●	●	●				●	●		●	●	●		
Santa Ysabel Creek	5.52	●	●	●	●				●	●		●	●	●	●	
Lake Poway	5.52	See Reservoirs & Lakes – Table 2-4														
Black Canyon	5.52	●	●	●	●				●	●		●	●	●		●
Scholder Creek	5.52	●	●	●	●				●	●		●	●	●		
Temescal Creek	5.52	●	●	●	●				●	●		●	●	●		
Bear Creek	5.52	●	●	●	●				●	●		●	●	●		
Quail Canyon	5.52	●	●	●	●				●	●		●	●	●		
Carney Canyon	5.52	●	●	●	●				●	●		●	●	●		
Santa Ysabel Creek	5.51	●	●	●	●				●	●	●	●	●	●		
Boden Canyon	5.51	●	●	●	●				●	●	●	●	●	●		
Clevenger Canyon	5.51	●	●	●	●				●	●	●	●	●	●		

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Dieguito River Watershed – continued																
Santa Ysabel Creek	5.32	●	●	●	●				○	●		●		●	●	
Tims Canyon	5.32	●	●	●	●				○	●		●		●		
Schoolhouse Canyon	5.32	●	●	●	●				○	●		●		●		
Rockwood Canyon	5.35	●	●	●	●				○	●		●		●		
Guejito Creek	5.35	●	●	●	●				○	●		●		●		
unnamed intermittent streams	5.36	●	●	●	●				○	●		●		●		
Rockwood Canyon	5.32	●	●	●	●				○	●		●		●		
Santa Maria Creek	5.41	●	●	●	●				●	●		●		●		
Hatfield Creek	5.45	●	●	●	●				●	●		●		●		
Hatfield Creek	5.44	●	●	●	●				●	●		●		●		
Wash Hollow Creek	5.43	●	●	●	●				●	●		●		●		
Wash Hollow Creek	5.44	●	●	●	●				●	●		●		●		
Hatfield Creek	5.42	●	●	●	●				●	●		●		●		
Santa Teresa Valley	5.46	●	●	●	●				●	●		●		●		
unnamed intermittent streams	5.47	●	●	●	●				●	●		●		●		
Hatfield Creek	5.41	●	●	●	●				●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Dieguito River Watershed – continued																
Santa Maria Creek	5.32	●	●	●	●				○	●		●		●		
unnamed intermittent streams	5.33	●	●	●	●				○	●		●		●		
unnamed intermittent streams	5.34	●	●	●	●				○	●		●		●		
San Dieguito River	5.32	●	●	●	●				○	●		●		●	●	
Cloverdale Creek	5.32	●	●	●	●				○	●		●		●	●	
San Dieguito River	5.21	●	●	●	●				●	●	●	●	●	●	●	
Highland Valley	5.31	●	●	●	●				○	●		●		●		
Lake Hodges	5.21	See Reservoirs & Lakes – Table 2-4														
Kit Carson Creek	5.21	●	●	●	●	○			●	●		●		●	●	
West Branch Kit Carson Creek	5.24	●	●	●	●	○			●	●		●		●		
East Branch Kit Carson Creek	5.24	●	●	●	●	○			●	●		●		●		
Green Valley Creek	5.21	●	●	●	●	○			●	●		●		●		
Green Valley Creek	5.22	●	●	●	●	○			●	●		●		●		
Felicita Creek	5.23	●	●	●	●	○			●	●		●		●		
West Fork Felicita Creek	5.23	●	●	●	●	○			●	●		●		●		
East Fork Felicita Creek	5.23	●	●	●	●	○			●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Dieguito River Watershed - continued																
San Dieguito Reservoir	5.21	See Reservoirs & Lakes – Table 2-4														
Warren Canyon	5.21	●	●	●	●				●	●	●	●	●	●		
San Bernardo Valley	5.21	●	●	●	●				●	●		●		●	●	
unnamed intermittent streams	5.24	●	●	●	●				●	●		●		●		
unnamed intermittent streams	5.23	●	●	●	●				●	●		●		●		
unnamed intermittent streams	5.22	●	●	●	●				●	●		●		●		
San Dieguito River	5.11	+	○	○					●	●		●	●	●		●
Lusardi Creek	5.12	+	○	○					●	●		●		●		
Lusardi Creek	5.11	+	○	○					●	●		●		●		
La Zanja Canyon	5.11	+	○	○					●	●		●		●		
Gonzales Canyon	5.11	+	○	○					●	●		●		●		
San Dieguito Lagoon	5.11	See Coastal Waters – Table 2-3														
Los Penasquitos Creek Watershed																
Los Penasquitos Lagoon	6.10	See Coastal Waters – Table 2-3														
Soledad Canyon	6.10	+	●	●					○	●		●	●	●		
Carol Canyon	6.10	+	●	●					○	●		●	●	●	●	

● Existing Beneficial Use

○ Potential Beneficial Use

\+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Los Penasquitos Creek Watershed – continued																
Miramar Reservoir	6.10	See Reservoirs & Lakes – Table 2-4														
Los Penasquitos Creek	6.20	+	●	○					●	●		●	●	●		
Rattlesnake Creek	6.20	+	●	○					●	●		●	●	●		
Poway Creek	6.20	+	●	○					●	●		●		●		
Beeler Creek	6.20	+	●	○					●	●		●		●		
Chicarita Creek	6.20	+	●	○					●	●		●		●		
Cypress Canyon	6.20	+	●	○					●	●		●		●		
Los Penasquitos Creek	6.10	+	●	●					○	●	●	●		●		
unnamed tributary	6.10	+	●	●					○	●		●		●	●	
Carmel Valley	6.10	+	●	●					○	●		●		●		
Deer Canyon	6.10	+	●	●					○	●		●		●		
McGonigle Canyon	6.10	+	●	●					○	●		●		●		
Bell Valley	6.10	+	●	●					○	●		●		●		
Shaw Valley	6.10	+	●	●					○	●		●		●		
San Diego County Coastal Streams																
unnamed intermittent coastal streams	6.30	+							○	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

\+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Rose Canyon Watershed																
Rose Canyon	6.40	+		○					●	●		●		●		
San Clemente Canyon	6.40	+		○					●	●		●	●	●	●	●
Tecolote Creek Watershed																
Tecolote Creek [3]	6.50	+							○	●		●		●		
San Diego River Watershed																
San Diego River	7.41	●	●	●	●				●	●		●	●	●		
Coleman Creek	7.42	●	●	●	●				●	●		●	●	●		
Eastwood Creek	7.42	●	●	●	●				●	●		●	●	●		
Jim Green Creek	7.42	●	●	●	●				●	●		●	●	●		
Mariette Creek	7.42	●	●	●	●				●	●		●	●	●		
Boring Creek	7.42	●	●	●	●				●	●		●	●	●		
Bailey Creek	7.42	●	●	●	●				●	●		●	●	●		
Coleman Creek	7.41	●	●	●	●				●	●		●	●	●		
Setenec Creek	7.42	●	●	●	●				●	●		●	●	●		
Setenec Creek	7.41	●	●	●	●				●	●		●	●	●		
Temescal Creek	7.41	●	●	●	●				●	●		●	●	●		
Paine Bottom	7.41	●	●	●	●				●	●		●	●	●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

[3] Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria -Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Diego River Watershed – continued																
Orinoco Creek	7.41	●	●	●	●				●	●		●	●	●		
Iron Springs Canyon	7.41	●	●	●	●				●	●		●	●	●		
Dye Canyon	7.41	●	●	●	●				●	●		●	●	●		
Richie Creek	7.41	●	●	●	●				●	●		●	●	●		
Cedar Creek	7.41	●	●	●	●				●	●		●	●	●		●
Sandy Creek	7.41	●	●	●	●				●	●		●	●	●		
Dehr Creek	7.41	●	●	●	●				●	●		●	●	●		●
Kelly Creek	7.41	●	●	●	●				●	●		●	●	●		
Cuyamaca Reservoir	7.43	See Reservoirs & Lakes – Table 2-4														
Little Stonewall Creek	7.43	●	●	●	●				●	●		●	●	●		●
Boulder Creek	7.41	●	●	●	●				●	●		●	●	●		●
Azalea Creek	7.41	●	●	●	●				●	●		●	●	●		
Johnson Creek	7.41	●	●	●	●				●	●		●	●	●		
Sheep Camp Creek	7.41	●	●	●	●				●	●		●	●	●		
San Diego River	7.31	●	●	●	●				●	●		●	●	●		
El Capitan Reservoir	7.31	See Reservoirs & Lakes – Table 2-4														
Isham Creek	7.31	●	●	●	●				●	●		●	●	●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC 1	REC 2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Diego River Watershed – continued																
Sand Creek	7.31	●	●	●	●				●	●		●	●	●		
Conejos Creek	7.31	●	●	●	●				●	●		●	●	●		●
King Creek	7.31	●	●	●	●				●	●		●	●	●		
West Fork King Creek	7.31	●	●	●	●				●	●		●	●	●		
Echo Valley	7.31	●	●	●	●				●	●		●	●	●		
Peutz Valley	7.31	●	●	●	●				●	●		●	●	●		
Chocolate Canyon	7.32	●	●	●	●				●	●		●	●	●		
Alpine Creek	7.33	●	●	●	●				●	●		●	●	●		
Chocolate Canyon	7.31	●	●	●	●				●	●		●	●	●		
San Diego River	7.15	○		●					●	●		●		●	●	
San Diego River	7.12	○		●					●	●		●		●	●	
Lake Jennings	7.12	See Reservoirs & Lakes – Table 2-4														
Quail Canyon	7.12	○		●					●	●		●		●		
Wildcat Canyon	7.12	○		●					●	●		●		●		
San Vicente Creek	7.23	●	●	●	●				●	●		●		●		
Swartz Canyon	7.23	●	●	●	●				●	●		●		●		
Klondike Creek	7.23	●	●	●	●				●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Diego River Watershed – continued																
San Vicente Creek	7.22	●	●	●	●				●	●		●		●		
Darney Canyon	7.22	●	●	●	●				●	●		●		●		
Longs Gulch	7.22	●	●	●	●				●	●		●		●		
San Vicente Reservoir	7.21	See Reservoirs & Lakes – Table 2-4														
West Branch San Vicente Creek	7.21	●	●	●	●				●	●		●		●		
Aqueduct Arm Creek	7.21	●	●	●	●	○			●	●		●		●		
Padre Barona Creek	7.24	●	●	●	●				●	●		●		●		
Wright Canyon	7.24	●	●	●	●				●	●		●		●		
Featherstone Canyon	7.24	●	●	●	●				●	●		●		●		
Padre Barona Creek	7.12	○		●					●	●		●		●		
Foster Canyon	7.21	●	●	●	●				●	●		●		●		
San Vicente Creek	7.12	○		●					●	●		●		●		
Slaughterhouse Canyon	7.12	○		●					●	●		●		●		
Los Coches Creek	7.14	○		●					●	●		●		●		
Rios Canyon	7.14	○		●					●	●	●	●		●		
Los Coches Creek	7.12	○		●					●	●		●		●		
Forrester Creek [3]	7.13	○		●					●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

[3] Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria -Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC 1	REC 2	BIOL	WARM	COLD	WILD	RARE	SPWN
San Diego River Watershed - continued																
Forrester Creek [3]	7.12	○		●					●	●		●		●		
Sycamore Canyon	7.12	+	●	●					●	●		●		●	●	
unnamed tributary	7.12	+	●	●					●	●		●		●	●	
Clark Canyon	7.12	+	●	●					●	●		●		●	●	
West Sycamore Canyon	7.12	+	●	●					●	●		●		●		
Quail Canyon	7.12	+	●	●					●	●		●		●		
Little Sycamore Canyon	7.12	+	●	●					●	●		●		●		
Spring Canyon	7.12	+	●	●					●	●		●		●	●	
Oak Canyon	7.12	+	●	●					●	●		●		●		
San Diego River [3]	7.11	+	●	●					●	●	●	●		●	●	
unnamed tributary	7.11	+	●	●					●	●		●		●	●	
Alvarado Canyon	7.11	+	●	●					●	●		●		●		
Lake Murray	7.11	See Reservoirs & Lakes – Table 2-4														
Murphy Canyon	7.11	+	●	●					●	●		●		●	●	
Shepherd Canyon	7.11	+	●	●					●	●		●		●		
Murray Canyon	7.11	+	●	●					●	●		●		●		
Mouth of San Diego River	7.11	See Coastal Waters – Table 2-3														

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

[3] Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria -Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Pueblo San Diego Watershed																
unnamed intermittent coastal streams	8.10	+							○	●		●		●		
Powerhouse Canyon	8.21	+							○	●		●		●		
Chollas Creek [3,4]	8.22	+							○	●		●		●		
South Chollas Valley	8.22	+							○	●		●		●		
unnamed intermittent streams	8.31	+							○	●		●		●		
Paradise Creek	8.32	+							○	●		●		●		
Paradise Valley	8.32	+							○	●		●		●		
Sweetwater River Watershed																
Sweetwater River	9.35	●	●	●	●				●	●		●	●	●		●
Stonewall Creek	9.35	●	●	●	●				●	●		●	●	●		●
Harper Creek	9.35	●	●	●	●				●	●		●	●	●		●
Cold Stream	9.35	●	●	●	●				●	●		●	●	●		●
Japacha Creek	9.35	●	●	●	●				●	●		●	●	●		●
Juaquapin Creek	9.35	●	●	●	●				●	●		●	●	●		●
Arroyo Seco	9.35	●	●	●	●				●	●		●	●	●		
Sweetwater River	9.34	●	●	●	●				●	●		●	●	●		●

● Existing Beneficial Use

○ Potential Beneficial Use

\+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

[3] Chollas Creek is designated as an impaired water body for copper, lead and zinc pursuant to Clean Water Act Section 303(d). A Total Maximum Daily Load (TMDL) has been adopted to address this impairment. See Chapter 3, Water Quality Objectives for Toxicity and Toxic Pollutants and Chapter 7, Total Maximum Daily Loads

[4] Aliso Creek, San Juan Creek, Tecolote Creek, Forrester Creek, San Diego River (lower), and Chollas Creek are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria -Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Sweetwater River Watershed - continued																
Descanso Creek	9.34	●	●	●	●				●	●		●	●	●		
Samagatuma Creek	9.34	●	●	●	●				●	●		●	●	●		
Sweetwater River	9.31	●	●	●	●				●	●		●	●	●		●
Viejas Creek	9.33	●	●	●	●				●	●		●	●	●		
Viejas Creek	9.31	●	●	●	●				●	●		●	●	●		
Loveland Reservoir	9.31	See Reservoirs & Lakes – Table 2-4														
Taylor Creek	9.31	●	●	●	●				●	●		●		●		
Japatul Valley	9.32	●	●	●	●				●	●		●		●		
Sweetwater River	9.21	●	●	●	●				●	●	●	●		●	●	
unnamed tributary	9.21	●	●	●	●				●	●	●	●		●	●	
Lawson Creek	9.21	●	●	●	●				●	●	●	●		●		
Beaver Canyon	9.21	●	●	●	●				●	●		●		●		
Wood Valley	9.21	●	●	●	●				●	●		●		●		
Sycuan Creek	9.25	●	●	●	●				●	●		●		●		
North Fork Sycuan Creek	9.26	●	●	●	●				●	●		●		●		
North Fork Sycuan Creek	9.25	●	●	●	●				●	●		●		●		
Dehesa Valley	9.23	●	●	●	●				●	●		●		●		
Harbison Canyon	9.23	●	●	●	●				●	●		●		●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.
[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Sweetwater River Watershed - continued																
Galloway Valley	9.24	●	●	●	●				●	●		●		●		
Mexican Canyon	9.21	●	●	●	●				●	●		●		●		
unnamed intermittent streams	9.22	●	●	●	●				●	●		●		●		
Steel Canyon	9.21	●	●	●	●				●	●		●		●		
Sweetwater Reservoir	9.21	See Reservoirs & Lakes – Table 2-4														
Coon Canyon	9.21	●	●	●	●				●	●		●		●		
Sweetwater River	9.12	+		●					○	●		●		●		
Spring Valley	9.12	+		●					○	●		●		●		
Wild Mans Canyon	9.12	+		●					○	●		●		●		
Long Canyon	9.12	+		●					○	●		●		●		
Rice Canyon	9.12	+		●					○	●		●		●		
Telegraph Canyon	9.11	+		●					○	●		●		●		
San Diego County Coastal Streams																
unnamed intermittent coastal streams	10.10	+							○			●				

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC 1	REC 2	BIOL	WARM	COLD	WILD	RARE	SPWN
Otay River Watershed																
Jamul Creek	10.34	●	●	●	●				●	●		●		●		
Jamul Creek	10.33	●	●	●	●				●	●	●	●		●		
Jamul Creek	10.36	●	●	●	●				●	●	●	●		●		
Dulzura Creek	10.37	●	●	●	●				●	●		●		●		
Dulzura Creek	10.36	●	●	●	●				●	●	●	●		●	●	
Dutchman Canyon	10.36	●	●	●	●				●	●		●		●		
Pringle Canyon	10.36	●	●	●	●				●	●		●		●		
Sycamore Canyon	10.36	●	●	●	●				●	●	●	●		●		
Hollenbeck Canyon	10.36	●	●	●	●				●	●	●	●		●		
Lyons Valley	10.35	●	●	●	●				●	●		●		●		
Cedar Canyon	10.36	●	●	●	●				●	●	●	●	●	●		●
Little Cedar Canyon	10.36	●	●	●	●				●	●	●	●	●	●		
Jamul Creek	10.31	●	●	●	●				●	●		●		●	●	
Lower Otay Reservoir	10.31	See Reservoirs & Lakes – Table 2-4														
unnamed tributary	10.31	●	●	●	●				●	●	●	●		●	●	
Upper Otay Reservoir	10.32	See Reservoirs & Lakes – Table 2-4														
Proctor Valley	10.32	●	●	●	●				●	●	●	●		●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Otay River Watershed – continued																
Otay River	10.20	+	●	○					○	●		●		●	●	
O'Neal Canyon	10.20	+	●	○					○	●		●		●		
Salt Creek	10.20	+	●	○					○	●		●		●		
Johnson Canyon	10.20	+	●	○					○	●		●		●		
Wolf Canyon	10.20	+	●	○					○	●		●		●		
Dennery Canyon	10.20	+	●	○					○	●		●		●		
Poggi Canyon	10.20	+	●	○					○	●		●		●		
Tijuana River Watershed																
Tijuana River	11.11	+		○					○	●	●	●		●	●	
Moody Canyon	11.11	+		○					○	●		●		●		
Smugglers Gulch	11.11	+		○					○	●		●		●		
Goat Canyon	11.11	+		○					○	●		●		●		
Tijuana River Estuary	11.11	See Coastal Waters – Table 2-3														
Spring Canyon	11.12	+	●	○					○	●		●		●		
Dillon Canyon	11.12	+	●	○					○	●		●		●		
Finger Canyon	11.12	+	●	○					○	●		●		●		
Wruck Canyon	11.12	+	●	○					○	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Tijuana River Watershed - continued																
unnamed intermittent streams	11.12	+	●	○					○	●		●		●		
unnamed intermittent streams	11.21	+							●	●		●		●		
Tijuana River	11.21	+							●	●		●		●		
Tecate Creek	11.23	+							●	●		●		●		
Cottonwood Creek	11.60	●	●	●	●		●		○	●		●	●	●	●	
Kitchen Creek	11.60	●	●	●	●		●		○	●		●	●	●		●
Long Canyon	11.60	●	●	●	●		●		○	●		●	●	●		●
Troy Canyon	11.60	●	●	●	●		●		○	●		●	●	●		●
Fred Canyon	11.60	●	●	●	●		●		○	●		●	●	●		
Horse Canyon	11.60	●	●	●	●		●		○	●		●	●	●		
La Posta Creek	11.70	●	●	●	●		●		●	●		●	●	●		
Simmons Canyon	11.70	●	●	●	●		●		●	●		●	●	●		
La Posta Creek	11.60	●	●	●	●		●		○	●		●	●	●		
Morena Reservoir	11.50	See Reservoirs & Lakes – Table 2-4														
Morena Creek	11.50	●	●	●	●		●		●	●		●	●	●		●
Long Valley	11.50	●	●	●	●		●		●	●		●	●	●		
Bear Valley	11.50	●	●	●	●		●		●	●		●		●		

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Tijuana River Watershed - continued																
Cottonwood Creek	11.30	●	●	●	●		●		●	●		●	●	●	●	●
Hauser Creek	11.30	●	●	●	●		●		●	●		●	●	●		●
Salazar Canyon	11.30	●	●	●	●		●		●	●		●	●	●		
Barrett Lake	11.30	See Reservoirs & Lakes – Table 2-4														
Boneyard Canyon	11.30	●	●	●	●		●		●	●		●	●	●		
Skye Valley	11.30	●	●	●	●		●		●	●		●	●	●		
Pine Valley Creek	11.41	●	●	●	●		●		●	●		●	●	●		●
Indian Creek	11.41	●	●	●	●		●		●	●		●	●	●		
Lucas Creek	11.41	●	●	●	●		●		●	●		●	●	●		
Noble Canyon	11.41	●	●	●	●		●		●	●		●	●	●		●
Los Rasalies Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Paloma Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Bonita Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Chico Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Madero Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Los Gatos Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Boiling Spring Ravine	11.42	●	●	●	●		●		●	●		●	●	●		

● Existing Beneficial Use

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Tijuana River Watershed - continued																
Agua Dulce Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Escondido Ravine	11.42	●	●	●	●		●		●	●		●	●	●		
Scove Canyon	11.41	●	●	●	●		●		●	●		●	●	●		
Pine Valley Creek	11.30	●	●	●	●		●		●	●		●	●	●		●
Oak Valley	11.30	●	●	●	●		●		●	●		●	●	●		●
Nelson Canyon	11.30	●	●	●	●		●		●	●		●	●	●		
Secret Canyon	11.30	●	●	●	●		●		●	●		●	●	●		
Horsethief Canyon	11.30	●	●	●	●		●		●	●		●	●	●		
Espinosa Creek	11.30	●	●	●	●		●		●	●		●	●	●		
Wilson Creek	11.30	●	●	●	●		●		●	●		●	●	●		●
Pats Canyon	11.30	●	●	●	●		●		●	●		●	●	●		
Cottonwood Creek	11.23	+							●	●		●		●		
Dry Valley	11.23	+							●	●		●		●		
Bob Owens Canyon	11.23	+							●	●		●		●		
McAlmond Canyon	11.24	+							●	●		●		●		
McAlmond Canyon	11.23	+							●	●		●		●		

● Existing Beneficial Use

\+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-2. BENEFICIAL USES OF INLAND SURFACE WATERS

Inland Surface Waters [1, 2]	Hydrologic Unit Basin Number	BENEFICIAL USE														
		MUN	AGR	IND	PROC	GWR	FRSH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Tijuana River Watershed - continued																
Rattlesnake Canyon	11.23	+							●	●		●		●		
Potrero Creek	11.25	+							●	●		●		●		
Little Potrero Creek	11.25	+							●	●		●		●		
Potrero Creek	11.23	+							●	●		●		●		
Grapevine Creek	11.23	+							●	●		●		●		
Bee Canyon	11.22	+							●	●		●		●		
Bee Creek	11.23	+							●	●		●		●		
Mine Canyon	11.21	+							●	●		●		●		
unnamed intermittent streams	11.81	+							●	●		●		●		
unnamed intermittent streams	11.82	+							●	●		●		●		
Campo Creek	11.84	+							●	●		●	●	●		
Diablo Canyon	11.84	+							●	●		●		●		
Campo Creek	11.83	+							●	●		●		●		
Miller Creek	11.83	+							●	●		●		●		
Campo Creek	11.82	+							●	●		●		●		
Smith Canyon	11.82	+							●	●		●		●		
unnamed intermittent streams	11.85	+							●	●		●		●		

● Existing Beneficial Use

+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.

[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.

Table 2-3. BENEFICIAL USES OF COASTAL WATERS

Coastal Waters	Hydrologic Unit Basin Number	BENEFICIAL USE														
		IND	NAV	REC1	REC2	COMM	BIOL	EST	WILD	RARE	MAR	AQUA	MIGR	SPWN	WARM	SHELL
Pacific Ocean[1]		●	●	●	●	●	●		●	●	●	●	●	●		●
Dana Point Harbor[2]		●	●	●	●	●			●	●	●		●	●		●
Del Mar Boat Basin		●	●	●	●	●			●	●	●		●	●		●
Mission Bay		●		●	●	●		●	●	●	●		●	●		●
Oceanside Harbor		●	●	●	●	●			●	●	●		●	●		●
San Diego Bay [3,4,5]		●	●	●	●	●	●	●	●	●	●		●	●		●

[1] Certain Pacific Ocean shoreline segments of the following Hydrological Units, Areas, and Subareas are designated as water quality limited segments for indicator bacteria pursuant to Clean Water Act section 303(d): San Joaquin Hills HSA 901.11 and Laguna Beach HAS 901.12, Aliso Creek HSA 901.13, Dana Point HSA 901.14, Lower San Juan HSA 901.27, San Clemente HA 901.30, San Luis Rey HU 903.00, San Marcos HA 904.50, San Dieguito HU 905.00, Miramar Reservoir HA 906.10, Scripps HA 906.30, and Mission San Diego HSA 907.11 and Santee HSA 907.12. Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria - Total Coliform, Fecal Coliform, *E. Coli* and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

[2] The shoreline segment along Baby Beach within Dana Point Harbor is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 7, *Total Maximum Daily Loads for Indicator Bacteria, Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay*.

[3] Includes the tidal prisms of the Otay and Sweetwater Rivers.

[4] The Shelter Island Yacht Basin portion of San Diego Bay is designated as an impaired water body for dissolved copper pursuant to Clean Water Act section 303(d). A Total Maximum Daily Load (TMDL) has been adopted to address this impairment. See Chapter 3, Water Quality Objectives for Pesticides, Toxicity and Toxic Pollutants and Chapter 7, Total Maximum Daily Loads.

[5] The shoreline segment along Shelter Island Shoreline Park within San Diego Bay is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 7, *Total Maximum Daily Loads for Indicator Bacteria, Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay*.

● Existing Beneficial Use

Table 2-3. BENEFICIAL USES OF COASTAL WATERS

Coastal Waters	Hydrologic Unit Basin Number	BENEFICIAL USE														
		IND	NAV	REC1	REC2	COMM	BIOL	EST	WILD	RARE	MAR	AQUA	MIGR	SPWN	WARM	SHELL
Coastal Lagoons																
Tijuana River Estuary	11.11			●	●	●	●	●	●	●	●		●	●		●
Mouth of San Diego River[6]	7.11			●	●	●		●	●	●	●		●	●		●
Famosa Slough and Channel	7.11			●	●	●		●	●	●	●		●	●		●
Los Penasquitos Lagoon [7]	6.10			●	●		●	●	●	●	●		●	●		●
San Dieguito Lagoon	5.11			●	●		●	●	●	●	●		●	●		
Batiquitos Lagoon	4.51			●	●		●	●	●	●	●		●	●		
San Elijo Lagoon	4.61			●	●		●	●	●	●	●		●	●		
Agua Hedionda Lagoon	4.31	●		●	●	●	●	●	●	●	●	●	●	●		●

[6] The mouth of San Diego River is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria - Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)*.

[7] Fishing from shore or boat permitted, but other water contact recreational (REC-1) uses are prohibited.

● Existing Beneficial Use

○ Potential Beneficial Use

Table 2-3. BENEFICIAL USES OF COASTAL WATERS

Coastal Waters	Hydrologic Unit Basin Number	BENEFICIAL USE														
		IND	NAV	REC1	REC2	COMM	BIOL	EST	WILD	RARE	MAR	AQUA	MIGR	SPWN	WARM	SHELL
Coastal Lagoons – continued																
Buena Vista Lagoon[8]	4.21			●	●		●	○	●	●	●				●	
Loma Alta Slough	4.10			●	●			●	●	●	●					
Mouth of San Luis Rey River[9]	3.11			●	●				●	●	●		●			
Santa Margarita Lagoon	2.11			●	●			●	●	●	●		●	●		

8 Fishing from shore or boat permitted, but other water contact recreational (REC-1) uses are prohibited.

9 The mouth of San Luis Rey River is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria - Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek).*

● Existing Beneficial Use

○ Potential Beneficial Use

Table 2-3. BENEFICIAL USES OF COASTAL WATERS

Coastal Waters	Hydrologic Unit Basin Number	BENEFICIAL USE														
		IND	NAV	REC1	REC2	COMM	BIOL	EST	WILD	RARE	MAR	AQUA	MIGR	SPWN	WARM	SHELL
Coastal Lagoons – continued																
Aliso Creek Mouth[10]	1.13			●	●				●	●	●					
San Juan Creek Mouth[11]	1.27			●	●				●	●	●		●			●
San Mateo Creek Mouth	1.40			●	●		●		●	●	●		●	●		
San Onofre Creek Mouth	1.51			●	●				●	●	●		●	●		

[10] The mouth of Aliso Creek is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria - Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek).*

[11] The mouth of San Juan Creek is designated as a water quality limited segment for indicator bacteria pursuant to Clean Water Act section 303(d). Total Maximum Daily Loads have been adopted to address these impairments. See Chapter 3, *Water Quality Objectives*, Bacteria - Total Coliform, Fecal Coliform, *E. Coli*, and Enterococci, and Chapter 7, *Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek).*

● Existing Beneficial Use

○ Potential Beneficial Use

Table 2-4. BENEFICIAL USES OF RESERVOIRS AND LAKES

Reservoirs & Lakes	Hydrologic Unit Basin Number	BENEFICIAL USE												
		MUN	AGR	IND	PROC	GWR	FRSH	REC1	REC2	WARM	COLD	WILD	RARE	POW
O'Neill Lake	2.13	●	●	●	●			●	●	●	●	●	●	
Diamond Valley Lake	2.35 & 2.36	●	●	●	●	●		●[1]	●	●	●	●		●
Lake Skinner	2.42	●	●	●	●	○		●[1]	●	●		●		
Vail Lake	2.81	●	●	●	●	●		●[1]	●	●		●		
Turner Lake	3.13	●	●	●				○	●	●				
Lake Henshaw	3.31	●	●	●	●		●	●[1]	●	●		●	●	●
Olivenhain Reservoir	5.21	●		●				●[1]	●	●	●	●		●
San Dieguito Reservoir	5.21	●	●	○				●	●	●	●	●		
Lake Dixon	4.62	●	●	○				●[1]	●	●	●	●		
Lake Wohlford	4.63	●	●	○				●[1]	●	●	●	●		●
Lake Hodges	5.21	●	●	●	●			●[1]	●	●	●	●	●	
Lake Poway	5.52	●	●	●	●			●[1]	●	●	●	●		
Sutherland Lake	5.53	●	●	●	●			●[1]	●	●	●	●	●	
Miramar Reservoir	6.10	●		●				●[1]	●	●		●		●
Lake Murray	7.11	●		●				●[1]	●	●	●	●		●
Lake Jennings	7.12	●		●				●	●	●	●	●		

[1] Fishing from shore or boat permitted, but other water contact recreational (REC-1) uses are prohibited.

● Existing Beneficial Use

○ Potential Beneficial Use

Table 2-4. BENEFICIAL USES OF RESERVOIRS AND LAKES

Reservoirs & Lakes	Hydrologic Unit Basin Number	BENEFICIAL USE												
		MUN	AGR	IND	PROC	GWR	FRSH	REC1	REC2	WARM	COLD	WILD	RARE	POW
San Vicente Reservoir	7.21	●	●	●	●			●[1]	●	●	●	●		
El Capitan Reservoir	7.31	●	●	●	●			●[1]	●	●	●	●	●	
Cuyamaca Reservoir	7.43	●	●	●	●			●[1]	●	●	●	●	●	
Sweetwater Reservoir	9.21	●	●	●	●			●	●	●		●		
Loveland Reservoir	9.31	●	●	●	●			●	●	●	●	●		
Lower Otay Reservoir	10.31	●	●	●	●			●[1]	●	●	●	●		
Upper Otay Reservoir	10.32	●	●	●	●			●	●	●	●	●		
Lake Barrett	11.30	●	●	●	●		●	●	●	●	●	●	●	
Morena Reservoir	11.50	●	●	●	●		●	●[1]	●	●	●	●	●	

[1] Fishing from shore or boat permitted, but other water contact recreational (REC-1) uses are prohibited.

● Existing Beneficial Use

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
SAN JUAN HYDROLOGIC UNIT		1.00						
Laguna	HA	1.10						
San Joaquin Hills	HSA [1]	1.11	●	●				
Laguna Beach	HSA [1]	1.12	●	●				
Aliso	HSA [2]	1.13	●	●				
Dana Point	HSA [1]	1.14	+	●				
Mission Viejo	HA	1.20						
Oso	HSA	1.21	●	●	●			
Upper Trabuco	HSA	1.22	●	●	●			
Middle Trabuco	HSA	1.23	●	●	●			
Gobernadora	HSA	1.24	●	●	●			
Upper San Juan	HSA	1.25	●	●	●			
Middle San Juan	HSA	1.26	●	●	●			

1 These beneficial uses do not apply to all lands on the coastal side of the inland boundary of the right-of-way of Pacific Coast Highway 1, and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of HA 1.10 are as shown.

2 These beneficial uses do not apply westerly of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

\+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water			Hydrologic Unit Basin Number	BENEFICIAL USE					
				MUN	AGR	IND	PROC	FRSH	GWR
SAN JUAN HYDROLOGIC UNIT - continued			1.00						
Lower San Juan	HSA	3	1.27	●	●	●			
Ortega	HSA		1.28	●	●	●			
San Clemente	HA		1.30						
Prima Deshecha	HSA	2	1.31	●	●				
Segunda Deshecha	HSA		1.32	+					
San Mateo Canyon	HA	2	1.40	●	●	●			
San Onofre	HA	2	1.50	●	●				

2 These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

3 These beneficial uses do not apply to all lands on the coastal side of the inland boundary of the right-of-way of Pacific Coast Highway 1 west of the San Juan Creek channel and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of HA 1.20 are as shown.

● Existing Beneficial Use

+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
SANTA MARGARITA HYDROLOGIC UNIT		2.00						
Ysidora	HA [2]	2.10	●	●	●	●		
DeLuz	HA	2.20	●	●	●			
Murrieta	HA	2.30	●	●	●	●		
Auld	HA	2.40	●	●	●			
Pechanga	HA	2.50	●	●	●			
Wilson	HA	2.60	●	●	○			
Cave Rocks	HA	2.70	●	●				
Aguanga	HA	2.80	●	●	●			
Oakgrove	HA	2.90	●	●				

2 These beneficial uses do not apply westerly of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

○ Potential Beneficial Use

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
SAN LUIS REY HYDROLOGIC UNIT		3.00						
Lower San Luis	HA [2]	3.10	●	●	●			
Monserate	HA	3.20						
Pala	HSA	3.21	●	●	●			
Pauma	HSA	3.22	●	●	●			
La Jolla Amago	HSA	3.23	●	●	●	●		
Warner Valley	HA	3.30						
Warner	HSA	3.31	●	●	●		●	
Combs	HSA	3.32	●	●	●			

2 These beneficial uses do not apply westerly of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE MUN	AGR	IND	PROC	FRSH	GWR
CARLSBAD HYDROLOGIC UNIT		4.00						
Loma Alta	HA [2]	4.10	+		●			
Buena Vista Creek	HA	4.20						
El Salto	HSA [2]	4.21	●	●	○			
Vista	HSA	4.22	●	●	●			
Agua Hedionda	HA	4.30						
Los Monos	HSA [2]	4.31	●	●	●			
Los Monos	HSA [5]	4.31	○	○	○			
Los Monos	HSA [6]	4.31	○	●	○			
Buena	HSA	4.32	●	●	●			

2 These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

5 These beneficial uses designations apply to the portion of HSA 4.31 bounded on the west by the easterly boundary of Interstate Highway 5 right-of-way; on the east by the easterly boundary of El Camino Real; and on the north by a line extending along the southerly edge of Agua Hedionda Lagoon to the easterly end of the lagoon, thence in an easterly direction to Evans Point, thence easterly to El Camino Real along the ridge lines separating Letterbox Canyon and the area draining to the Marcario Canyon.

6 These beneficial uses apply to the portion of HSA 4.31 tributary to Agua Hedionda Creek downstream from the El Camino Real crossing, except lands tributary to Marcario Canyon (located directly southerly of Evans Point, land directly south of Agua Hedionda Lagoon, and areas west of Interstate Highway 5.

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water			Hydrologic Unit Basin Number	BENEFICIAL USE					
				MUN	AGR	IND	PROC	FRSH	GWR
CARLSBAD HYDROLOGIC UNIT - continued			4.00						
Encinas	HA		4.40	+					
San Marcos	HA		4.50						
Batiquitos	HSA	2,7	4.51	●	●	●			
Batiquitos	HSA	8	4.51	○	○	○			
Richland	HSA	2,7	4.52	●	●	●			
Twin Oaks	HSA	2,7	4.53	●	●	●			
Escondido	HA		4.60						
San Elijo	HSA	2	4.61	○	●	●			
Escondido	HSA		4.62	●	●	●			
Lake Wohlford	HSA		4.63	●	●	●			

2 These beneficial uses do not apply westerly of easterly boundary of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

7 These beneficial uses do not apply to HSA 4.51 and HSA 4.52 between Highway 78 and El Camino Real and to all lands which drain to Moonlight Creek, Cottonwood Creek and to Encinitas Creek and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the subarea are as shown.

8 These beneficial uses apply to the portion of HSA 4.51 bounded on the south by the north shore of Batiquitos Lagoon, on the west by the easterly boundary of the Interstate Highway 5 right-of-way, on the north by the subarea boundary and on the east by the easterly boundary of El Camino Real.

● Existing Beneficial Use

○ Potential Beneficial Use

\+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
SAN DIEGUITO HYDROLOGIC UNIT		5.00						
Solana Beach	HA [2]	5.10	●	●	●			
Hodges	HA	5.20	●	●	●			
San Pasqual	HA	5.30	●	●	●			
Santa Maria Valley	HA	5.40						
Ramona	HSA	5.41	●	●	●	●		
Lower Hatfield	HSA	5.42	●	●	●			
Wash Hallow	HSA	5.43	●	●	●			
Upper Hatfield	HSA	5.44	●	●	●			
Ballena	HSA	5.45	●	●	●			
East Santa Teresa	HSA	5.46	●	●	●			
West Santa Teresa	HSA	5.47	●	●	●			
Santa Ysabel	HA	5.50	●	●				

2 These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Interstate Highway 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water			Hydrologic Unit Basin Number	BENEFICIAL USE					
				MUN	AGR	IND	PROC	FRSH	GWR
PENASQUITOS HYDROLOGIC UNIT			6.00						
Miramar Reservoir	HA	[2, 9]	6.10	●	●	●			
Poway	HA		6.20	●	●	○			
Scripps	HA		6.30	+					
Miramar	HA	[10]	6.40	+		○			
Tecolote	HA		6.50	+					

2 These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Interstate Highway 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

9 These beneficial uses do not apply to all lands which drain to Los Penasquitos Canyon from 1.5 miles west of Interstate Highway 15 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

10 These beneficial uses do not apply west of Interstate Highway 15. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

○ Potential Beneficial Use

+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
SAN DIEGO HYDROLOGIC UNIT		7.00						
Lower San Diego	HA	7.10						
Mission San Diego	HSA [2]	7.11	○	●	●	●		
Santee	HSA	7.12	●	●	●	●		
El Cajon	HSA	7.13	●	●	○	○		
Coches	HSA	7.14	●	●	●	○		
El Monte	HSA	7.15	●	●	●	○		
San Vicente	HA	7.20	●	●				
El Capitan	HA	7.30	●	●				
Boulder Creek	HA	7.40	●	●				

2 These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

○ Potential Beneficial Use

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
PUEBLO SAN DIEGO HYDROLOGIC UNIT		8.00						
Point Loma	HA	8.10	+					
San Diego Mesa	HA	8.20	+					
National City	HA [2]	8.30	●					
SWEETWATER HYDROLOGIC UNIT		9.00						
Lower Sweetwater	HA	9.10						
Telegraph	HSA	9.11	○	●	○			
La Nacion	HSA	9.12	●	●	●			
Middle Sweetwater	HA	9.20	●	●	●			
Upper Sweetwater	HA	9.30	●	●				

2 These beneficial uses do not apply westerly of the easterly boundary of the right-of-way of Interstate 5 and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

○ Potential Beneficial Use

\+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE					
			MUN	AGR	IND	PROC	FRSH	GWR
OTAY HYDROLOGIC UNIT		10.00						
Coronado	HA	10.10	+					
Otay Valley	HA	10.20	●	●	●			
Otay Valley	HA [11]	10.20	+		●			
Dulzura	HA	10.30	●	●	●			

11 This beneficial use designation applies to the portion of Otay HA (10.20), limited to lands within and tributary to Salt Creek on the east and Poggi Canyon on the west and including the several smaller drainage courses between these tributaries of the Otay River.

● Existing Beneficial Use

\+ Excepted from MUN (see text)

Table 2-5. BENEFICIAL USES OF GROUND WATERS

Ground Water		Hydrologic Unit Basin Number	BENEFICIAL USE MUN	AGR	IND	PROC	FRSH	GWR
TIJUANA HYDROLOGIC UNIT		11.00						
Tijuana Valley	HA	11.10						
San Ysidro	HSA [12]	11.11	●	●	●			
Water Tanks	HSA	11.12	○	○	○			
Potrero	HA	11.20	●	●	●			
Barrett Lake	HA	11.30	●	●				
Monument	HA	11.40	●	●				
Morena	HA	11.50	●	●				
Cottonwood	HA	11.60	●	●				
Cameron	HA	11.70	●	●				
Campo	HA	11.80	●	●	●			

12 These beneficial uses do not apply west of Hollister Street and this area is excepted from the sources of drinking water policy. The beneficial uses for the remainder of the hydrologic area are as shown.

● Existing Beneficial Use

○ Potential Beneficial Use

SAN DIEGO
Integrated Regional
Water Management

Appendix 3-B:
Water Quality Objectives for the San Diego Region

Excerpted from Basin Plan (Regional Board, Updated 2016)
Basin Plan Table 3-2 (Water Quality Objectives)




Table 3-2. Water Quality Objectives

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters			Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
				TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN JUAN HYDROLOGIC UNIT			**901.00**													
Laguna	HA		1.10	1,000	400	500	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Mission Viejo	HA		1.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Clemente	HA		1.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Mateo Canyon	HA		1.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Onofre	HA		1.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
SANTA MARGARITA HYDROLOGIC UNIT			**902.00**													
Ysidora	HA		2.10	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Deluz	HA		2.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Deluz Creek	HSA	b	2.21	750	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Gavilan	HSA	b	2.22	750	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Murrieta	HA		2.30	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Auld	HA		2.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Pechanga	HA		2.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Wolf	HSA	b	2.52	750	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Wilson	HA		2.60	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Cave Rocks	HA		2.70	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Aguanga	HA		2.80	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Oakgrove	HA		2.90	750	300	300	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-2. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN LUIS REY HYDROLOGIC UNIT		**903.00**													
Lower San Luis	HA	3.10	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Monserat	HA	3.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Warner Valley	HA	3.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
CARLSBAD HYDROLOGIC UNIT		**904.00**													
Loma Alta	HA	4.10	-	-	-	-	-	-	-	-	-	none	20	20	1.0
Buena Vista Creek	HA	4.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Agua Hedionda	HA	4.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Encinas	HA	4.40	-	-	-	-	-	-	-	-	-	none	20	20	1.0
San Marcos	HA	4.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Escondido Creek	HA	4.60	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
SAN DIEGUITO HYDROLOGIC UNIT		**905.00**													
Solana Beach	HA	5.10	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Hodges	HA	5.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
San Pasqual	HA	5.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Santa Maria Valley	HA	5.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Santa Ysabel	HA	5.50	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-2. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
PENASQUITOS HYDROLOGIC UNIT		**906.00**													
Miramar Reservoir	HA	6.10	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Poway	HA	6.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Scripps	HA	6.30	-	-	-	-	a	-	-	-	-	none	20	20	-
Miramar	HA	6.40	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Tecolote	HA	6.50	-	-	-	-	a	-	-	-	-	none	20	20	-
SAN DIEGO HYDROLOGIC UNIT		**907.00**													
Lower San Diego	HA	7.10	1,000	400	500	60	a	0.3	0.05	0.5	1.0	none	20	20	-
Mission San Diego	HSA	7.11	1,500	400	500	60	a	1.0	1.00	0.5	1.0	none	20	20	-
Santee	HSA c,	7.12	1,000	400	500	60	a	1.0	1.00	0.5	1.0	none	20	20	-
Santee	HSA d	7.12	1,500	400	500	60	a	1.0	1.00	0.5	1.0	none	20	20	-
San Vicente	HA	7.20	300	50	65	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
El Capitan	HA	7.30	300	50	65	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Boulder Creek	HA	7.40	300	50	65	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
PUEBLO SAN DIEGO HYDROLOGIC UNIT		**908.00**													
Point Loma	HA	8.10	-	-	-	-	-	-	-	-	-	none	20	20	-
San Diego Mesa	HA	8.20	-	-	-	-	-	-	-	-	-	none	20	20	-
National City	HA	8.30	-	-	-	-	-	-	-	-	-	none	20	20	-

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-2. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Inland Surface Waters		Hydrologic Unit Basin Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	N&P	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SWEETWATER HYDROLOGIC UNIT		**909.00**													
Lower Sweetwater	HA	9.10	1,500	500	500	60	a	0.3	0.05	0.5	0.75	none	20	20	-
Middle Sweetwater	HA	9.20	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Upper Sweetwater	HA	9.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
OTAY HYDROLOGIC UNIT		**910.00**													
Coronado	HA	10.10	-	-	-	-	-	-	-	-	-	-	-	-	-
Otay Valley	HA	10.20	1,000	400	500	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
Dulzura	HA	10.30	500	250	250	60	a	0.3	0.05	0.5	0.75	none	20	20	1.0
TIJUANA HYDROLOGIC UNIT		**911.00**													
Tijuana Valley	HA	11.10	-	-	-	-	-	-	-	-	-	-	-	-	-
San Ysidro	HSA	11.11	2,100	-	-	-	a	-	-	-	-	none	20	20	-
Potrero	HA	11.20	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Barrett Lake	HA	11.30	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Monument	HA	11.40	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Morena	HA	11.50	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Cottonwood	HA	11.60	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Cameron	HA	11.70	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0
Campo	HA	11.80	500	250	250	60	a	0.3	0.05	0.5	1.0	none	20	20	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Endnotes for Table 3-2

a. 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. Threshold total Phosphorus (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisances in streams and other flowing waters appears to be 0.1 mg/l total P. These values are not to be exceeded more than 10% of the time unless studies of the specific body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N: P=10:1 shall be used. Note - Certain exceptions to the above water quality objectives are described in Chapter 4 in the sections titled Discharges to Coastal Lagoons from Pilot Water Reclamation Projects and Discharges to Surface Waters.

b. These objectives apply to the lower portion of Murrieta Creek in the Wolf HSA (2.52) and the Santa Margarita River from it's beginning at the confluence of Murrieta and Temecula Creeks, through the Gavilan HSA (2.22) and DeLuz HSA (2.21), to where it enters the Upper Ysidora HSA (2.13).

c. Sycamore Canyon Subarea, a portion of the Santee Hydrologic Subarea, includes the watersheds of the following north-south trending canyons: Oak Creek, Spring Canyon, Little Sycamore Canyon, Quail Canyon, and Sycamore Canyon. The Sycamore Canyon subarea extends eastward from the Mission San Diego HSA to the confluence of the San Diego River and Forester Creek, immediately south of the Santee Lakes.

d. These objectives apply to the Lower Sycamore Canyon portion of the Santee Hydrologic Subarea described as all of the Sycamore Canyon watershed except that part which drains north of the boundary between sections 28 and 33, Township 14 South, Range 1 West.

Table 3-3. Water Quality Objectives

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water		Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	NO_3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN JUAN HYDROLOGIC UNIT		**901.00**													
Laguna	HA	1.10													
San Joaquin Hills	HSA	1.11	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Laguna Beach	HSA	1.12	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Aliso	HSA	1.13	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Dana Point	HSA	1.14	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Mission Viejo	HA	1.20													
Oso	HSA	1.21	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Upper Trabuco	HSA	1.22	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Middle Trabuco	HSA	1.23	750	375	375	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Gobernadora	HSA	1.24	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Upper San Juan	HSA	1.25	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Middle San Juan	HSA	1.26	750	375	375	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Lower San Juan	HSA	1.27	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Ortega	HSA	1.28	1,100	375	450	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
San Clemente	HA	1.30													
Prima Deshecha	HSA	1.31	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Segunda Deshecha	HSA	1.32	1,200	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
San Mateo Canyon	HA [a]	1.40	500 [b]	250	250 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
San Onofre	HA [a]	1.50	500 [b]	250	250 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water		Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO4	%Na	NO3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SANTA MARGARITA HYDROLOGIC UNIT		**902.00**													
Ysidora	HA [a]	2.10	750 [c]	300 [c]	300 [c]	60	45 [c]	0.3 [c]	0.05 [c]	0.5	0.75 [c]	none	5	15	1.0
Deluz	HA	2.20	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Deluz Creek	HSA [m]	2.21	750	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Gavilan	HSA [m]	2.22	750	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Murrieta	HA	2.30	750 [c]	300 [c]	300 [c]	60	45 [c]	0.3 [c]	0.05 [c]	0.5	0.75 [c]	none	5	15	1.0
Domenigoni	HSA	2.35	2,000	-	-	-		-	-	-	-	-	-	-	-
Auld	HA	2.40	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Pechanga	HA	2.50	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Pauba	HSA [o]	2.51	750	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Wolf	HSA [p]	2.52	750	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Wilson	HA	2.60	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Cave Rocks	HA	2.70	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Aguanga	HA	2.80	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Oakgrove	HA	2.90	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
SAN LUIS REY HYDROLOGIC UNIT		**903.00**													
Lower San Luis	HA	3.10	800 [r]	300	400	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Mission	HSA [a]	3.11	1,500 [cd]	500 [cd]	500 [cd]	60	45 [cd]	0.85 [cd]	0.15 [cd]	0.5 [d]	0.75 [cd]	none	5	15 [d]	1.0 [d]
Bonsall	HSA	3.12	1,500 [cd]	500 [cd]	500 [cd]	60	45 [cd]	0.85 [cd]	0.15 [cd]	0.5 [d]	0.75 [cd]	none	5	15 [d]	1.0 [d]
Moosa	HSA	3.13	1,200 [r]	300	400	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Valley Center	HSA	3.14	1,100 [r]	300	400	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water			Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
				TDS	Cl	SO_4	%Na	NO_3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN LUIS REY HYDROLOGIC UNIT (continued)			**903.00**													
Monserate	HA		3.20													
Pala	HSA		3.21	900 [c]	300 [c]	500 [c]	60	45 [c]	0.3 [c]	0.05 [c]	0.5	0.75	none	5	15	1.0
Pauma	HSA		3.22	800 [c]	300 [c]	400 [c]	60	45 [c]	0.3 [c]	0.05 [c]	0.5	0.75	none	5	15	1.0
La Jolla Amago	HSA		3.23	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Warner Valley	HA		3.30	500	250	250	60	5	0.3	0.05	0.5	0.75	none	5	15	1.0
CARLSBAD HYDROLOGIC UNIT			**904.00**													
Loma Alta	HA		4.10	-	-	-	-	-	-	-	-	-	-	-	-	-
Buena Vista Creek	HA		4.20													
El Salto	HSA	a	4.21	3,500	800	500	60	45	0.3	0.05	0.5	2.0	none	5	15	1.0
Vista	HSA	a	4.22	1,000 [b]	400 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Agua Hedionda	HA	a	4.30	1,200	500	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Los Monos	HSA	a j	4.31	3,500	800	500	60	45	0.3	0.05	0.5	2.0	none	5	15	1.0
Encinas	HA	a	4.40	3,500 [b]	800 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
San Marcos	HA	a e	4.50	1,000	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Batiquitos	HSA	a e k	4.51	3,500	800	500	60	45	0.3	0.05	0.5	2.0	none	5	15	1.0
Escondido Creek	HA	a	4.60	750	300	300	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
San Elijo	HSA	a	4.61	2,800	700	600	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Escondido	HSA		4.62	1,000	300	400	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water			Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
				TDS	Cl	SO_4	%Na	NO_3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN DIEGUITO HYDROLOGIC UNIT			**905.00**													
Solana Beach	HA	[a]	5.10	1,500 [b]	500 [b]	500 [b]	60	45 [b]	0.85 [b]	0.15 [b]	0.5	0.75 [b]	none	5	15	1.0
Hodges	HA		5.20	1,000 [b]	400 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
San Pasqual	HA		5.30	1,000 [b]	400 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Santa Maria Valley	HA		5.40	1,000	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Santa Ysabel	HA		5.50	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
PENASQUITOS HYDROLOGIC UNIT			**906.00**													
Miramar Reservoir	HA	[a f]	6.10	1,200	500	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Poway	HA		6.20	750 [q]	300	300	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Scripps	HA		6.30	-	-	-	-	-	-	-	-	-	-	-	-	-
Miramar	HA	[g]	6.40	750	300	300	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Tecolote	HA		6.50	-	-	-	-	-	-	-	-	-	-	-	-	-
SAN DIEGO HYDROLOGIC UNIT			**907.00**													
Lower San Diego	HA		7.10													
Mission San Diego	HSA	[a]	7.11	3,000 [b]	800 [b]	600 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
Santee	HSA		7.12	1,000 [b]	400 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Santee (alluvial aquifer for lower Sycamore Canyon)	HSA	[n]	7.12	2,000 [b]	800 [b]	600 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
El Cajon	HSA		7.13	1,200 [b]	250 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Coches	HSA		7.14	600 [b]	250 [b]	250 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
El Monte	HSA		7.15	600 [b]	250 [b]	250 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water		Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
			TDS	Cl	SO_4	%Na	NO_3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
SAN DIEGO HYDROLOGIC UNIT (continued)		**907.00**													
San Vicente	HA	7.20	600	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
El Capitan	HA	7.30	1,000	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Conejos Creek	HSA	7.31	350	60	60	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Boulder Creek	HA	7.40	350	60	60	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
PUEBLO SAN DIEGO HYDROLOGIC UNIT		**908.0**													
Point Loma	HA [i]	8.10	-	-	-	-	-	-	-	-	-	-	-	-	-
San Diego Mesa	HA [i]	8.20	-	-	-	-	-	-	-	-	-	-	-	-	-
National City	HA [i]	8.30	750	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
SWEETWATER HYDROLOGIC UNIT		**909.00**													
Lower Sweetwater	HA	9.10													
Telegraph	HSA	9.11	3,000 [b]	750 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	2.0 [b]	none	5	15	1.0
La Nacion	HSA	9.12	1,500 [b]	500 [b]	500 [b]	60	45 [b]	0.3 [b]	0.15 [b]	0.5	0.75 [b]	none	5	15	1.0
Middle Sweetwater	HA	9.20	1,000	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
Upper Sweetwater	HA	9.30	500	250	250	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0
OTAY HYDROLOGIC UNIT		**910.00**													
Coronado	HA	10.10	-	-	-	-	-	-	-	-	-	-	-	-	-
Otay Valley	HA	10.20	1,500 [b]	500 [b]	500 [b]	60	45 [b]	0.3 [b]	0.05 [b]	0.5	0.75 [b]	none	5	15	1.0
Otay Valley	HA [l]	10.20	-	-	-	-	-	-	-	-	-	none	-	-	-
Dulzura	HA	10.30	1,000	400	500	60	45	0.3	0.05	0.5	0.75	none	5	15	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Table 3-3. Water Quality Objectives (continued)

Concentrations not to be exceeded more than 10% of the time during any one year period.

Ground Water			Hydrologic Basin Unit Number	Constituent (mg/L or as noted)												
				TDS	Cl	SO_4	%Na	NO_3	Fe	Mn	MBAS	B	ODOR	Turb NTU	Color Units	F
TIJUANA HYDROLOGIC UNIT			**911.00**													
Tijuana Valley	HA	h	11.10	2,500 b	550 b	900 b	70	-	-	-	-	2.0 b	none	-	-	-
Potrero	HA		11.20	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Barrett Lake	HA		11.30	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Monument	HA		11.40	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Morena	HA		11.50	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Cottonwood	HA		11.60	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Cameron	HA		11.70	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0
Campo	HA		11.80	500	250	250	60	45	0.3	0.05	0.5	1.0	none	5	15	1.0

HA - Hydrologic Area
HAS - Hydrologic Sub-Area (Lower case letters indicate endnotes following the table)

Endnotes for Table 3-3

a. The water quality objectives do not apply westerly of the easterly boundary of Interstate Highway 5. The objectives for the remainder of the Hydrologic Area (Subarea) are as shown.

b. Detailed salt balance studies are recommended for this area to determine limiting mineral concentration levels for discharge. On the basis on existing data, the tabulated objectives would probably be maintained in most areas. Upon completion of the salt balance studies, significant water quality objective revisions may be necessary. In the interim period of time, projects of ground water recharge with water quality inferior to the tabulated numerical values may be permitted following individual review and approval by the Regional Board if such projects do not degrade existing ground water quality to the aquifers affected by the recharge.

c. The recommended plan would allow for measurable degradation of ground water in this basin to permit continued agricultural land use. Point sources, however, would be controlled to achieve effluent quality corresponding to the tabulated numerical values. In future years demineralization may be used to treat ground water to the desired quality prior to use.

Endnotes for Table 3-3 (continued)

d. A portion of the Upper Mission Basin is being considered as an underground potable water storage reservoir for treated imported water. The area is located north of Highway 76 an the boundary of hydrologic subareas 3.11 and 3.12. If this program is adopted, local objectives approaching the quality of the imported water would be set and rigorously pursued.

e. The water quality objectives do not apply to hydrologic subareas 4.51 and 4.52 between Highway 78 and El Camino Real and to all lands which drain to Moonlight Creek, Cottonwood Creek and Encinitas Creek. The objectives for the remainder of the Hydrologic Area are as shown.

f. The water quality objectives do not apply to all lands which drain to Los Penasquitos Canyon from 1.5 miles west of Interstate Highway 15. The objectives for the remainder of the Hydrologic Area are as shown.

g. The water quality objectives do not apply west of Interstate Highway 15. The objectives for the remainder of the Hydrologic Area are as shown.

h. The water quality objectives do not apply west of Hollister Street. The objectives for the remainder of the Hydrologic Area are as shown.

i. No significant amount of ground water in this unit.

j. The water quality objectives apply to the portion of Subarea 4.31 bounded on the west by the easterly boundary of the Interstate 5 right-of-way and on the east by the easterly boundary of El Camino Real.

k. The water quality objectives apply to the portion of Subarea 4.51 bounded on the south by the north shore of Batiquitos Lagoon, on the west by the easterly boundary of the Interstate 5 right-of-way and on the east by the easterly boundary of El Camino Real.

l. The water quality objectives apply to the portion of the Otay HA 10.20 limited to lands within and tributary to Salt Creek on the east and Poggi Canyon on the west and including the several smaller drainage courses between these tributaries of the Otay River.

m. These objectives apply to the alluvial ground water beneath the Santa Margarita River from the confluence of Murrieta and Temecula Creeks through the Gavilan and DeLuz HSAs to a depth of 100 feet and a lateral distance equal to the area of the floodplain covered by a 10 year flood event. These objectives do not apply to ground water in any of the basins beneath DeLuz, Sandia, and Rainbow Creeks and other unnamed creeks, which are tributaries of the Santa Margarita River.

n. These objectives apply for only the alluvial aquifer in the Lower Sycamore Canyon portion of the Santee Hydrologic Subarea described as all of the Sycamore Canyon watershed except that part which drains north of the boundary between sections 28 and 33, Township 14 South, Range 1 West.

Endnotes for Table 3-3 (continued)

o. These objectives apply to ground waters within 250 feet of the surface for the most downstream 4,200 acres of the Pauba HSA (2.51) which drain directly to the most downstream 2.7 mile segment of Temecula Creek. Excluded from this area are all lands upgradient from a point 0.5 miles east of the intersection of Butterfield Stage Road and Highway 79.

p. These objectives apply to ground waters within 250 feet of the surface for the most downstream 2,800 acres of the Wolf HSA (2.52) including those portions of the HSA which drain directly to the most downstream 1.5 mile segment of Pechanga Creek. Excluded from this area are all lands of HSA 2.52 which are upgradient of the intersection of Pala Road and Via Eduardo.

q. These objectives apply to ground waters of the Poway HSA (6.2) that lie east of the San Diego County Water Authority's (SDCWA) First Aqueduct. Ground water quality objectives west of the SDCWA First Aqueduct are 1,000 mg/l.

r. The total dissolved solids (TDS) objective for the alluvial aquifer in the Moosa Hydrologic Subarea (903.13) is 1,200 mg/l. The TDS objective for the alluvial aquifer in the Valley Center Hydrologic Subarea (903.14) is 1,100 mg/l.

SAN DIEGO
Integrated Regional
Water Management

Appendix 3-C:
303(d) List of Impaired Waters in the San Diego Region




Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Agua Hedionda Creek	7 miles	Benthic community effects	2010	2025
		Bifenthrin	2014	2029
		Chlorpyrifos	2014	2029
		Cypermethrin	2014	2029
		Indicator bacteria	2014	2019
		Malathion	2014	2029
		Manganese	2006	2019
		Nitrogen	2014	2019
		Phosphorus	2010	2019
		Selenium	2006	2019
		Total dissolved solids	2002	2019
		Total nitrogen	2010	2019
		Toxicity	2010	2019
Aliso Creek	19 miles	Benthic community effects	2010	2025
		Indicator bacteria	2002	2011
		Malathion	2014	2029
		Nitrogen	2014	2019
		Phosphorus	2002	2019
		Selenium	2010	2021
		Total nitrogen	2010	2019
		Toxicity	2002	2019
Alpine Creek	2.2 miles	Indicator bacteria	2014	2019
Alvarado Creek	5.1 miles	Nitrogen	2010	2023
		Selenium	2010	2021
Arroyo Trabuco	23 miles	Benthic community effects	2010	2025
		Indicator bacteria	2014	2019
		Malathion	2014	2029
		Nitrogen	2014	2019
		Phosphorus	2010	2019

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Total nitrogen	2010	2019
		Toxicity	2010	2019
Bell Canyon Creek	14 miles	Toxicity	2014	2027
Buena Creek	4.8 miles	DDT	2006	2019
		Indicator bacteria	2014	2019
		Nitrate and nitrite	2006	2019
		Nitrogen	2014	2023
		Phosphorus	2010	2023
Buena Vista Creek	11 miles	Benthic community effects	2010	2025
		Bifenthrin	2014	2027
		Selenium	2010	2019
		Toxicity	2014	2019
Campo Creek	6.3 miles	Indicator bacteria	2014	2029
Carroll Canyon	12 miles	Benthic community effects	2010	2025
		Toxicity	2014	2027
Chocolate Creek	4.5 miles	Indicator bacteria	2014	2029
		Nitrogen	2010	2025
		Phosphorus	2010	2023
Chollas Creek	3.5 miles	Bifenthrin	2014	2027
		Chlorpyrifos	2014	2025
		Copper	1996	2005
		Cypermethrin	2014	2025
		Diazinon	2002	2003
		Indicator bacteria	2002	2011
		Lead	1996	2005
		Malathion	2014	2025
		Nitrogen	2014	2019
		Phosphorus	2010	2019
		Trash	2010	2021

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Zinc	1996	2008
Cloverdale Creek	1.2 miles	Nitrogen	2014	2023
		Phosphorus	2002	2019
		Total dissolved solids	2002	2019
Cottonwood Creek (San Marcos Creek watershed)	1.9 miles	Benthic community effects	2014	2025
		DDT	2006	2019
		Nitrogen	2014	2023
		Phosphorus	2006	2019
		Selenium	2010	2019
		Toxicity	2014	2019
Cottonwood Creek (Tijuana River watershed)	53 miles	Indicator bacteria	2014	2029
		Selenium	2010	2019
Couser Canyon Creek	3.4 miles	Indicator bacteria	2014	2029
Cristianitos Creek	6.7 miles	Cadmium	2014	2029
		Indicator bacteria	2014	2025
		Selenium	2014	2029
De Luz Creek	14 miles	Iron	2006	2019
		Manganese	2006	2019
		Nitrogen	2016	2025
		Sulfates	2016	2019
East Channel Creek	2.2 miles	Indicator Bacteria	2014	2029
Encinitas Creek	3 miles	Benthic Community Effects	2010	2025
		Phosphorus	2006	2019
		Selenium	2010	2019
		Toxicity	2010	2019
English Canyon	3.6 miles	Benthic Community Effects	2014	2025
		Benzo[b]fluoranthene	2006	2019
		Dieldrin	2006	2019
		Phosphorus	2010	2023
		Selenium	2010	2019

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Total Nitrogen as N	2010	2021
		Toxicity	2014	2019
Escondido Creek	26 miles	Benthic Community Effects	2010	2025
		Bifenthrin	2014	2027
		DDT	2006	2019
		Indicator Bacteria	2014	2019
		Malathion	2014	2027
		Manganese	2006	2019
		Nitrogen	2014	2019
		Phosphate	2006	2019
		Selenium	2006	2019
		Sulfates	2006	2019
		Total Dissolved Solids	2006	2019
		Toxicity	2010	2019
Eucalyptus Hills Creek	2.8 miles	Diazinon	2014	2025
		Indicator Bacteria	2014	2029
Felicita Creek	0.92 miles	1,4-Dioxane	2014	2027
		Aluminum	2006	2019
		Indicator Bacteria	2014	2025
		Tetrachloroethylene/PCE	2014	2027
		Total Dissolved Solids	2002	2019
		Trichloroethylene/TCE	2014	2027
Forester Creek	6.4 miles	Benthic Community Effects	2014	2025
		Indicator Bacteria	2014	2011
		Nitrogen	2010	2029
		Phosphorus	2006	2019
		Selenium	2010	2019
		Total Dissolved Solids	2002	2019
Gopher Creek	4.4 miles	Indicator Bacteria	2014	2025
Green Canyon Creek	5.2 miles	Indicator Bacteria	2014	2025
Green Valley Creek	0.98 miles	Benthic Community Effects	2010	2025
		Bifenthrin	2014	2025

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Chloride	2006	2019
		Chlorpyrifos	2014	2025
		Manganese	2006	2019
		Pentachlorophenol (PCP)	2006	2019
Harbison Canyon	3.5 miles	Indicator Bacteria	2014	2025
Jamacha Creek	1.8 miles	Indicator Bacteria	2014	2025
Jamul Creek	10 miles	Toxicity	2010	2019
Keys Creek	13 miles	Indicator Bacteria	2014	2025
		Nitrogen	2010	2025
		Selenium	2010	2019
Kit Carson Creek	0.99 miles	Pentachlorophenol	2006	2019
		Total dissolved solids	2002	2019
La Zanja Canyon	4.5 miles	Indicator Bacteria	2014	2025
Laguna Canyon Channel	1.6 miles	Benthic Community Effects	2014	2025
		Indicator Bacteria	2014	2025
		Phosphorus	2010	2023
		Total Nitrogen as N	2010	2025
		Toxicity	2010	2019
Live Oak Creek (San Diego County)	2.5 miles	Indicator Bacteria	2014	2025
Loma Alta Creek	7.8 miles	Benthic Community Effects	2010	2025
		Bifenthrin	2014	2027
		Selenium	2010	2019
		Toxicity	2010	2019
Long Canyon (Lower Sweetwater Watershed)	1.4 miles	Indicator Bacteria	2014	2025
Long Canyon Creek (tributary to Murrieta Creek)	8.3 miles	Chlorpyrifos	2010	2019
		Iron	2010	2019
		Manganese	2010	2019
		Nitrogen	2014	2023
		Phosphorus	2010	2023

Table C-1
Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1]
Streams and Rivers (Listed Alphabetically)

Stream or River	Impaired Area	Pollutant	Year Listed	Scheduled TMDL Completion
		Indicator Bacteria	2014	2027
		Nitrogen	2010	2027
		Phosphorus	2010	2023
		Selenium	2010	2019
Los Coches Creek	8.8 miles	Indicator Bacteria	2014	2027
		Nitrogen	2010	2027
		Phosphorus	2010	2023
		Selenium	2010	2019
Los Peñasquitos Creek	12 miles	Benthic Community Effects	2010	2025
		Bifenthrin	2014	2027
		Chlorpyrifos	2014	2027
		Indicator Bacteria	2014	2019
		Nitrogen	2014	2019
		Phosphate	2006	2019
		Total Dissolved Solids	2006	2019
		Toxicity	2010	2023
Mexican Canyon Creek (eastern tributary to Sweetwater River, Upper)	4.5 miles	Indicator Bacteria	2014	2027
Mexican Canyon Creek (western tributary to Sweetwater River, Upper)	3.2 miles	Indicator Bacteria	2014	2027
Moosa Canyon Creek	18 miles	Indicator Bacteria	2014	2027
		Nitrogen	2010	2023
		Phosphorus	2010	2023
Moro Canyon Creek	3.4 miles	Nitrogen	2010	2023
		Phosphorus	2010	2023
		Selenium	2010	2021
		Toxicity	2010	2021
Murrieta Creek	12 miles	Chlorpyrifos	2010	2021
		Copper	2016	2019
		Indicator Bacteria	2014	2025

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Iron	2006	2019
		Manganese	2006	2019
		Nitrogen	2006	2019
		Phosphorus	2002	2019
		Toxicity	2010	2021
Oso Creek (near Mission Viejo Golf Course)	1 mile	Chloride	2006	2019
		Sulfates	2006	2019
		Total dissolved solids	2006	2019
Oso Creek (lower)	4 miles	Nitrogen	2010	2023
		Phosphorus	2010	2023
		Selenium	2010	2021
		Toxicity	2010	2021
Paleta Creek	4.1 miles	Copper	2010	2021
		Lead	2010	2021
Paradise Creek	2.8 miles	Phosphorus	2010	2023
		Selenium	2010	2021
Pine Valley Creek (lower)	16 miles	Indicator Bacteria	2014	2025
Poggi Canyon Creek	7.8 miles	Nitrogen	2014	2023
		Toxicity	2010	2021
Poway Creek	7.3 miles	Nitrogen	2014	2023
		Selenium	2010	2021
		Toxicity	2010	2021
Prima Deshecha Creek	1.2 miles	Cadmium	2010	2021
		Indicator Bacteria	2014	2027
		Malathion	2014	2027
		Nitrogen	2014	2023
		Phosphorus	2002	2019
		Selenium	2014	2027

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Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Turbidity	2002	2019
Rainbow Creek	5 miles	Aluminum	2016	2025
		Iron	2006	2019
		Nitrogen	2002	2006
		Phosphorus	2002	2006
		Sulfates	2006	2019
		Total dissolved solids	2006	2019
Redhawk Channel	0.15 miles	Chlorpyrifos	2010	2021
		Copper	2010	2021
		Diazinon	2010	2021
		Indicator Bacteria	2014	2025
		Iron	2010	2019
		Manganese	2010	2021
		Nitrogen	2010	2021
		Phosphorus	2010	2021
		Total Dissolved Solids	2010	2021
Reidy Canyon Creek	3.9 miles	Indicator Bacteria	2014	2027
		Phosphorus	2006	2019
Rose Creek	13 miles	Benthic Community Effects	2010	2025
		Selenium	2010	2021
		Toxicity	2010	2021
Salt Creek (Orange County)	10 miles	Benthic Community Effects	2014	2025
		Malathion	2014	2027
		Toxicity	2014	2027
San Diego River (lower)	16 miles	Benthic Community Effects	2014	2025
		Cadmium	2014	2029
		Indicator Bacteria	2014	2011
		Nitrogen	2010	2029
		Oxygen, Dissolved	2014	2019
		Phosphorus	2002	2019
		Total Dissolved Solids	2002	2019

Table C-1
Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1]
Streams and Rivers (Listed Alphabetically)

Stream or River	Impaired Area	Pollutant	Year Listed	Scheduled TMDL Completion
		Toxicity	2010	2025
San Diego River (Upper)	32 miles	Indicator Bacteria	2014	2025
		Oxygen, Dissolved	2014	2025
		Sulfates	2010	2025
San Dieguito River	19 miles	Benthic Community Effects	2010	2025
		Indicator Bacteria	2014	2011
		Nitrogen	2010	2021
		Phosphorus	2010	2021
		Total Dissolved Solids	2010	2021
		Toxicity	2010	2021
San Dieguito River, unnamed tributary below Hodges Dam	4.2 miles	Indicator Bacteria	2014	2025
San Elijo Creek (San Diego County)	3.7 miles	Indicator Bacteria	2014	2025
San Elijo Creek (San Diego County), unnamed tributary at San Elijo Avenue	1.6 miles	Indicator Bacteria	2014	2025
San Juan Creek	1 mile	Benthic Community Effects	2010	2025
		DDE	2006	2019
		Indicator Bacteria	1992	2019
		Nitrogen	2014	2021
		Oxygen, Dissolved	2014	2029
		Phosphorus	2016	2021
		Selenium	2010	2021
		Toxicity	2010	2021
San Luis Rey River (west of Interstate 5)	19 miles	Benthic Community Effects	2010	2025
		Bifenthrin	2014	2029
		Chloride	2002	2019
		Indicator Bacteria	2014	2021
		Nitrogen	2014	2021

Table C-1
Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1]
Streams and Rivers (Listed Alphabetically)

Stream or River	Impaired Area	Pollutant	Year Listed	Scheduled TMDL Completion
		Phosphorus	2010	2021
		Toxicity	2010	2021
San Luis Rey River (east of Interstate 5)	35 miles	Indicator Bacteria	2014	2025
		Phosphorus	2010	2023
		Total Nitrogen as N	2010	2021
San Marcos Creek	19 miles	Benthic Community Effects	2010	2025
		DDE	2006	2019
		Indicator Bacteria	2014	2025
		Phosphorus	2006	2019
		Selenium	2010	2021
		Toxicity	2014	2019
San Marcos, Lake, drain to central southwest fork of lake	0.07 miles	Copper	2014	2027
		Indicator Bacteria	2014	2025
San Mateo Creek (San Diego County)	18 miles	Indicator Bacteria	2014	2025
		Invasive Species	2014	2027
		Ammonia as Nitrogen	2010	2021
San Vicente Creek (San Diego County)	16 miles	Indicator Bacteria	2014	2025
		Phosphorus	2010	2023
		Total Nitrogen as N	2010	2021
		Toxicity	2010	2021
Sandia Creek	1.5 miles	Aluminum	2016	2027
		Ammonia (Unionized)	2014	2025
		Iron	2006	2025
		Manganese	2006	2025
		Nitrogen	2006	2029
		Selenium	2016	2027
		Silver	2016	2027

Table C-1
Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1]
Streams and Rivers (Listed Alphabetically)

Stream or River	Impaired Area	Pollutant	Year Listed	Scheduled TMDL Completion
		Sulfates	2006	2019
		Total Dissolved Solids	2002	2019
Santa Gertrudis Creek	12 miles	Chlorpyrifos	2010	2021
		Copper	2010	2021
		Indicator Bacteria	2014	2021
		Iron	2010	2021
		Manganese	2010	2021
		Nitrogen	2014	2023
		Phosphorus	2010	2021
Santa Margarita River (lower)	19 miles	Benthic Community Effects	2014	2025
		Chlorpyrifos	2014	2029
		Indicator Bacteria	2014	2025
		Nitrogen	2014	2025
		Phosphorus	2010	2021
		Toxicity	2010	2025
Santa Margarita River (upper)	18 miles	Indicator Bacteria	2014	2025
		Iron	2014	2025
		Manganese	2010	2025
		Nitrogen	2014	2023
		Phosphorus	2002	2019
		Toxicity	2010	2025
Santa Ysabel Creek (above Sutherland Reservoir)	12 miles	Toxicity	2010	2021
Segunda Deshecha Creek	0.92 miles	Benthic Community Effects	2014	2025
		Indicator Bacteria	2014	2027
		Malathion	2014	2027
		Nitrogen	2014	2027
		Phosphorus	2002	2019
		Selenium	2014	2027
		Toxicity	2010	2021

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Turbidity	2002	2019
Soledad Canyon	1.7 miles	Sediment toxicity	2002	2019
		Selenium	2010	2021
Steele Canyon	5.4 miles	Indicator Bacteria	2014	2025
Sweetwater River (below Sweetwater Reservoir)	5.3 miles	Benthic Community Effects	2014	2025
		Chlorpyrifos	2014	2025
		Indicator Bacteria	2014	2021
		Nitrogen	2014	2021
		Phosphorus	2010	2021
		Selenium	2010	2021
		Total Dissolved Solids	2010	2021
		Toxicity	2010	2021
Sweetwater River, North Fork, unnamed tributary at Tavern Road	1.6 miles	Indicator Bacteria	2014	2025
		Manganese	2014	2027
Sweetwater River, Upper (above Sweetwater Reservoir)	43 miles	Aluminum	2014	2027
		Benthic Community Effects	2014	2025
		Indicator Bacteria	2014	2025
		Selenium	2010	2027
		Total Nitrogen as N	2010	2027
Switzer Creek	1.3 miles	Copper	2010	2021
		Lead	2010	2021
		Zinc	2010	2021
Sycamore Canyon	8.3 miles	Oxygen, Dissolved	2014	2025
Tecate Creek	1.2 miles	Nitrogen	2010	2027
		Phosphorus	2010	2023
		Selenium	2010	2021

Table C-1 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Streams and Rivers (Listed Alphabetically)				
Stream or River	**Impaired Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Tecolote Creek	6.6 miles	Benthic Community Effects	2010	2025
		Bifenthrin	2014	2025
		Cadmium	1996	2019
		Copper	1996	2019
		Cypermethrin	2014	2025
		Diazinon	2014	2025
		Indicator Bacteria	1996	2011
		Lead	1996	2019
		Nitrogen	2010	2021
		Phosphorus	2006	2019
		Selenium	2010	2021
		Toxicity	1996	2019
		Turbidity	2006	2019
		Zinc	1996	2019
Tecolote Creek, South Fork	4 miles	Indicator Bacteria	2014	2025
Telegraph Canyon	10 miles	Nitrogen	2010	2027
		Selenium	2010	2021
Temecula Creek	44 miles	Chlorpyrifos	2010	2021
		Copper	2010	2021
		Indicator Bacteria	2014	2025
		Phosphorus	2006	2019
		Total dissolved solids	2006	2019
		Toxicity	2010	2021
Tijuana River	6 miles	Ammonia as Nitrogen	2010	2027
		Benthic Community Effects	2010	2025
		Cadmium	2014	2025
		Chlorpyrifos	2014	2025

Table C-1
Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1]
Streams and Rivers (Listed Alphabetically)

Stream or River	Impaired Area	Pollutant	Year Listed	Scheduled TMDL Completion
		Diazinon	2014	2025
		Eutrophic	1996	2019
		Indicator Bacteria	1992	2010
		Low Dissolved Oxygen	1996	2019
		Malathion	2014	2025
		Pesticides	1996	2019
		Phosphorus	2010	2021
		Sedimentation/Siltation	2010	2021
		Selenium	2010	2025
		Solids	1996	2019
		Surfactants (MBAS)	2010	2021
		Synthetic Organics	1996	2019
		Total Nitrogen as N	2010	2025
		Toxicity	2010	2025
		Trace Elements	1998	2019
		Trash	1998	2019
Warm Springs Creek (Riverside County)	15 miles	Chlorpyrifos	2010	2021
		Indicator Bacteria	2014	2021
		Iron	2010	2021
		Manganese	2010	2021
		Nitrogen	2014	2021
		Phosphorus	2010	2021
Wood Canyon (Orange County)	3.9 miles	Benthic Community Effects	2010	2025
		Diazinon	2014	2027
		Selenium	2014	2027

1 Category 5 303(d) listings represent impaired waters where development of a Total Daily Maximum Load (TMDL) is required. The above listings were approved by the State Water Resources Control Board on October 3, 2017 and approved by the U.S. Environmental Protection Agency on April 6, 2018.

Table C-2 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Lakes and Reservoirs				
Lake or Reservoir	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Barrett Lake	125 acres	Color	2006	2019
		Manganese	2006	2019
		Perchlorate	2010	2019
		Phosphorus	2010	2023
		Total nitrogen	2010	2019
		pH	2006	2019
El Capitan Lake	1454 acres	Color	2006	2019
		Manganese	2006	2019
		Phosphorus	2010	2021
		Total nitrogen	2010	2021
		pH	2006	2019
Guajome Lake	33 acres	Eutrophic	1996	2019
Lake Hodges	1104 acres	Color	2002	2019
		Manganese	2006	2019
		Mercury	2016	2021
		Nitrogen	2002	2019
		Phosphorus	2002	2013
		Turbidity	2006	2019
		pH	2006	2019
Loveland Reservoir	420 acres	Aluminum	2006	2019
		Dissolved oxygen	2006	2019
		Manganese	2006	2019
		pH	2006	2019
Morena Reservoir	104 acres	Ammonia	2014	2019
		Color	2006	2019
		Manganese	2006	2019
		Nitrogen	2010	2023
		Phosphorus	2010	2019
		pH	2006	2019
Otay Reservoir, Lower	1050 acres	Ammonia	2010	2019

Table C-2 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Lakes and Reservoirs				
Lake or Reservoir	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Color	2006	2019
		Iron	2006	2019
		Manganese	2006	2019
		Nitrogen	2010	2021
		Phosphorus	2010	2023
		pH	2014	2019
San Marcos Lake	17 acres	Ammonia as Nitrogen	2006	2019
		Copper	2014	2027
		Nutrients	2006	2019
		Phosphorus	2006	2019
San Vicente Reservoir	1058 acres	Chloride	2006	2019
		Color	2006	2023
		Nitrogen	2014	2023
		Sulfates	2006	2019
		pH	2014	2019
Sutherland Reservoir	561 acres	Color	2002	2019
		Iron	2016	2021
		Manganese	2006	2019
		Nitrogen	2014	2021
		Phosphorus	2010	2023
		pH	2006	2019
Sweetwater Reservoir	925 acres	Dissolved oxygen	2006	2019

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Appendix C-3 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Bays, Estuaries and Bay Shoreline Waters[2]				
Bay or Estuary	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Agua Hedionda Lagoon	6.8 acres	Toxicity	2014	2027
Aliso Creek (mouth)	0.29 acres	Indicator Bacteria	1990	2011
		Toxicity	2014	2027
Batiquitos Lagoon	433 acres	Toxicity	2014	2027
Buena Vista Lagoon	202 acres	Indicator Bacteria	1996	2008
		Nutrients	1996	2019
		Sedimentation/Siltation	1996	2019
		Toxicity	2014	2027
Dana Point Harbor	119 acres	Copper	2010	2019
		Indicator Bacteria	2002	2025
		Oxygen, Dissolved	2014	2029
		Toxicity	2010	2021
		Zinc	2010	2023
Famosa Slough and Channel	32 acres	Eutrophic	1990	2027
Loma Alta Slough	8.2 acres	Eutrophic	1996	2027
		Indicator bacteria	1996	2027
Los Peñasquitos Lagoon	469 acres	Sedimentation/Siltation	1992	2014
		Toxicity	2014	2027
Mission Bay	1,968 acres	Mercury	2014	2027
		PCBs (Polychlorinated biphenyls)	2014	2027
Mission Bay, area at Mouth of Rose Creek	9.2 acres	Eutrophic	1996	2019
		Lead	1996	2019
Mission Bay, area at mouth of Tecolote Creek	3.1 acres	Eutrophic	1996	2019
		Lead	1996	2019
Mission Bay Shoreline, Bahia Point	0.14 miles	Indicator Bacteria	2014	2019
Mission Bay Shoreline, Bonita Cove	0.09 miles	Indicator Bacteria	2014	2019
Mission Bay Shoreline, Bonita Cove (eastern shore)	0.03 miles	Indicator Bacteria	2014	2025
Mission Bay Shoreline, Campland	0.08 miles	Indicator Bacteria	2014	2025
Mission Bay Shoreline, De Anza Cove	0.06 miles	Indicator Bacteria	2014	2019

Appendix C-3 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Bays, Estuaries and Bay Shoreline Waters[2]				
Bay or Estuary	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Mission Bay Shoreline, Fanuel Park	0.12 miles	Indicator Bacteria	2014	2019
Mission Bay Shoreline, Leisure Lagoon	0.12 miles	Indicator Bacteria	2014	2019
Mission Bay Shoreline, Leisure Lagoon	0.12 miles	Indicator Bacteria	2014	2025
Mission Bay Shoreline, at North Cove Beach at Vacation Isle	0.03 miles	Indicator Bacteria	2014	2025
Mission Bay Shoreline, North Crown Point	0.12 miles	Indicator Bacteria	2014	2019
Mission Bay Shoreline, at Ski Beach at Vacation Isle	0.03 miles	Indicator Bacteria	2014	2025
Mission Bay Shoreline, at Visitors Center	0.1 miles	Indicator Bacteria	2014	2019
Mission Bay, Quivera Basin	65 acres	Copper	2010	2021
Oceanside Harbor	52 acres	Copper	2010	2021
		Toxicity	2010	2027
Pacific Ocean Shoreline, Aliso HSA, at Aliso Creek mouth	0.03 miles	Indicator Bacteria	2014	2025
		Toxicity	2014	2029
Pacific Ocean Shoreline, Dana Point HSA, at Niguel Marine Life Refuge	0.03 miles	Toxicity	2014	2029
Pacific Ocean Shoreline, Imperial Beach Pier	0.42 miles	Indicator Bacteria	2014	2019
		PCBs (Polychlorinated biphenyls)	2006	2019
		Trash	2014	N/A
Pacific Ocean Shoreline, Loma Alta HSA, at Loma Alta Creek mouth	0.03 miles	Indicator Bacteria	1998	2019
		Trash	2014	N/A
Pacific Ocean Shoreline, Otay Valley HA, at Carnation Ave and Camp Surf Jetty	0.03 miles	Indicator Bacteria	2014	2019
Pacific Ocean Shoreline, Point Loma HA, at Bermuda Ave	0.03 miles	Indicator Bacteria	2014	2019
Pacific Ocean Shoreline, San Elijo HSA, at Cardiff State Beach at San Elijo Lagoon	0.44 miles	Indicator Bacteria	1998	2008

Appendix C-3 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Bays, Estuaries and Bay Shoreline Waters[2]				
Bay or Estuary	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Pacific Ocean Shoreline, San Mateo Canyon HA, at San Mateo Creek outlet	0.31 miles	Indicator Bacteria	2014	2025
Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River	0.03 miles	Indicator Bacteria	2014	2021
Pacific Ocean Shoreline, Tijuana HU, at Cortez Avenue	0.03 miles	Indicator Bacteria	2014	2025
Pacific Ocean Shoreline, Tijuana HU, at Monument Road	0.03 miles	Indicator Bacteria	2014	2019
Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth	0.03 miles	Indicator Bacteria	2014	2019
Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive	0.03 miles	Indicator Bacteria	2014	2019
Pacific Ocean Shoreline, Tijuana HU, at the US Border	0.03 miles	Indicator Bacteria	2014	2019
San Diego Bay	10,783 acres	Mercury	2014	2027
		PAHs	2014	2025
		PCBs	2006	2019
San Diego Bay Shoreline, 32nd Street Naval Station	103 acres	Benthic community effects	1998	2019
		Sediment toxicity	1998	2019
San Diego Bay Shoreline, Chula Vista Marina	0.41 miles	Copper	2006	2019
San Diego Bay Shoreline, Downtown Anchorage	7.4 acres	Benthic community effects	1998	2019
		Sediment toxicity	1998	2019
San Diego Bay Shoreline, Near G St Pier	0.42 miles	Indicator Bacteria	2002	2025
San Diego Bay Shoreline, No. of 24th Street Marine Terminal	9.5 acres	Benthic community effects	2002	2019
		Sediment toxicity	2002	2019
San Diego Bay Shoreline, 7th Street Channel	9 acres	Benthic community effects	2002	2008
		Sediment toxicity	2002	2008
San Diego Bay Shoreline, Tidelands Park	0.38 miles	Indicator Bacteria	1800	2021

Appendix C-3 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Bays, Estuaries and Bay Shoreline Waters[2]				
Bay or Estuary	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
San Diego Bay Shoreline B Street and Broadway Piers	9.9 acres	Benthic community effects	2002	2019
		Sediment toxicity	2002	2019
		Indicator Bacteria	2010	2019
San Diego Bay Shoreline, Americas Cup Harbor	88 acres	Copper	1992	2019
San Diego Bay Shoreline, Bayside Park (J Street)	50 acres	Indicator Bacteria	2014	2021
San Diego Bay Shoreline, Coronado Cays	47 acres	Copper	1992	2019
San Diego Bay Shoreline, Glorietta Bay	52 acres	Copper	1992	2019
San Diego Bay Shoreline, Harbor Island (East Basin)	73 acres	Copper	1992	2019
San Diego Bay Shoreline, Harbor Island (West Basin)	132 acres	Copper	1992	2019
San Diego Bay Shoreline, Marriott Marine	24 acres	Copper	1992	2019
San Diego Bay Shoreline, Near Chollas Creek	15 acres	Benthic community effects	2002	2010
		Sediment toxicity	2002	2010
San Diego Bay Shoreline, Near Coronado Bridge	37 acres	Benthic community effects	2002	2019
		Sediment toxicity	2002	2019
San Diego Bay Shoreline, Near Switzer Creek	5.5 acres	Chlordane	2002	2019
		PAHs	2002	2019
San Diego Bay Shoreline, Near Sub Base	16 acres	Benthic community effects	2002	2021
		Toxicity	2002	2021
San Elijo Lagoon	330 acres	Eutrophic	1996	2019
	150 acres	Indicator bacteria	1996	2015
		Sedimentation/siltation	1996	2019

Appendix C-3 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Bays, Estuaries and Bay Shoreline Waters[2]				
Bay or Estuary	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
		Toxicity	2014	2025
San Juan Creek (mouth)	6.3 acres	Cadmium	2014	2025
		Copper	2014	2025
		Indicator Bacteria	1990	2011
		Nickel	2014	2025
Tijuana River Estuary	1319 acres	Eutrophic	1996	2019
		Indicator bacteria	1988	2010
		Lead	1992	2019
		Low Dissolved oxygen	1988	2019
		Nickel	1992	2019
		Pesticides	1992	2019
		Thallium	1992	2019
		Toxicity	2014	2025
		Trash	1996	2019
		Turbidity	2006	2019

1 Category 5 303(d) listings represent impaired waters where development of a Total Daily Maximum Load (TMDL) is required. The above listings were approved by the State Water Resources Control Board on October 3, 2017 and approved by the U.S. Environmental Protection Agency on April 6, 2018.

2 See Table D-4 for impaired sections of the Pacific Ocean shoreline that are not within bays or estuaries.

Appendix C-4 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Pacific Ocean Shoreline[2]				
Pacific Ocean Shoreline	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Aliso Hydrologic Subarea, Aliso Beach (middle)	0.03 miles	Enterococcus	1998	2021
		Total coliform	1998	2021
Aliso Hydrologic Subarea, Aliso Creek mouth	0.03 miles	Enterococcus	1998	2021
		Fecal coliform	1998	2021
		Total coliform	1998	2012
Batiquitos Hydrologic Subarea, Moonlight State Beach at Cottonwood Creek outlet	0.03 miles	Total coliform	1998	2019
Coronado Hydrologic Area, Silver Strand (north end)	0.03 miles	Enterococcus	2010	2021
Dana Point Hydrologic Subarea, Aliso Beach at West Street	0.03 miles	Indicator bacteria	2010	2005
Dana Point Hydrologic Subarea, Dana Point Harbor at Baby Beach	0.03 miles	Enterococcus	1998	2012
		Total coliform	1998	2012
Dana Point Hydrologic Subarea, Salt Creek outlet at Monarch Beach	0.03 miles	Total coliform	1998	2021
Imperial Beach Pier	0.42 miles	Fecal coliform	2010	2019
		PCBs	2006	2019
		Total coliform	2010	2019
Laguna Beach Hydrologic Subarea, Main Beach	0.03 miles	Total coliform	1998	2019
Loma Alta Hydrologic Subarea, Loma Alta Creek Mouth	0.03 miles	Indicator bacteria	1998	2019
Lower San Juan Hydrologic Subarea, North Beach Creek	0.03 miles	Enterococcus	1998	2021
		Fecal coliform	1998	2021
		Total coliform	1998	2021
Lower San Juan Hydrologic Subarea, North Doheny State Park Campground	0.03 miles	Enterococcus	2010	2021
		Total coliform	2010	2021
Lower San Juan Hydrologic Subarea, San Juan Creek	0.03 miles	Enterococcus	1998	2021
		Fecal coliform	1998	2021
		Total coliform	1998	2021

Appendix C-4 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Pacific Ocean Shoreline[2]				
Pacific Ocean Shoreline	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Lower San Juan Hydrologic Subarea, South Doheny State Park Campground	0.03 miles	Enterococcus	2010	2021
Miramar Reservoir Hydrologic Area, Los Peñasquitos River mouth	0.39 miles	Total coliform	2010	2019
Otay Hydrologic Unit, Carnation Avenue and Camp Surf Jetty	0.03 miles	Total coliform	2010	2019
Point Loma Hydrologic Area, Bermuda Avenue	0.03 miles	Total coliform	2010	2019
San Clemente Hydrologic Unit, Poche Beach	0.03 miles	Enterococcus	1998	2019
		Total coliform	1998	2019
San Clemente Hydrologic Unit, San Clemente City Beach at Pier	0.03 miles	Enterococcus	1998	2019
San Clemente Hydrologic Unit, San Clemente City Beach, North Beach	0.03 miles	Total coliform	1998	2019
San Clemente Hydrologic Unit, San Capistrano Beach at Beach Road	0.03 miles	Enterococcus	1998	2021
San Clemente Hydrologic Unit, South Capistrano County Beach	0.03 miles	Enterococcus	1998	2012
		Total coliform	1998	2021
San Diego Hydrologic Unit, San Diego River at Dog Beach	0.03 miles	Enterococcus	1998	2012
		Total coliform	1998	2010
San Dieguito Hydrologic Unit, San Dieguito Lagoon Mouth at San Dieguito River Beach	0.03 miles	Total coliform	1998	2010
San Elijo Hydrologic Unit, Cardiff State Beach at Cardiff Lagoon	0.44 miles	Total coliform	1998	2008
San Luis Rey Hydrologic Unit, San Luis Rey River Mouth	0.03 miles	Enterococcus	1998	2021
		Total coliform	1998	2021
San Mateo Canyon Hydrologic Area at San Mateo Creek outlet	0.31 miles	Total coliform	2010	2019

Appendix C-4 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] Pacific Ocean Shoreline[2]				
Pacific Ocean Shoreline	**Impacted Area**	**Pollutant**	**Year Listed**	**Scheduled TMDL Completion**
Scripps Hydrologic Area at Avenida de la Playa at La Jolla Shores Beach	0.03 miles	Total coliform	2010	2019
Scripps Hydrologic Area at Childrens Pool	0.03 miles	Enterococcus	1998	2021
		Fecal Coliform	1998	2021
		Total Coliform	1998	2021
Scripps Hydrologic Area at La Jolla Cove	0.03 miles	Total coliform	2010	2019
Scripps Hydrologic Area at Pacific Beach Point, Pacific Beach	0.03 miles	Enterococcus	2010	2019
		Fecal coliform	2010	2019
		Total coliform	2010	2019
Scripps Hydrologic Area at Ravina	0.03 miles	Total coliform	1998	2019
Scripps Hydrologic Area at Vallecitos Court, La Jolla Shores Beach	0.03 miles	Total coliform	2010	2021
Tijuana Hydrologic Unit, 0.75 miles north of Tijuana River	0.03 miles	Enterococcus	1996	2021
		Fecal coliform	1996	2021
		Total coliform	1996	2021
Tijuana Hydrologic Unit at Monument Road	0.03 miles	Fecal coliform	1996	2021
		Total coliform	1996	2019
Tijuana Hydrologic Unit, at Tijuana River mouth	0.03 miles	Enterococcus	1996	2019
		Fecal coliform	1996	2019
		Total coliform	1996	2019
Tijuana Hydrologic Unit, at Seacoast Drive	0.03 miles	Enterococcus	1996	2021
		Fecal coliform	1996	2021
		Total coliform	1996	2019
Tijuana Hydrologic Unit, at U.S. Border	0.03 miles	Enterococcus	1996	2021
		Fecal coliform	1996	2021
		Total coliform	1996	2019

1 Category 5 303(d) listings represent impaired waters where development of a Total Daily Maximum Load (TMDL) is required. The above listings were approved by the State Water Resources Control Board on August 4, 2010 and approved by the U.S. Environmental Protection Agency on October 11, 2011.

2 Impaired shoreline waters along estuaries or bays are presented in Table D-3.

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Appendix 3-D:
Endangered and Threatened Species in the San Diego Region




Table 4-1
MSCP Covered Species

Common Name	Scientific Name	Status	Habitat
Plants			
San Diego thornmint	*Acanthomintha ilicifolia*	FT, SE	Chaparral, coastal scrub, grassland, vernal pools.
Shaw's agave	*Agave shawii*	CNPS List 2	Coastal scrub.
San Diego ambrosia	*Ambrosia pumila*	FE, CNPS List 1B	Coastal scrub.
Aphanisma	*Aphanisma blitoides*	CNPS List 1B	Coastal dunes and coastal scrub.
Del Mar manzanita	*Arctostaphylos glandulosa var. crassifolia*	FE, CNPS List 1B	Chaparral, coniferous forest.
Otay manzanita	*Arctostaphylos otavensis*	CNPS 1B	Chaparral and cismontane woodland.
Coastal dunes milk vetch	*Astragalus tener* var. *titi*	FE, SE, CNPS List 1B	Coastal scrub and coastal dunes.
Encinitas baccharis	*Baccharis vanessae*	FT, SE, CNPS List 1B	Chaparral.
Nevin's barberry	*Berberis nevinii*	FE, SE, CNPS List 1B	Chaparral, cismontane woodland, coastal scrub, riparian scrub.
Thread-leaved brodiaea	*Brodiaea filifolia*	FT, SE, CNPS List 1B	Cismontane woodland, coastal scrub, grassland, vernal pools.
Orcutt's brodiaea	*Brodiaea orccuttii*	CNPS List 1B	Vernal pools, grassland, coniferous forest, cismontane woodland, chaparral.
Dense reed grass	*Calamagrostis koelerioide*	CNPS List 4	Meadows, slopes, dry hills, and ridges.
Dunn's mariposa lily	*Calocjortus dunnii*	SR, CNPS List 1B	Coniferous forest and chaparral.
Slender-pod jewel flower	*Caulanthus stenocarpus*	SR	Chaparral.
Lakeside ceanothus	*Ceanothus cyaneus*	CNPS List 1B	Coniferous forest and chaparral.
Wart-stemmed ceonothus	*Ceonothus verrucosus*	CNPS List 2	Chaparral.
Salt marsh bird's-beak	*Cordylanthus maritimus* ssp. *maritimus*	FE, SE, CNPS List 1B	Coastal salt marsh and coastal dunes.
Orcutt's bird's-beak	*Cordylanthus orcuttianus*	CNPS List 2	Coastal scrub.
Del Mar sand aster	*Corethyrogyre filaginiogolia* var. *linifolia*	CNPS List 1B	Chaparral and coastal scrub.
Tecate cypress	*Cupressus forbesii*	CNPS List 1B	Coniferous forest and chaparral.
Short-leaved live-forever	*Dudleya blochmaniae* ssp. *brevifolia*	SE, CNPS List 1B	Chaparral and coastal scrub.
Variegated dudleya	*Dudleya variegata*	CNPS List 1B	Chaparral, coastal scrub, cismontane woodland, grassland, and vernal pools.
Sticky dudleya	*Dudleya viscida*	CNPS List 1B	Coastal scrub and chaparral.
Palmer's ericameria	*Ericameria palmeri* ssp. *palmeri*	CNPS List 2, County Group B	Coastal drainages in mesic chaparral.
Coast wallflower	*rysimum ammophilum*	FE, SE, CNPS List 1B	Vernal pools, coastal scrub, and grassland.
San Diego button-celery	*Eryngium aristulatum* ssp. *parishii*	CNPS List 1B	Chaparral (maritime), coastal dunes, and coastal scrub.
San Diego barrel cactus	*Ferocactus viridescens*	CNPS List 2	Chaparral, coastal scrub, grassland.

Table 4-1
MSCP Covered Species

Common Name	Scientific Name	Status	Habitat
Otay tarplant	*Hemizonia viridescens*	FT, SE, CNPS List 1B	Coastal scrub and grassland.
Heart-leaved pitcher sage	*Lepechinia cardiophylla*	CNPS List 1B	Coniferous forest, chaparral, and cismontane woodland.
Gander's pitcher sage	*Lepechinia ganderi*	CNPS List 1B	Coniferous forest, coastal scrub, and grassland.
Nuttall's lotus	*Lotus nuttallianus*	CNPS List 1B	Coastal dunes and coastal scrub.
Felt-leaved monardella	*Lotus hypoleuca* ssp. *lanata*	CNPS List 1B	Chaparral and cismontane woodland.
Willowy monardella	*Monardella linoides* ssp. *viminea*	FE, SE, CNPS List 1B	Coastal scrub (alluvial ephemeral washes with adjacent coastal scrub, chaparral, and sycamore woodland.
San Diego goldenstar	*Muilla clevelandii*	CNPS List 1B	Chaparral, coastal scrub, grassland, and vernal pools.
Postrate navarretia	*Navarretia fossalis*	CNPS List 1B	Coastal scrub, grassland, and vernal pools.
Dehesa bear-grass	*Nolina interra*	SE, CNPS List 1B	Dry slopes in chaparral.
Snake cholla	*Opuntia parryi* var. *Serpentina*	CNPS List 1B	Chaparral and coastal scrub.
California Orcutt grass	*Orcuttia californica*	FE, SE, CNPS List 1B	Vernal pools.
San Diego mesa mint	*Poqoqyne abramsii*	CNPS List 1B	Coniferous forest and chaparral.
Otay mesa mint	*Poqoqyne nudiuscula*	FE, SE, CNPS List 1B	Vernal pools.
Torrey pine (native populations)	*Pinus torreyana* ssp. *torreyana*	FE, SE, CNPS List 1B	Vernal pools.
Small-leaved rose	*Rosa minutifolia*	SE, CNPS List 2	Coastal scrub and chaparral.
Gander's butterweed	*Senecio ganderi*	CNPS List 1B	Chaparral, cismontane woodland, coastal scrub, riparian woodland, and grassland.
Narrow-leaved nightshade	*Solanum tenuilobatum*	N/A	Open chamise chaparral and sage scrub.
Parry's tetracoccus	*Tetrocaccus dioicus*	County Group A	Found in chaparral and coastal scrub. Prefers stony, decomposed gabbro soil
Wildlife			
Saltmarsh skipper	*Panoquina errans*	N/A	Coastal salt marshes.
Thorne's hairstreak	*Mitoura thornei*	N/A	Associated with Tecate Cypress (Otay Mt.).
Riverside fairy shrimp*	*Streptocephalus woottonii*	FE	Vernal pools.
San Diego fairy shrimp*	Branchinecta sandiegonensis	FE	Vernal pools.
Arroyo southwestern toad	*Bufo microscanphus* ssp. *californicus*	FE	Semi-arid regions near washes or intermittent streams.
California red-legged frog	*Rana aurora* ssp. *Draytoni*	FT	Lowlands & foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation.
Southwestern pond turtle	*Clemmys marmorata* ssp. *Pallida*	CSC	Permanent or nearly permanent bodies of water in many habitat types (below 6,000 ft. elevation).

Table 4-1
MSCP Covered Species

Common Name	Scientific Name	Status	Habitat
Orange-throated whiptail	*Cnemidophorus hyperythrus* ssp. *beldingi*	CSC	Coastal scrub and chaparral.
San Diego horned lizard	*Phrynosoma coronatum* ssp. *balinvillei*	CSC	Coastal sage scrub and chaparral in arid and semi-arid climate conditions.
Cooper's hawk	*Accipiter cooperii*	CSC	Woodland (nesting).
Tricolored blackbird	*Agelaius tricolor*	CSC	Riparian (marshes)
Golden eagle	*Aguila chrysaetos*	CSC	(Nesting & wintering) Rolling foothills mountain areas and desert.
Southern California rufous-crowned sparrow	*Aimophila ruficeps* ssp. *canescens*	CSC	Coastal sage scrub and chaparral.
Canada goose	*Branta canadensis* ssp. *Moffitti*	N/A	Nests at edges of ponds, lakes, or swamps on rocks or grass out in the water.
Swainson's hawk	*Buteo swainsoni*	ST	(Nesting) riparian and oaks.
Ferruginous hawk	*Buteo regalis*	CSC	(Wintering) Grassland, desert scrub.
Coastal cactus wren	*Campylorhynchus brunneicapillus* ssp. *Couesi*	CSC	Coastal sage scrub.
Western snowy plover	*Charadrius alexandrinus* ssp. *nivosus*	FT, CSC	(Nesting) Coastal beaches.
Mountain plover	*Charadrius montanus*	CSC	(Wintering) Grassland and agricultural fields.
Northern harrier	*Circus cyanus*	CSC	(Nesting) coastal salt & freshwater marsh and grasslands.
Reddish egret	*Egretta rufescens*	N/A	Marshes and swamps
Southwestern willow flycatcher	*Empidonax traillii* ssp. *extimus*	FE, SE	(Nesting) Riparian woodlands.
American peregrine falcon	*Falco peregrinus anatum*	SE (federally delisted)	(Nesting) Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also human-made structures.
Bald eagle	*Haliaeetus leucocephalus*	FT, SE	(Nesting & wintering) Ocean shore, lake margins, & rivers. Most nests within 1 mi of water.
Long-billed curlew	*Numenius americanus*	N/A	(Nesting) Breeds in upland grasslands and wet meadows.
Belding's savannah sparrow	*Passerculus sandwichensis* ssp. *beldingi*	SE	Coastal salt marshes.
Large-billed savannah sparrow	*Passerculus sandwichensis*	CSC	(Wintering) Breeds along the Colorado River delta in Mexico and winters at the Salton Sea.
Californica brown pelican	*Palcanus occidentalis* ssp. *californicus*	FE, SE	(Nesting colony) Colonial nester on coastal islands just outside the surf line.
White-faced ibis	*Plegadis chihi*	CSC	(Rookery site) Shallow fresh-water marsh.
California gnatcatcher	*Polioptila californica* ssp. *californica*	FT, CSC	Coastal sage scrub.
Light-footed clapper rail	*Rallus longirostris* ssp. *levipes*	FE, SE	Salt marshes traversed by tidal sloughs, where cordgrass and pickleweed are the dominant vegetation.

Table 4-1
MSCP Covered Species

Common Name	Scientific Name	Status	Habitat
Western bluebird	*Sialia mexicana*	N/A	Edges of oak woodlands, typically where they adjoin meadows or grasslands (Unitt 1984).
Burrowing owl	*Speotyro (Athene) cunicularia* ssp. *hypugaea*	CSC	(Burrow sites) Open, dry annual or perennial grasslands and agricultural fields.
Elegant tern	*Sterna elegans*	CSC	(Nesting colony) Only knwon breeding colony in U.S. located in the salt work dikes at the south end of San Diego Bay.
California least tern	*Sterna antillarum* ssp. *browni*	FE, SE	(Nesting colony) Nests along the coast from San Francisco Bay south to northern Baja California.
Least Bell's vireo	*Vireo bellii* ssp. *pusillus*	SE, FE	(Nesting) Summer resident of southern California in low riparian in the vicinity of water or in dry river bottoms.
American badger	*Taxidea taxus*	CSC	Drier open stages of most shrub, forest, and herbaceous habitats with friable soils.
Southern mule deer	*Odocoileus hemionus fuliginata*	N/A	Various habitats from forests to deserts.
Mountain lion	*Felis concolor*	CFP	Brushy or forested regions.

FT – Federally Threatened; FE – Federally Endangered; ST – State Threatened; SE – State Endangered; SR - State Rare; CSC – California Species of Concern; CFP – California Fully Protected Species; CNPS List 1B – California Native Plant Society List 1B (Plants rare, threatened or endangered in California and elsewhere); CNPS List 2 – California Native Plant Society List 2 (Plants rare, threatened or endangered in California, but more common elsewhere); CNPS List 4 – California Native Plant Society List 4 (Plants of limited distribution; a watch list); County Group B – Plants rare, threatened or endangered in California, but more common elsewhere; County Group A – Plants rare, threatened or endangered in California and elsewhere.

Table 4 - 2
Sensitive Species (not covered by the MSCP)

Common Name	Scientific Name	Status	Habitat
Plants			
Delicate clarkia	*Clarkia delicata*	CNPS List 1B	Oak woodlands.
Summer holly	*Comarostaphylis diversifolia ssp. diersifolia*	CNPS List 1B	Coastal and foothill canyons in chaparral.
Otay tarplant	*Deinandra conjugens*	CNPS List 1B	Upper montane coniferous forest.
Short-leaved dudleya	*Dudleya multicaulis*	CNPS List 1B	Chaparral and coastal scrub.
San Diego sunflower	*Hulsea californica*	CNPS List 1B	Chaparral slopes in montane areas.
Spreading navarretia	*Navarretia fossalis*	CNPS List 1B	Vernal pools.
Chaparral nolina	*Nolina cismontana*	CNPS List 1B	Chaparral and coastal scrub.
Nuttall's scrub oak	*Quercus dumosa*	CNPS List 1B	Maritime chaparral.
Moreno currant	*Ribes canthariforme*	CNPS List 1B	Moist areas in southern interior chaparral.
Gander's ragwort	*Senecio ganderi*	CNPS List 1B	Gabbro soils in interior regions.
Invertebrates			
Laguna Mountain skipper	*Pyrgus ruralis lagunae*	FE	Open mountain meadows.
Quino checkerspot butterfly*	*Euphydryas editha quino*	FE	Open sunny areas in sage scrub and chaparral.
Fish			
Desert pupfish (introduced in ABDSP)	*Cyprinodon macularius*	FE, SE	Desert ponds, springs, marshes and streams.
Tidewater goby	*Eucyclogobius newberryi*	FE	Brackish water habitats along the coast.
Unarmored three-spine stickleback (introduced)	*Casterosteus aculeatus williamsoni*	FE, SE	Weedy pools, backwaters, and among emergent vegetation along stream edges.
Southern steel head trout	*Oncorhynchus mykiss*	FE, CSC	Rivers and creeks (federal listing refers to populations from Santa Maria River south to San Mateo Creek).
Amphibians and Reptiles			
Desert slender salamander	*Batrachoseps major aridus*	FE, SE	Desert washes and desert scrub (known only from Hidden Palm Canyon and Guadalupe Creek).
Mountain yellow legged frog	*Rana muscosa*	FE	Federal listing refers to populations in the San Gabriel, San Jacinto and San Bernardino Mountains only (always found near water).
Southwestern pond turtle	*Clemmys marmorata pallida*	CSC	Permanent or nearly permanent bodies of water in a variety of habitat types.
Coastal western whiptail	*Aspidoscelis tigris stejnegeri*	FSC	Deserts and semiarid areas with sparse vegetation and open areas (also found in woodland and riparian areas).
Northern red diamond rattlesnake	*Crotalus rubber ruber*	CSC/FSC	Chaparral, woodland, grassland, and desert areas.

Table 4 - 2
Sensitive Species (not covered by the MSCP)

Common Name	Scientific Name	Status	Habitat
Barefoot banded gecko	*Coleonyx switaki*	FT	Areas of massive rock and rock outcrops at the heads of canyons.
Coastal rosy boa	*Charina trivirgata*	FSC	Desert and chaparral areas with dense vegetation and rocky cover.
Mammals			
Pacific pocket mouse	*Perognathus longimembris pacificus*	FE, CSC	Narrow coastal plains from the Mexican border to Los Angeles.
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*	CSC/FSC	Intermediate canopy stages of shrub habitats.
Stephens' kangaroo rat	*Dipodomys stephensi*	FE, ST	Grasslands and sparse scrub habitats.
Peninsular bighorn sheep	*Ovis Canadensis nelsoni*	FE, ST	Open desert slopes below 4,000 feet.
Birds			
California condor (extirpated)	*Gymnogyps californianus*	FE, SE	Open grasslands and foothill chaparral in mountain ranges.
California black rail (extirpated)	*Laterallus jamaicensis coturniculus*	ST	Salt marshes bordering larger bays.
Marbled murrelet (only found offshore)	*Brachyramphus marmoratus*	FT, SE	Feeds near shore and nests inland along the coast.
Coastal cactus wren	*Campylorhynchus brunneicapillus sandiegensis*	CSC	Sage scrub.
Grasshopper sparrow	*Ammodramus savannarum*	N/A	Dense grasslands on rolling hills and hillsides on lower mountain slopes.
Burrowing owl	*Athene cunicularia*	CSC	Open, dry grasslands and agricultural fields.
Golden eagle	*Aquila chrysaetos*	CSC	Rolling foothills of mountain areas, sage-juniper flats, and deserts.
California spotted owl	*Strix occidentalis occidentalis*	CSC	Mixed conifer forest.
Bank swallow (formerly bred)	*Riparia riparia*	ST	Riparian and other lowland habitats west of the desert.
Yellow-breasted chat	*Icteria virens*	CSC	Riparian thickets near watercourses.

* The County of San Diego is currently in the process of amending the MSCP to include the Quino checkerspot butterfly.

FSC – Federal Species of Concern; FT – Federally Threatened; FE – Federally Endangered; ST – State Threatened; SE – State Endangered; CSC – California Species of Concern; CNPS List 1B – California Native Plant Society List 1B (Plants rare, threatened or endangered in California and elsewhere).

SAN DIEGO
Integrated Regional Water Management

Appendix 4-A:
Tribal Water Stories




SAN DIEGO
Integrated Regional
Water Management

TRIBAL WATER STORIES OF COASTAL SOUTHERN CALIFORNIA

INTRODUCTION

The San Diego Integrated Regional Water Management (IRWM) Program is an interdisciplinary effort of San Diego Region organizations and stakeholders to develop long-term water supply reliability, improve water quality, and protect natural resources. The tribes of San Diego County are essential stakeholders to the IRWM Program.

In 2009, as a part of the California Water Plan Update process, the Department of Water Resources identified stories as powerful and effective educational tools to learn about Native American tribes, as they teach about people, places, history, culture, and spirituality. Although the California Tribal Water Stories (http://www.waterplan.water.ca.gov/tribal2/tws/) offers a wonderful collection of stories from tribes throughout California, it did not include many stories from Southern California tribes.

This Tribal Water Stories of Southern California document is filled with stories, myths, and songs from several Native American Tribes of greater San Diego County.

This document aims to entertain and educate its readers while honoring and celebrating the people and culture that have kept these stories alive for generations.

Special thanks to the Kumeyaay and their website, www.kumeyaay.com, which aims to promote and preserve Kumeyaay culture. The site is filled with educational material told from the Kumeyaay perspective and is a great resource for all.

CONTENTS

JATIO WA MEYA JATIO 1
THAT TALKS OF WATER

This song, sung by Kumeyaay singer Gloria Castañeda Silva (1947–2008), repeats the phrases, "the water is flowing" and "the water is mixed." The song contains both Spanish and Kumeyaay words. Kumeyaay belongs to the Yuman language family and there are approximately 50 surviving speakers. The rhythm is meant to echo the speed and movement of the water it describes and honors the natural resource most valued by the Kumeyaay.

AH-HA' WI-AH-AH' 3
WATER COLDER WATER

In the Kumeyaay tradition, stories explain the reason for the existence of all things. There is a spring located high in the Cuyamaca Mountains named Ah-ha' Wi-Ah-ah.' This story tells of how the spring was named by a mythical giants and how it protected Kumeyaay maidens from the giants' torturous ways.

CUPEÑO CREATION MYTH 5

In this Cupeño Creation Myth, we are introduced to the gods Tumaiyowit and Mukat. They created the world and all that is in it. Despite their great power to create, they were unable to live peacefully with each other. After Tumaiyowit died, Mukat was left to the ill-will of mankind and trouble-maker Coyote. This story teaches us how the gods used water to determine if all is well in the world.

IN-YAR'EN AH-HA' 7
NO EYES IN WATER

There is a spring known to the Kumeyaay, located at the edge of a river flat at Descanso, in which an evil spirit once dwelled. The evil spirit's cries and screams filled the women of the nearby village with fear for generations. This story illustrates the power of water and the type of spirits it can sometimes attract.

CHAUP, THE SPIRIT OF THE SHOOTING STAR 9

In this story, we meet Cenohow, a beauty who bathed in a clear lagoon every night. One night, she gave birth to two sons who eventually fall in love with women from a neighboring tribe. Both men are killed, but not before one brother had a son, named Chaup. Upon growing up, Chaup learns of his father's fate and becomes consumed by revenge. Chaup leaves his village and finds his grandmother, Cenohow. At night, Chaup comes out of the cave to fly across the endless sky in search of little boys and girls in order to steal their souls for his grandmother to eat. This story tells of how their two hearts were changed by these events, and how pride and revenge can get the better of you.

CHUMASH FLOOD STORY 11

This Chumash story describes the symbiotic relationship between the sun and water. Through the experience of Spotted Woodpecker surviving a great flood, we learn why woodpeckers love acorns and how the sun protects all living things.

THE FLOOD 13

This story teaches us of the power of nature and the fragility of life. For when the flood engulfed the land, only a chosen few survived on a little hill. From those few, all Indians descended, the story explains. Their spirits take the forms of deer, bears and snakes; these people were to become the ancestors of all things on earth.

KUMEYAAY CREATION STORY 15

In the beginning, there was nothing but water. One of two brothers, Teaipakomat, decided that he wanted more, so he took it upon himself to fashion the land we walk on, the sun in our skies, and the people themselves. This was cause for celebration, but the people lacked knowledge for things such as dance, for a large snake that lived out in the ocean had swallowed all learning. This story tells of the brave volunteer who traveled to the sea and brought the snake back to the village, ultimately resulting in the snake providing knowledge to the world.

COYOTE AND THE FLOOD 17

In this Cahuilla story, we follow mischievous Coyote on his hunting adventure, searching for ducks to bring home to his starving family. Despite wise advice from his brother, Bobcat, Coyote learns a difficult lesson about frogs, ducks, and the powers of water.

THE LAND OF THIS LIFE 19

When westerners arrived in San Pasqual, it was a time for joy as the Mexican army was vanquished and the people were free. But this arrival also marked the beginning of two cultures colliding. Felicita meets the man with the golden hair by the edge of the water and begins a love affair that sadly ends in sorrow. This story teaches us about sacrifice in the face of great pain, for in the Land of Death all wrongs are made right.

THE SPRING BEHIND THE CEMETERY 21

This Luiseño story describes a cemetery where a spring has flourished and oddly enough, fresh coals are produced from it. The spring came to be when a man lost his stick while looking for yucca to harvest. The man happened upon another world that, once revealed, would become his undoing.

JATIO WA MEYA JATIO

THAT TALKS OF WATER

A KUMEYAAY SONG

KUMIAIS
HOMENAJE A GLORIA CASTAÑEDA SILVA, CANTANTE KUMIAI (2008)
WWW.CDI.GOB.MX

Jatio wa meya jatio, Jatio wa meya jatio, Jatio wa meya jatio, Jatio wa meya jatio
Kuame ya, kuame ya,jatio wa meya.
Jatio wa meya jatio , Jatio wa meya jatio Jatio wa meya jatio, Jatio wa meya jatio
Kuame ya, kuame ya, jatio wa meya. [Se repite ocho veces]
Ah, ah, ah, ah, ah, ah, ah, ah.
El agua va corriendo, el agua va corriendo El agua va corriendo, el agua va corriendo
El agua está revuelta, el agua va corriendo

The water is flowing, the water is flowing, the water is flowing, the water is flowing,
the water is mixed, the water is flowing. [Repeat 8 times]

AH-HA' WI-AH-AH'

WATER COLDER WATER

HTTP://KUMEYAAY.COM/KUMEYAAY-HISTORY/84-AH-HA-WI-AH-AH-WATER-COLDER-WATER-.HTML

The cold spring, located on the high peak of the Cuyamacas, is well known to all lovers of these mountains, and the Indians, who must ever have a reason for the existence of things, tell how it was created and named by one of their mythical creatures long ago.

At one time in the ages past, the Ah-ha' Kwe-ah-mac' (Water Beyond) mountains were infested by monstrous giants with loathsome, ill-shapen bodies, who terrorized the surrounding country. These marauders, lurking and watching their opportunity, frequently stole the Indian maids from their villages, keeping them in bondage as slaves.

One of the giants, named Hum-am' Kwish' wash (Whip to Kill People), lived in the vicinity of Pam-mum'am-wah' (Green Valley).

He reveled in the most fiendish greediness, but his innate sense of the beautiful was keen and strong. He not only selected the most delightful places to live, but surrounded himself with objects pleasing to the eye. Always he stole the fairest of the Indian maids and required them to weave the most exquisite designs known in their art of basket making.

His cruelty was extreme, and did his slaves displease him in the least, they met with the most horrible death imaginable.

This hideous being possessed supernatural powers, which he employed in various ways. It seems that he wanted nothing but the coldest water to drink. He tried the water in the streams and tried the water in the springs that abound throughout the country, but never did any of it suit his taste, so he created for himself a spring of colder water.

In one of the most alluring spots on the mountainside, in the dense shade of the fragrant forest of pines and cedars, he brought forth a crystal spring of icy water and named it Ahha' Wi-Ah-ha' (Water Colder Water).

Here in this nook of surpassing loveliness, where the graceful lilies nod their stately heads, and delicate fronds of lace-like greenery push their way up through the carpet of velvet moss, he sent his slaves with their beautifully woven water-baskets to fetch him a drink when he grew thirsty.

One day, calling a slave, he commanded her to bring some water instantly, with dire threats of punishment should it become tepid before it reached him.

This maiden, radiant with the beauty of the starlight, was so good, so pure, so true that she had been fairly adored by her people before she was so cruelly snatched from their midst.

Swiftly she wound her way up through the towering aisles of solemn pines, softly intoning their prayers to the heavens above them. Wistfully longing to be free from the dreadful ogre who held her captive, she begged the trees to plead with the great In 'ya (Sun), who rules over all, to take pity on her distress.

The flowers and the birds felt the quivering throb of her anguish. The starry-eyed snow-flowers, gleaming in the shade by the wayside, gave their incense to be wafted on high by the whispering breeze; the cooing dove sent its most plaintive cry above; and every other living thing along the pathway offered its gift in her behalf to In 'ya riding the heavens in his flaming ball of light.

When she reached the spring, she sat on its brink and filled her basket with its cold, refreshing water. Gazing into the crystal depths, she caught a glimmer of a shadow quickly passing and at once knew it to be that of the good spirit of the spring.

She beseeched and pleaded with it to save her from the clutches of Hum-am' Kwish 'wash, and as she leaned over farther and farther, trying to get one more glimpse of the shadow, the waters rose up and gently engulfed her.

All nature hushed in a sweet silence of gratitude as she was drawn into the protecting arms of Ah-ha' Wi-Ahha', and there she has dwelt in safety ever since.

CUPEÑO CREATION MYTH

HILL, JOSEPH J.
"THE HISTORY OF WARNER'S RANCH AND ITS ENVIRONS,"
LOS ANGELES: PRIVATELY PRINTED (1927)

The gods Tumaiyowit and Mukat created the world and all that is in it. They quarreled and argued as to their respective ages. They disagreed on many things. Tumaiyowit wished people to die. Mukat did not. Tumaiyowit went down to another world under this world, taking his belongings with him. People die because Tumaiyowit died.

Mukat, who remained on earth, finally fell under the ill-will of mankind, because he caused quarreling and fighting. Each evening he put the people to sleep by blowing tobacco-smoke from his pipe. When they were fast asleep, he arose stealthily, stepped over them, and went to the ocean to defecate. Each time, he heard his excrement strike the ocean floor and he knew that all was well. Three times he would hear the sound. Then he returned. When the people awoke they found him in his place. They tried every possible way to discover when and where the god attended to his natural functions, but to no avail.

Finally, a very slim lizard hid on the god's cane. The god did not see it. The lizard discovered where the god went and what he did, and reported to the people. Then they set the frog to bewitch the god. The frog hid in the ocean and, as the god defecated, swallowed his excrement. The god, not hearing the usual sound, knew that something was wrong. He poked downward with his cane, which rubbed along the back of the frog, making the marks that we see there today. The god Mukat became ill and died. When ill, he told the people, "If I die today or tomorrow, burn me. Do not let Coyote come near me, for he will do an evil deed."

Upon the death of the god, his body was burned. The people sent Coyote to fetch wood for the funeral pyre, for they feared that he might eat the body of the god. Coyote departed. He was away nearly a day. As soon as he left they started to burn the body. The fire-drill and the hearth with which the pyre was ignited were two men. The body of the god was burning when Coyote reached the end of the world. He saw the smoke and hurried back. When he arrived at home, all the body was burned except the heart, which the people kept turning to make it burn. When Coyote arrived, the people were standing close together about the pyre. He said, "Brothers and sisters, let me see this. He is my god." They only stood the closer together, but Coyote jumped over them and seized the heart. He ran north, where he ate it. Where the blood dripped, there is gold. The people pursued in vain. Coyote looked back as he ran with the heart in his mouth. That is why a coyote, when running, always looks back to this day.

The people who stood around that pyre became trees—some tall, others short. It was over the short people that Coyote had jumped. The people pursued Coyote northward. Across the mountains in that direction the trees stretch today. They are the people who pursued Coyote. Some have been knocked down, just as Coyote knocked down the people.

IN-YAR'EN AH-HA'

NO EYES IN WATER

HTTP://KUMEYAAY.COM/KUMEYAAY-HISTORY/88-IN-YAREN-AH-HA-NO-EYES-IN-WATER.HTML

A spring that rises in the edge of the river flat at Descanso is pointed out by the Indians as one in which dwells a bad spirit. The following tale concerns its evil power.

All night long those who were awake heard the uncanny screams of Kwin Mari' (Blind Baby), who dwelt in the bewitched spring of In-yar'en Ah-ha' (No Eyes in Water), which oozed from the muddy bank and trickled down a sedgy flat to the river. Sharp, distressing sounds they were, like the cries of a frightened baby, and left a shuddering fear in the hearts of all who listened in the little village of Pilch 'oom-wa (White as Ashes).

This village, so called because nearly every morning the frost caused the ground to appear as though powdered with ashes, was just west of the river, and so near the evil spring that the piercing wails penetrated the remotest 'ewaa (house).

Old women and fearless men listened with bated breath; young mothers clasped their little ones closer in shivering fear, thinking how they might perchance have been born under the blight of Kwin Mari'; those dear women, who were living in daily hope of giving a beautiful, brave man-child to their people, cowered in agony on their pallets of fur, drawing the soft robes closer about their heads to deaden the shrill cries.

All who heard know that the spirit of Kwin Ma-ri' was seeking a victim. Even the children knew that it could cast a spell over the mother before her little one entered the world, which would seal its eyes to earthly sight forever. So throughout the night they lay in waking dread.

As the first gray line of dawn pushed up through the blackness of the night the cries ceased, and a strange woman crept into the village faintly calling for help.

Eagerly the people succored her; and when her strength returned she told how those in her own village had been killed, she alone escaping.

She spoke of how, after wandering about for several days, she had heard in the night the screams of a baby in distress and set out at once to find it. Stumbling in the dark, over rocks and thorny brush, she at last entered an open space soft under foot with the touch of new grown grass. As she drew nearer and nearer to the sounds, she reached a bank, mucky and wet. Here she stooped down to pick up the baby, thinking she had found it, but her hands plunged into a pool of water instead, and, as the sharp cries rose again from her very feet, she fell back, paralyzed with fear.

Not until dawn had she been able to move. Then she crawled to the nearest shelter, which she saw rising ghost-like on the hill before her. Little did she know what had befallen her, but the people, who well knew, kept her with them caring for her tenderly till her little one was born.

Only after she had seen how tightly closed were his tiny eyelids, resisting all efforts to open them, did they tell her of Kwin Ma-ri', dwelling in the bewitched spring of the In-yar' en Ah-ha', and how it had the power, could it but touch the mother, of blinding her unborn babe.

CHAUP, THE SPIRIT OF THE SHOOTING STAR

ROBERTS, ELIZABETH JUDSON
INDIAN STORIES OF THE SOUTH WEST (1917)

"The little ones play by the laguna,
By the water of the laguna in the reeds;
The sun goes to rest, the mothers call,
'Come, come, or Chaup may get you!'
Then the little ones run to the mothers in fear,
Soon the fires turn white with ashes,
The people sleep.
Across the river the coyote calls his mate."

Long ago when the world was young, there lived on the seashore, a maiden named Cenohow. She was very beautiful, but her heart was cold and proud. She was quis-see-i (Spirit person), and at this time everything on earth was connected; she had a beautiful home by a laguna of clear water where every morning she bathed. All creatures loved Cenohow; they called to her as she sang to them a low sweet song. When she walked on the white sand of the seashore, the waves whispered to her, "Where is your mate, lovely one?" and the maiden answered proudly, "Earth has no mate for me, oh Sea." For many years the birds and animals tried to woo the maiden, but she would give herself to none of them, as her scorn grew so did the animals hate and they conversed no more. Finally, it was the gopher that cunningly won her as a mate. The gopher found red earth that the Indians use for paint and threw it into Cenohow's laguna. Cenohow cautiously entered the red water of her laguna. She felt something touch her again and again. Rushing from the water she lay as if dead and, when she awoke, she knew that something had changed. Trembling with fear, she turned away from the water that she now hated and she sensed that she was to be a mother. When the time came, she brought forth twin boys, Qualth and Key-yo-ho-mar-r.

Cenohow, though no longer lonely, retained a bitter heart. One day the maiden said to them,

"Go to the mountain and on a high cliff you will find two birds; the larger one is Qualth's and the smaller one is Key-yo-ho-mar-r's." When the boys reached the owls to which their mother spoke, they quarreled over which owl they wanted and in their selfishness called the spirits for rain and drowned the two owls. Now, with two owls lying wet and dead, the boys felt ashamed. "We will not hunt anymore; we do not wish to cause death."

As the twins grew toward manhood there came into their hearts the human longing for a mate. Carving little flutes, they began to play a low sweet call that seemed to speak to the heart of love. Eventually, two buzzard-maidens came to them from across the mountain -Namlawey and Epaclune - and became their wives. However, the next day, Namlawey came to her sister troubled by Qualth's lack of regard for her, requesting to leave. Epaclune, too afraid to stay alone with the spirit-people, agreed to leave and they set upon their way back to their mountain home. The buzzard people were a strange, fierce tribe who worshiped the sun and could change their form to many animals. They ate the men and children of other tribes when they had the opportunity, and were the lowest and vilest people of earth. Epaclune knew that she was to be a mother. When the old cannibal chief discovered this, he proclaimed, "If thy child by those cursed spirit-people be a girl, it may live; but if it be a boy, we shall have a fiesta and eat it."

When the baby was born, though a boy, the two sisters lied to the chief and from that day forth the sisters protected him by dressing him as a girl. Key-yo-ho-mar-r, being a quis-see-i knew that his child had been born, and much to Cenohow's dismay, both brothers set off up the mountain. Key-yo-ho-mar-r took the boy in his arms; tenderly passed his hand over the beautiful little face and said, "Son of my heart, thou shalt carry my name to the stars." At that moment, they were discovered. Quickly the brothers fled and for a long time the brothers ran strong, far ahead of the howling crowd behind them, but finally Key-yo-ho-mar-r began to lag. Qualth, realizing that his brother could go no further, quietly replied, “I care not for life without you, my brother. We will live or die together.” Soon the angry buzzard-people reached them and tore them to pieces and used the brothers’ knee bones as balls.

As Little Key-yo-ho-mar-r grew larger, it became harder to make him appear as a girl. Eventually, the sister gave in and told him of the distant sea, of Cenohow and his father and the danger to his life. Key-yo-ho-mar-r listened until she had finished, and a new look of hatred came into his eyes. The boy spent much time planning how best to avenge his father.

Not long after this, he saw some boys in the village playing with some white bones. Little Key-yo-ho-mar-r took the bones from them and kicked them far over the mountain and, with the help of the spirits, out into the sea.

That night he went to the fierce chief’s hut and killed him while he slept. Then, without a word of farewell, he left the hated tribe towards his father’s distant home by the sea. When the chief’s dead body was discovered, all the hateful buzzard-people set off after the spirit-boy. Little Key-yo-ho-mar-r ran until he reached the spot where his father and uncle had been killed by these same people. There he stopped and faced them; he stretched his arms towards the sky and prayed to the spirits for help. And the spirits heard! Dark clouds gathered over his head and the rain began falling in torrents; the forked lightning darted around about him in blinding light, while the thunder shook the very mountains themselves.

When at last he dropped his arms to his sides, the storm ceased as suddenly as it had begun. But between him and the frightened buzzard-people ran a wide river of water. His mother and aunt begged to join him. He placed his bow across the river and it grew and grew to form a bridge over the river. When they and the other buzzard-people that followed reached the middle of the river, he callously tipped them into the water. “You wished to come over the water,” he cried; “now you may ever remain by the water,” and he changed them into the little birds called ‘kildees ’. Always may you see the kildees by the rivers or lagunas or on the seashore; they are the buzzard-people who tried to cross on Little Key-yo-ho-mar-r’s bow and fell into the water. After this, Little Key-yo-ho-mar-r went on his way and, when he drew near the great ocean, he fell on his face and for a long time he lay listening to its mighty voice.

Together Little Key-yo-ho-mar-r and his grandmother Cenohow lived together by the sea talking of the wrongs done to them, their hearts growing full of hatred; they came only to think of revenge. When all the love had left Little Key-yo-ho-mar-r’s heart, he called to the evil spirits and gave himself into their hands. He and old Cenohow were lifted high above the earth to the snowcapped mountains to the cave of the Wind Spirit. Cenohow’s lower body was changed to stone. Little Key-yo-ho-mar-r’s lower half of his body was transformed into a great fish with shining scales of blue, red, and gold. His name was changed to Chaup (Shooting Star) and to this day he flies through the skies as a shooting star collecting the souls of children to be devoured by Cenohow. There are times when the night sky is clear, and Chaup grows so angry that you can see his grand fish tail flash far across the sky….

CHUMASH FLOOD STORY

BLACKBURN, THOMAS C.
DECEMBER'S CHILD: A BOOK OF CHUMASH ORAL NARRATIVES (1975)
UNIVERSITY OF CALIFORNIA PRESS, BERKELEY
94-95

Spotted Woodpecker, Sun's nephew, was the only one saved in the flood. We don't know why the flood came or how it started, but it kept raining and the water kept rising higher and higher until even the mountains were covered. All the people drowned except Woodpecker, who found refuge on top of the tallest tree in the world. The water kept rising until it touched his feet. He cried out to Sun, "Help me, Uncle! I am drowning! Save me!"

Sun's two daughters heard him and told their father that his nephew, Woodpecker, was calling for help. "He is stiff from cold and hunger," they said. Sun held his torch down low and the water began to go down again. Woodpecker was warmed by the heat. Then Sun tossed him two acorns. They fell in the water near the tree and Woodpecker picked them up and swallowed them. Then Sun threw down two more acorns. Woodpecker ate them, too, and was content. That is why he likes acorns so much—they are still his food.

THE FLOOD

DUBOIS, CONSTANCE GODDARD
"THE RELIGION OF THE LUISEÑO INDIANS OF SOUTHERN CALIFORNIA" (1908)
UNIVERSITY OF CALIFORNIA PUBLICATIONS IN AMERICAN ARCHAEOLOGY AND ETHNOLOGY
8(3): P. 286

There is a wonderful little knoll, near Bonsall, the Spanish name of it Mora, the Indian name Katuta; and when there was a flood that killed all the people, some stayed on this hill and were not drowned.

All the high mountains were covered, but this little hill remained above the water. One can see heaps of seashells and seaweed upon it, and ashes where those people cooked their food, and stones set together, left as they used them for cooking; the shells were those of shell-fish they caught to eat.

They stayed there till the water went down. From the top of this hill one can see that the high mountains are lower than it is. This hill was one of the First People.

KUMEYAAY CREATION STORY

HTTP://KUMEYAAY.COM/KUMEYAAY-HISTORY/80-KUMEYAAY-CREATION-STORY.HTML

In the beginning there was no earth or land. There was nothing except salt water.

This covered everything like a big sea. Two brothers lived under this water; the oldest was Teaipakomat. Both of them kept their eyes closed, for the salt would blind them. The oldest brother, after a while, went up on top of the salt water and looked around. He could see nothing but water. Soon the younger brother too came up. He opened his eyes on the way and salt water blinded him. When he got to the top he could see nothing at all, so he went back.

When the elder brother saw that there was nothing, he made first of all miskiluwi (little red ants). They filled the water up thick with their bodies and so made land. Then Teaipakomat caused certain black birds with flat bills, xanyil, to come into being. There was no sun or light when he made these birds. So they were lost and could not find their roost. So Teaipakomat took three kinds of clay, red, yellow, and black, and made a round, flat object. This he took in his hand and threw up against the sky. It stuck there. It began to give a dim light. We call it the moon now, halya.

The light was so poor that they could not see very far. So Teaipakomat was not satisfied, for he had it in mind to make people. He took some more clay and made another round, flat object and tossed that up against the other side of the sky. It also stuck there. It made everything light. It is the inyau (sun). Then he took a light-colored piece of clay, mutakwic, and split it up part way. He made a man of it. That is the way he made man. Then he took a rib from the man and made a woman. This woman was Sinyaxau, First Woman. The children of this man and this woman were ipai (people).

They lived in the east at a great mountain called Wikami. If you go there now you will hear all kinds of singing in all languages. If you put your ear to the ground you will hear the sound of dancing. This is caused by the spirits of all the dead people, who go back there when they die and dance just as they do here. That is the place where everything was created first.

A big snake lived out in the ocean over in the west. He was called Maihaiowit. He was the same as Teaipakomat but had taken another form. This snake had swallowed all learning. All the arts were inside his body—singing, dancing, basket making, and all the others. The place where the snake lived was called Wicuwul (present day Coronado Islands).

The people at this time at Wikami wished to have an Image Ceremony. They had made a wokeruk, a ceremonial ‘ewaa (house), but did not know what else to do. They could neither dance nor make speeches. One man knew more than the others did. He told them they ought to do more than just build the ‘ewaa, so that the people who came after them would have something to do. So they made up their minds to send for Maihaiowit and ask him to give them the dances. Another sea monster, Xamilkotat, was going to swallow everyone who tried to go out to Maihaiowit. So the people said the man who went had better change himself into a bubble.

So the man who had first spoken about the matter changed himself into a bubble. The monster swallowed him anyway. When he found himself down inside the monster, he first went north, but he could find no way out. Then he went south, east, and west but could find no way out. Then he reached his hand toward the north—he was a wonderful medicine-man - and got a blue flint, awi-haxwa. He broke this so as to get a sharp edge. Then he cut a hole through the monster and got out. Then he went on and on till he got to the place where Maihaiowit lived. The snake had a big circular ‘ewaa, with the door in the top. The man went in there. When the snake saw him he called out:

“Mamapitc inyawa maxap meyo?” (Who-are-you my-house hole comes-in?)

The man answered:

"Inyatc eyon enuwi." (I it-is, Uncle.)

"Tell me what you want," said the snake.

"I came over from Wikaimi," said the man. "They are trying to make a wukeruk ceremony there, but they don't know how to sing or dance."

"All right," said the snake, "I will come and teach them. You go ahead and I will come slowly."

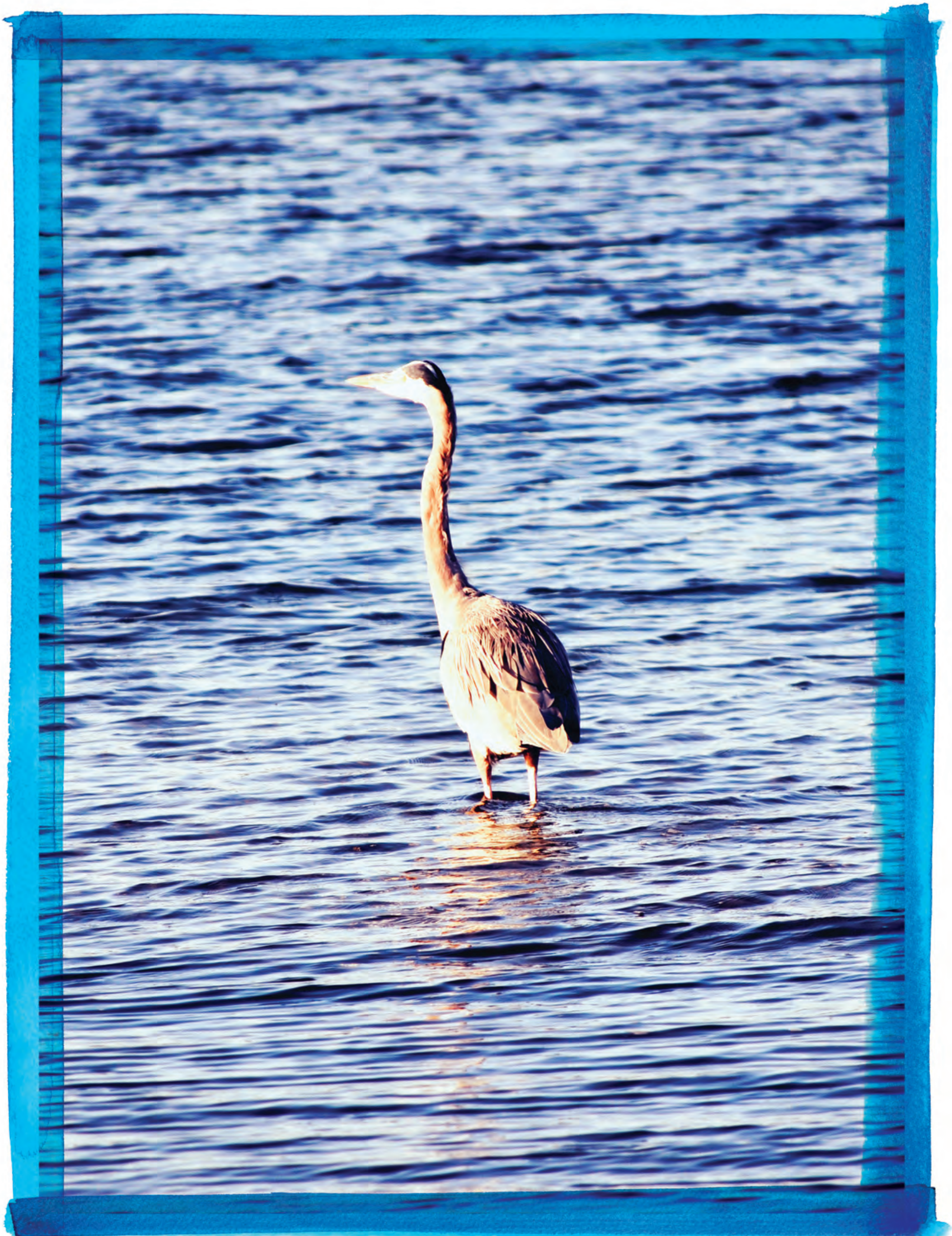
So the man went back. The monster came after him reaching from mountain to mountain. He left a great white streak over the country where he went along. You can still see it. The people at Wikami were expecting him, so they cleared a space. He came traveling fast as a snake travels. He went to the wukeruk.

First he put his head in. Then he began slowly pulling his length after him. He coiled and coiled, but there was no end to his length. After he had been coiling a long time the people became afraid of his size. So they threw fire on top of the 'ewaa and burned him.

When they put the fire on him he burst. All the learning inside of him came flying out. It was scattered all around. Each tribe got one thing. That is the reason one tribe knows the wildcat dancem and another the wukerukm and a third are good at peone. Some people got to be witches or kwusiyai (medicine-men), and orators, but not many.

The head of Maihaiwit was burned to a cinder. The rest of his body went back west. It did not go very far. In the Colorado River there is a great, white ridge of rock. That is his body. A black mountain nearby is his head. The people go to the white rock and make spearheads.

After the 'ewaa was burned up, the people were not satisfied, so they scattered in all directions. The people who went south were the oldest. They are called Akwal, Kwiliyeu, and Axwat. The rocks were still soft when the people scattered abroad over the earth. Wherever one of them stepped he left a footprint. The hollows around in all the rocks are where they set down their loads when they rested.



COYOTE *AND THE* FLOOD

MODESTO, RUBY AND MOUNT, GUY
"NOT FOR INNOCENT EARS: SPIRITUAL TRADITIONS OF A DESERT CAHUILLA MEDICINE WOMAN" (1980)
SWEETLIGHT BOOKS, CALIFORNIA

Coyote had a den along the banks of a wash. He lived there with his family. When he went hunting he'd bring home a rabbit, but usually he caught nothing. He was down and out. One day he went over to visit his big brother, Bobcat. Bobcat was eating ducks.

"E-ah! Where did you get those ducks?" asked Coyote.

"I got them at the river. Sit down and eat with us," answered Bobcat.

Coyote said, "I've been having hard luck lately. My family is starving!"

"You can take home some of this duck," said Mrs. Bobcat and she gave him some beans too.

Coyote went home with his gifts and the kids met him at the road to see what he had.

"Oh! Oh! I know where my brother gets these ducks, so now I can get some."

"E-ah!" his wife exclaimed. "Now we can eat!"

They had enough for several meals, and of course, Coyote ate again. But finally the food gave out.

"Our larder is empty," his wife said.

"I'll go get some ducks," Coyote said.

Coyote tried to sneak up on the ducks but they saw him and flew off. Coyote went three times but never caught any. After the third time Coyote went over to Bobcat's den.

"How did you catch those ducks? When I get near the water, they fly off. All I get is feathers! How do you do that?" asked Coyote.

"I sing my shaman songs. That way they don't fly away," said Bobcat.

Bobcat's wife gave Coyote some food to take home. Coyote ate at bobcat's again as he did before. Coyote went hunting the next morning. He sang his songs, then he jumped into the water but they all flew away. He tried this for three mornings but it didn't work.

"This is embarrassing," Coyote said. So he told his wife he'd be gone for several days. "You hunt for the family, but when I come back I'll have loads of ducks!"

So he went. But the ducks just flew away! Coyote tried to catch the ducks for three more days but could not catch any.

"Oh, shoot! I'm determined to catch them!" He was starving to death.

Then Coyote saw a frog. "Oh! Something to eat!"

"Don't!" said the frog. "If you eat me you'll drown in the water." But Coyote ate the frog anyway. "Now my stomach feels better."

The next day Coyote found another frog. This frog also said, "Don't eat me or you'll drown in the water."

But Coyote ate this one too. Two or three days later, Coyote found another frog.

"Don't eat me. You've been warned that the water will rise up and drown you."

But Coyote ate him anyway. He then went back to duck hunting. He noticed that the sand was wet but he kept on walking and that afternoon the water was up to his belly. Later that evening he had to climb a willow tree. He climbed way up to the top and was sitting on a limb. Water was everywhere. The ducks were laughing at him.

"This is your fault. It's because of you ducks!" Coyote said, forgetting about the frogs' warnings.

"Do you want us to help you?"

"Yes," Coyote said.

"We'll hold our wings open under you and you jump, and we'll take you to dry land."

One of the ducks got a sharp stick and told the other ducks to fly away when coyote jumped.

"Go ahead, jump. We'll take you to dry land."

"All right, here I come."

The ducks spread their wings to hide the sharp pointed stick. When Coyote jumped, the ducks flew away and Coyote was impaled in his behind.

Later the water receded and Coyote was stuck up on the stick, dead.

Mrs. Coyote was out searching for her husband all this time. It had been months since he left. She went over to Bobcat's den and ate with them.

"How is my little brother?" Bobcat asked.

"I don't know. He went hunting last summer and never returned! Would you look for him?"

Bobcat said he would look for his brother and gave Mrs. Coyote food to take home. He got up early in the morning and he walked miles and miles. Finally he met a frog.

"Have you seen my brother?"

"Yes. He ate one of my relations and was told he would drown."

The next day Bobcat met another frog who told him the same story. Then he met a third frog who said,

"Yes, Coyote is laying down there under a tree. We warned him."

"My goodness! This is terrible." There was Coyote's bones with just a little fur left.

"So this is where you were all these months. Well, this is what I've told you about copying me." So Bobcat sang his shaman song:

"My Brother, My Brother is smiling, Face to the West, Behind to the East."

As he would sing, he'd jump over Coyote, and the flesh started to come back. On the third jump all the flesh came back. Then he blew smoke on coyote and brushed him with feathers. Coyote came back to life.

"What did you do?" Bobcat asked.

"I came out looking for ducks."

"You ate a frog too, didn't you?"

"Oh, yes. I remember. I remember the ducks told me to jump and they would catch me. That's the last I remember."

"Well, we'll see," said Bobcat. "I'll call the ducks and you can pick all you want." And he sang his songs, "Here come the ducks!"

Coyote caught a whole mess of them. He was so greedy. He was drooling. They cracked the necks of the ducks.

"Let's go home," Bobcat sang his song and they flew home.

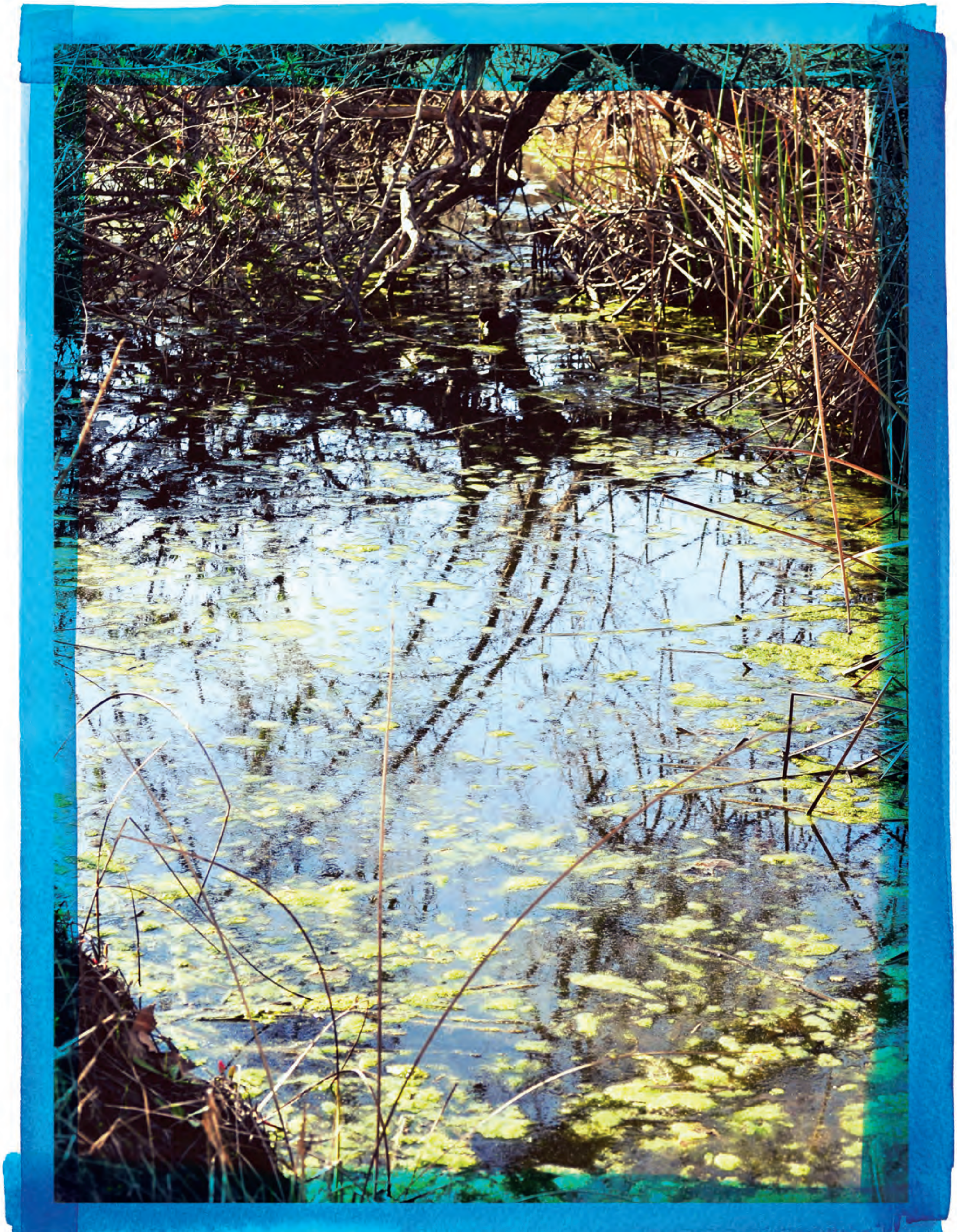
Upon returning, Mrs. Coyote asked, "Where have you been?"

"I went duck hunting," said Coyote, not mentioning the frogs.

"Have you been hunting all this time?"

"Yes," he said. "It took me all this time to catch them."

And Coyote never mentioned the stick or the flood, either.



THE LAND *OF THIS* LIFE

ROBERTS, ELIZABETH JUDSON
INDIAN STORIES OF THE SOUTH WEST (1917)

When I was a child, I lived here in the San Pasqual. Our village was by the lagunas and the river; with the other children I played among the reeds and tules. When I was about twelve years old, a priest and some soldiers came to our village and insisted that all the children must be brought for baptism. I watched the children who came before me as they were touched by the strange man, and seeing no harm come to them, I lost my fear. When it came my turn to stand before him, I smiled into his face, "I name thee Felicita," he said, as he touched me with the water, and that is how I gained my name. The years passed and I grew to be a woman and we lived well. But there came a day when a great company of Mexican soldiers rode into our valley, we ran to hide and wait until they had passed, but they did not leave. My father Pontho was the chief of our village and spoke to the soldiers. They agreed that we may come from our hiding places and live in the huts that the soldiers did not need, so at night we crept back, for it was cold, and the rain was falling.

The soldiers stayed many days and there was much rain. One morning, we heard the sound of voices; as they drew closer we saw they were wearing coats of blue: Americans. Soon there came sound of a battle. As I was watching that afternoon, I saw an American with hair like gold, shining in the sun. He and a Mexican were fighting in the willows at the foot of the hill where we were hiding. Eventually, the American failed to defend the Mexican's advances and the lance entered his side. After a moment, the Mexican rode away and I crept towards the fallen man. He groaned and my heart moved to pity; the soldier man opened his eyes, looked at me and smiled, and I remember thinking how like the sky they were. From that moment, I was no longer frightened. I collected water for him from the laguna, opened his shirt, and laid green leaves over his wound and bound them tight. After the battle died down, I told my father and he went to the Americans to alert them of the wounded man. Soon he returned with Americans, "Jim!", "Dick!" they cried to each other. Then Dick is the soldier man's name, I whispered to myself and Jim is the name of the friend who loves him. At last the sick man was taken away; he opened his eyes to smile and wave his hand a little, as a farewell. It was long before I saw him again, but I did not forget.

After many hardships, the Americans claimed the land from the Mexicans. When Americans sometimes would ride through our valley, I would always look for the soldier man with hair of gold, but I never saw him. Even when the son of the chief from another village asked for my hand in marriage, I said no, as I could not forget my soldier man. One day my brother went far down the valley hunting for rabbit; toward the evening he came running back to the village, "Americans!" he shouted. My father found out that they had come to retrieve the dead from the battle of San Pasqual. The next day, many Indians visited the soldiers including me. All the time I was looking, looking for my soldier man. Then I heard voices behind me; it was Jim and Dick, my soldier man. They remembered me. "Good afternoon, little girl," he called, "so you have found us again? I never thanked you for saving my life, little girl; but I've remembered every day, and I thank you now," he said. I could not answer him for the beating of my heart. "What is your name little girl?" "Felicita, and I am not a little girl; I am a woman," I finally answered. We laughed and he gave me sweet crackers and raisins and my heart filled with joy. The next day I went down by the river and washed my long hair. As I sat on the bank, I thought of my soldier man and he came, riding on his white horse. He met me every day by the river, in the evening, with the moon shining over our heads. Then came the day when the soldiers had to leave and he promised that I would see him again.

I tried to be content but the days and nights after he went were lonely and I would visit the river where we had met. It was there he found me, when he came at last. He had brought me two rings of gold for my ears and a silken scarf of blue, but he could stay with me only a little time. One day I went to the river to wash my hair; the hairs caught in one of my ear rings, tore it from my ear and sent it far out in to the river. With a cry I sprang into the water; I searched long for it, but to no avail. I feared that this was a sign that I would never see my soldier man again, so I ran to the quis-see-i (Spirit person), the old wise man. "In six

moons," he said; and that night my baby came. When the baby came, my heart stood still for a moment as its skin was as the white people's skin and on its head were tiny rings of hair like gold. Though my soldier man had not come back, I still had his child. I named her Niña, which means "little girl" in Spanish as that was what my soldier man called me. One evening, as I sat by the laguna, the old quis-see-i came to see me and again said, "Six moons." I wrapped my baby in the blue silk scarf and waited for my soldier man, but it was Captain Jim. He saw my Niña and dropped down on the doorstone and covered his face with his hands. Why should he grieve when the child was so like the friend that he loved, my soldier man. "I will tell him of the child," and with that he rode off. I waited two days before he met me in the willows of the laguna. His face was grave when he saw the child but I did not understand why. Holding the baby, he cried, "Felicita, I did not know of this; I should have come before. You must come to live at the mission with me so that I can see the child often." The week before I moved, I went to the laguna and to the river often and I wondered why I cared more for the places where I had met the soldier man than for the places I had known all my life. I could not understand, but it was so.

Life at the mission was strange, but I took comfort in the time that my soldier man and Niña spent together. He told me of his family, "I have one sister older than I, who is proud and beautiful. As I grew from a child, I was selfish. I did many things to cause my father to be angry with me, but always my sister helped me through my troubles. I thought that this year I might go home, for I am weary of this soldier's life, but, now, how can I leave Niña?" Then my heart was like the water when it whirls and breaks on the rocks, and I prayed that my baby might keep him for me. Winter brought sickness to my soldier man. After many days, Captain Jim came to me and told me that he had called for Dick's sister as he did not have long left.

Niña and her father cooed and laughed together for a while, but then he turned to me. "Felicita," he said, "I want to ask a great favor of you. Little Niña is like me; she is not like your people. Felicita, I want my sister to take Nina when she goes back to her home. She will teach her as the white people are taught and she will grow into a beautiful lady. Will you let her go, Felicita?" I nodded my head yes, but it broke my heart; it has never in all these years been happy again. I wished to run away into the darkness with my child, but I had made a promise to her father and handed her to his sister. Soon all was ready; the wagon drove away, and I never saw my baby again. It was more than I could bear. I would search all through the shadows of the trees by the river where I had watched him playing with the baby; I thought I might see his spirit shining for a moment in the darkness but I never saw it. My Nina must now be a woman; perhaps she has children and grandchildren. I cannot know. Sometimes I feel my baby in my arms and see my soldier man standing by, smiling. But soon I, too, shall go to the Land of Death and there all things that are wrong will be made right.

THE SPRING BEHIND THE CEMETARY

DUBOIS, CONSTANCE GODDARD
"THE RELIGION OF THE LUISEÑO INDIANS OF SOUTHERN CALIFORNIA" (1908)
UNIVERSITY OF CALIFORNIA PUBLICATIONS IN AMERICAN ARCHAEOLOGY AND ETHNOLOGY
8(3): P. 155

A man was going out to get some yucca and went to the spring. He had a stick in his hand, and he dropped it into the water, and it sank so deep he could not get it. He was a witch, so he went down under the water to look for the stick.

And he came out into a place where a man and woman lived, sitting, making baskets.

"Who are you, cousin, and where do you come from? What are you doing here?" they asked.

"I live up there, and I came down to look for the stick which I lost."

He stayed there three days. He was very thirsty, so the woman gave him a little shell full of water. He drank and drank, and still the shell was full of water. He was hungry and they gave him honey to eat.

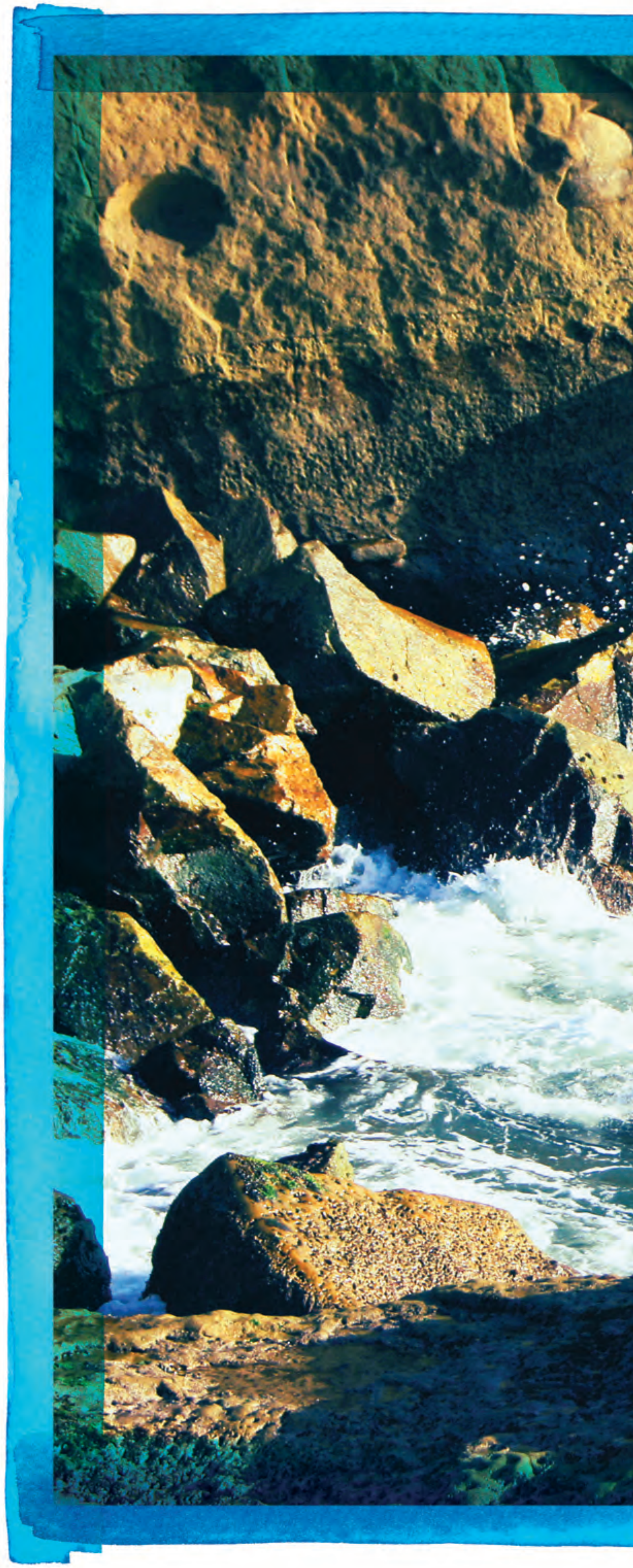
Then he began to wish for his home, and the man who lived there saw that he wanted to leave them, so he said he might go if he would promise never to tell where he had been. If he told this secret, the rattlesnake would immediately bite him and he would die. So the man promised not to tell, and they painted him all over and pushed him out, and he found himself in his own home.

His wife and his brother asked where he had been, but he would not tell them. But his wife was determined to find out and gave him no peace day or night until, at last, he consented to tell her.

"I shall be killed for telling this," he said, so he called all the people together and told them he must die; he wanted them to burn his body in a certain open level place where there was no water, but after his ashes were buried there, water would come up and there would be a nice spring.

So he went out of his house, and a rattlesnake was there, which bit him, and he died.

The people got wood for the funeral pyre and burned his body and buried his ashes. There was no water in this place, but two or three days after, there was a spring of water there. One can see it now behind the cemetery, and fresh coals, pieces of charcoal, are always rising where the water bubbles up.



SAN DIEGO
Integrated Regional
Water Management

San Diego County
Water Authority

RMC

AECOM

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Appendix 6-A:
RWMG Memorandum of Understanding

Fiscal Years 2012-2016 - Currently under revision




MEMORANDUM OF UNDERSTANDING
BETWEEN CITY OF SAN DIEGO
COUNTY OF SAN DIEGO, and SAN DIEGO COUNTY WATER AUTHORITY
for the
INTEGRATED REGIONAL WATER MANAGEMENT PROGRAM
For Fiscal Years 2012-2016

This Memorandum of Understanding (MOU) between the San Diego County Water Authority (Water Authority); the City of San Diego, a municipal agency (City); and the County of San Diego, a political subdivision of the State of California (County), sets forth the respective roles of Water Authority, City and County in regard to the Integrated Regional Water Management (IRWM) Plan and Program. Water Authority, City and County are sometimes referred to in this MOU collectively as the "Parties" and individually as "Party."

This MOU replaces the Memorandum of Understanding (March 25, 2009), as amended, between City, County, and Water Authority for Fiscal Years 2009-2013 for the IRWM Grant Program.

RECITALS:

1. The California Legislature enacted SBX2 1 (Perata, Chapter 1 Statutes of 2008), the Integrated Regional Water Management Planning Act, which repealed and re-enacted Part 2.2 of Division 6 of the Water Code relating to integrated regional water management plans. SBX2 1 provides that a regional water management group may prepare and adopt an integrated regional water management (IRWM) plan.

2. In November 2002, Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act, authorized the Legislature to appropriate funding for competitive grants for IRWM projects.

3. In November 2006, Proposition 84, the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act, authorized the Legislature to appropriate funding for competitive grants for IRWM projects.

4. The intent of the IRWM Grant Program (Program) established in accordance with Proposition 50 and SBX2 1, 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.

5. To qualify as a regional water management group (RWMG) and comply with the Program Guidelines (Guidelines) established under Proposition 50 and SBX2 1, at least three agencies must participate in the group; two of the agencies must have statutory authority over

water management that may include water supply, water quality, flood control, or stormwater management.

6. In 2005, the Parties established an RWMG that consists of Water Authority, which has statutory authority over water management; City, which has statutory authority over water management, water quality, wastewater, flood management and stormwater; and County, which has statutory authority over water quality, stormwater and flood control in the unincorporated area.

7. The Parties understand that only through a collaborative effort with the many stakeholders involved in water management planning can the IRWM Plan process be successful in the San Diego region.

8 As part of the public outreach and stakeholder involvement effort, the Parties established the Regional Advisory Committee (RAC), which comprises up to 32 representatives appointed by the Parties from the water management areas of water supply, water quality and natural resources/watersheds management; and representatives of businesses, academia and tribes, as well as other interested members of the public. The purpose of the RAC is to make recommendations to the Parties on key issues related to IRWM planning and grant applications.

9. The Parties, acting with positive recommendations from the RAC, completed the first San Diego IRWM Plan (Plan) in 2007. Subsequently, the Parties have received funding for planning and implementation of projects from the California Department of Water Resources (DWR). Additional funding is available to the San Diego IRWM Program from Proposition 84, approved by California voters in 2006.

10. To qualify for Proposition 84 IRWM funding, a planning region must have an IRWM Plan that complies with the requirements of California Water Code Section 83002(b)(3)(B), or must have committed to bringing its plan into compliance within two years of receiving such funding.

11. A Local Project Sponsor (LPS) is a proponent of an individual project that will be funded as part of an IRWM Program grant from the State or other future funding agencies. An LPS may be Water Authority, County, City, a Water Authority member agency, a municipality, a local agency or a non-profit organization.

12. This MOU consists of five major components: general grant obligations, San Diego IRWM Plan update, IRWM grant administration, the role of the RAC, and funding for IRWM Program management.

Now, therefore, in consideration of the above incorporated recitals and mutual obligations of the Parties herein expressed, the Parties agree as follows:

1. General Grant Obligations

a. The Parties are equal partners in the development and submission of IRWM grant applications. All Parties shall provide timely reviews and approvals before grant applications are submitted.

b. Water Authority shall submit the grant applications to the funding agency on behalf of the Parties.

c. To expedite the grant application process, Water Authority shall provide initial funding for a consultant to develop the applications. The total cost of the consultant and applications shall be shared by the parties consistent with Section 5 of this MOU.

d. The funding commitment by the Parties under Section 5 of this MOU assumes that the Parties will continue to pay or provide in-kind services as allowed for the entire cost of grant applications for the IRWM Program. As part of the IRWM Plan Update described in Section 2 of this MOU, the Parties agree to study the concept of obtaining funding from other sources to fully or partially defray the cost of grant applications.

e. Water Authority shall be responsible for administering funding for projects that are receiving IRWM Program grant funding with respect to submitting invoices and quarterly reports to the funding agency, distributing funding to LPS, and processing contract amendments as applicable.

f. The Parties shall share equally in any and all contractual liability, regardless of nature or type, which arises out of or results from a LPS's performance of services under its agreement with the Water Authority. The Parties shall share equally in any of the default provisions listed in the grant agreements received by the Parties. The Water Authority also agrees to pursue contractual remedies.

g. Each Party shall procure and maintain during the period of this MOU insurance from insurance companies admitted to do business in the State of California or shall self-insure to cover any contractual liability resulting from the conditions referenced in Section 1f.

2. San Diego IRWM Plan Update

a. The Parties are equal partners in the update of the Plan. Water Authority shall contract with a consultant to update the Plan in compliance with the Guidelines and schedule established by DWR, and submit the updated Plan to DWR.

b. The update of the Plan shall be contingent upon receipt of grant funding for this purpose.

3. IRWM Grant Contracts Administration

a. The Water Authority shall administer and manage IRWM grant agreements, administer the LPS contracts, develop and maintain a reporting and invoicing program, and communicate project and agreement progress to the RWMG, RAC, and the funding agency.

b. An LPS that has satisfied all invoicing requirements for a grant shall invoice the Water Authority, which shall in turn invoice the funding agency. The Water Authority shall, within 45 days of receipt of funds from the funding agency, disburse the funds to the LPS.

c. The Water Authority shall appropriate a percentage of the grant money allocated to each LPS project to fund administration of the IRWM grants. The Parties shall agree mutually to the percentage of the grant money that is to be appropriated for this purpose. To the extent that costs exceed the amount in this fund, and that the Parties mutually agree to the additional cost, the Parties shall equally share the additional costs in accordance with Section 5a.

d. Where a labor compliance requirement has been established by the granting agency, Authority shall report to the granting agency the compliance status of LPS, as reported by LPS, with applicable public works laws.

4. Role of Regional Advisory Committee (RAC)

The RAC shall be considered the project advisory committee. The Parties are committed to a cooperative relationship with the RAC and will incorporate the RAC's consensus recommendations in documents prepared for presentations to the Parties' governing bodies. The Parties' governing bodies will give primary consideration to the recommendations of the RAC as part of any decision related to the following:

a. Adoption of updates to the IRWM Plan for the San Diego Region.

b. Criteria for prioritizing projects to be submitted for IRWM grant programs.

c. Reevaluation of all projects submitted for grant funding if a funding agency funds the Program at a level lower than the requested grant amount and does not provide direction on which projects to fund. Parties shall fund the projects based on consultation with the RAC and the criteria for project prioritization (Section 4b).

d. Approval and submittal of grant applications.

e. Transition of responsibility for implementation of the IRWM Plan to a new institutional structure.

5. Funding

a. Funding for FY 2012-2016 shall not exceed $1,470,000. Each Party shall provide an equal share of this funding in an amount not to exceed $490,000. If a Party's contribution was not totally expended in the MOU (March 25, 2009), as amended, that Party shall be credited for the unexpended amount in this MOU.

b. In-kind services provided by the Parties shall be considered in excess of the above funding amounts and are not reimbursable. The Parties' staff shall separately document time spent on in-kind services for IRWM planning, administration and grant applications.

c. The funding commitment described in 5a shall not include expenditures to administer the IRWM Grant Program.

d. Water Authority shall invoice City and County on a quarterly basis along with supporting documentation of expenses. City and County shall remit payment within 60 days of receipt of invoice.

6. Assignment

Parties shall not assign or transfer this MOU or any rights under or interest in this MOU without written consent of all other Parties, which may be withheld for any reason.

7. Defense and Indemnity

Water Authority, City, and County each agree to mutually indemnify, defend at its own expense, including attorneys' fees, and hold each other harmless from and against all claims, costs, penalties, causes of action, demands, losses and liability of any nature whatsoever, including but not limited to liability for bodily injury, sickness, disease or death, property damage (including loss of use) or violation of law, caused by or arising out of or related to any negligent act, error or omission of that party, its officers or employees, or any other agent acting pursuant to its control and performing under this Agreement.

Nothing in the foregoing shall be construed to require any Party to indemnify another for any claim arising from the sole negligence or willful act of the Party to be indemnified.

8. Document Review

Water Authority, City and County each shall make available for inspection to the other Parties, upon reasonable advance notice, all records, books and other documents relating to the Plan and the Program, unless privileged.

9. Term

The term of this MOU shall begin on the date of execution by all Parties and expire on June 30, 2016 expressly contingent upon funding by Water Authority, City and County. The term may be extended by written agreement of all Parties. The Parties shall continue to participate in the planning, development and coordination of the Plan and Grants to the maximum extent possible. The Parties agree to notify one another in the event that their agency's future budget appropriations impact Program funding continuity. If appropriations are different than anticipated, the MOU and Program funding shall be adjusted based on actual funding.

10. Notice

Any notice, payment, credit or instrument required or permitted to be given hereunder will be deemed received upon personal delivery or 24 hours after deposit in any United States mail depository, first class postage prepaid, and addressed to the Party for whom intended as follows:

If to the Water Authority:	San Diego County Water Authority 4677 Overland Avenue San Diego, CA 92123 Attn: Mark Stadler
If to City:	City of San Diego Water Department 600 B Street, Suite 600 San Diego, CA 92101 Attn: Cathy Pieroni
If to County	County of San Diego 5201 Ruffin Road, Suite P San Diego, CA 92123 Attn: Sheri McPherson

Any Party may change such address or contact by notice given to the other Parties as provided herein.

11. Amendments

The MOU may be amended by written agreement of all Parties.

12. Severability

The partial invalidity of one or more parts of this MOU will not affect the intent or validity of this MOU.

13. Governing Law

This MOU shall be deemed a contract under the laws of the State of California and for all purposes shall be interpreted in accordance with such laws. Any action brought shall be in San Diego County, California.

14. Obligations

Nothing in this agreement shall create additional obligations with respect to the Plan or Program.

15. Termination of MOU

This MOU may be terminated by any Party with or without cause 30 days after notice in writing to the other Parties.

16. Signatures

The individuals executing this MOU represent and warrant that they have the legal capacity and authority to do so on behalf of their respective legal entities.

IN WITNESS WHEREOF, the Parties have executed this MOU as of the date below.

San Diego County
Water Authority

By: ______________________
Ken Weinberg
Director of Water Resources

City of San Diego

By: Hildred Pepper Jr.
Hildred Pepper Jr.
Purchasing & Contracting
Director

County of San Diego

By: Rill E. Crompton
Richard Crompton, Director
Department of Public Works

By: Bruce Retym RISKY
Winston F. McColl, Director
Department of Purchasing and Contracting

APPROVED AS TO FORM:

San Diego County
Water Authority

By: [signature]
General Counsel
San Diego County Water Authority

City of San Diego

By: [signature]
Raymond C. Palmucci
Deputy City Attorney

County of San Diego

By: [signature]
James O'Day
County Counsel, Senior Deputy

Date: 9/21/11

SAN DIEGO
Integrated Regional Water Management

Appendix 6-B:
Regional Advisory Committee (RAC) Charter




San Diego IRWM Program
DRAFT Regional Advisory Committee (RAC) Charter

October 2012 - Revised August 2018

This document is intended to establish rules and guidelines for the Regional Advisory Committee (RAC), which is a fundamental component of the San Diego Integrated Regional Water Management (IRWM) Program.

1. Purpose

The San Diego IRWM Program was established in 2005 by the Regional Water Management Group (RWMG), comprised of the San Diego County Water Authority, the City of San Diego, and the County of San Diego. The RAC is an advisory body which provides recommendations to the RWMG on topics related to the IRWM Program. The RWMG gives primary consideration to the recommendations of the RAC and incorporates the RAC's recommendations into documents prepared for presentation to the RWMG governing bodies.

The RAC was originally formed in December 2006 to assist the RWMG with completion of the San Diego IRWM Plan and prioritization of projects for a Proposition 50 funding application. The IRWM Plan was completed in 2007, and the San Diego Region was successfully awarded approximately $25 million to fund projects under Proposition 50. In 2010, the RAC participated in development of two successful Proposition 84 grant applications which brought an additional $9 million in grant funding to the Region. While the original purpose of the RAC has been fulfilled, the RAC continues to serve as an advisory body providing recommendations to the RWMG on key issues related to IRWM planning and funding applications.

This charter continues the establishment of the RAC, sets forth RAC member composition, duties, and responsibilities, and outlines organization and operation of the group.

2. Role of the RAC

As an advisory body to the RWMG, the RAC will work closely with the RWMG to develop recommendations for the following (*from 2012-2016 RWMG MOU*):

a. Adoption of updates to the IRWM Plan for the San Diego Region.
b. Establishment of criteria for prioritizing projects to be submitted for IRWM grant programs.
c. Reevaluation of projects submitted for grant funding, when necessary.
d. Approval and submittal of grant applications.
e. Transition of responsibility for implementation of the IRWM Plan to a new institutional structure.

When necessary, ad-hoc Workgroups are formed to meet separately and work on an issue or topic that cannot readily be resolved in the broader RAC setting.

3. Meetings

RAC Meetings

There will be six scheduled bi-monthly RAC meetings per year. All RAC meetings shall be noticed in accordance with the Brown Act. If desired by RAC Members, additional RAC meetings may be scheduled and noticed at least one week in advance.

Meetings shall be conducted in accordance with this Charter. The RAC Chair will determine if a quorum exists at any RAC meeting. Formal voting may not occur without a quorum of RAC members; however, presentations and discussion of agenda topics may occur.

Workgroup Meetings

Workgroups are convened on an ad-hoc basis. Workgroups are not subject to Brown Act requirements and may not be publicly noticed in advance.

Meetings shall be conducted in accordance with this Charter. The Workgroup Chair will determine if a quorum exists at any Workgroup meeting. Formal voting may not occur without a quorum of Workgroup members; however, presentations and discussion of agenda topics may occur.

Results of Workgroup meetings will be reported to the RAC at the next scheduled RAC meeting.

4. RAC Member Composition

There are six membership categories (herein referred to as caucuses) for voting members of the RAC. These caucuses include the RWMG, Water Supply, Water Quality, Natural Resources and Watersheds, Disadvantaged Communities/ Environmental Justice (DAC/EJ), and Other Members. In addition, there is a caucus for non-voting RAC members. The following is a general overview of the composition of each caucus. **Attachment A** provides a detailed description of the RAC Member Composition.

1. Regional Water Management Group: The three RWMG agencies – San Diego County Water Authority, the City of San Diego, and the County of San Diego.
2. Water Supply: Agencies and entities tasked with supplying water to homes, businesses, and agriculture.
3. Water Quality: Agencies and entities tasked with managing storm runoff, both quantity and quality, in man-made conveyances, collecting and disposing of wastewater, or treating and providing recycled water.
4. Natural Resources and Watersheds: Agencies and entities tasked with preserving, enhancing, and managing natural resources and watersheds.
5. DAC/EJ: Agencies and entities who represent disadvantaged communities (DACs) and/or environmental justice concerns.
6. Other Members: Other agencies and entities with interest in and/or impact on water resource management.
7. Non-Voting Members: State, federal, and regional agencies and organizations who are interested parties.

All RAC members must be knowledgeable in the field or interest that they represent. As such, RAC members must represent a public agency, non-profit organization, professional organization, or academia. In addition, the overarching goals for RAC membership are for the RAC to be geographically diverse, to represent multiple stakeholders, and to be approximately balanced between public agencies and non-profits.

5. RAC Member Attributes and Duties

The following are desired attributes for RAC members and their alternates:

1. Have knowledge and experience in water resources management.
2. Represents an agency, non-profit organization, tribe, or academia.
3. Have the ability and desire to objectively articulate the perspective of his/her RAC seat and caucus at a level beyond that within his/her individual organization.
4. Provide recommendations with the best interests of the entire San Diego IRWM region in mind.

The following are general duties for which RAC members and their alternates are responsible:

1. Attend meetings consistently – only two absences are acceptable in a 12-month period.
2. Come prepared – review materials ahead of time and provide comments as appropriate.
3. Be responsive to requests between meetings.
4. Act as a point of contact within his/her individual organization for collection and dissemination of information related to the IRWM Program.
5. Disseminate information about the IRWM Program to his/her contacts, as appropriate.
6. Designate an alternate to attend and participate in RAC meetings in his/her absence.
7. Recues his/her self from discussion and voting if he/she has a personal interest or stake in the outcome.

In relation to criterion 3 listed above, RAC members are grouped into seven caucuses, each of which has specific seats that are outlined in **Attachment A**.

All ad-hoc Workgroup members are also expected to display the attributes and duties listed above.

6. RAC Member and Alternate Terms

Once the RAC is established, members and their alternatives will serve four-year terms. RAC member and alternate terms do not apply to the RWMG caucus.

- In December 2012, half of the existing RAC members and their alternates will be assigned a two-year term (2013-2014). A total of 15 RAC members will be selected at random (using existing caucuses – 3 RWMG; 2 water supply; 2 water quality; 3 natural resources; and 5 at large).
- The other half of the existing RAC members will be dismissed and those seats will be opened up for applications from all IRWM stakeholders. Using the process outlined in Section 7, RAC members will be selected for those remaining seats. These RAC members and their alternates will be assigned a four-year term (2013-2016).
- All subsequent RAC members will serve a four-year term, with half the group being updated every odd year (2015, 2017, etc). There is no limit to the number of terms served.

RAC members and their alternates are subject to recusal due to conflicts of interest in accordance with *Government Code Title 9, Political Reform; Chapter 7, Conflicts of Interest.* A conflict of interest is defined as a RAC member using his/her position to influence IRWM program decisions in which he/she has a financial interest (§87100). Recusal will occur per the discretion of the RWMG, in consultation with the RAC Membership Workgroup described in Section 8. This recusal policy also applies to ad-hoc Workgroup members.

7. 2012 RAC Member Selection

At the October 3, 2012 RAC meeting, half of existing RAC members will be selected to remain in place and half will be opened to the application process described below. The names of existing RAC members who desire to continue their service on the RAC will be placed in a hat and a total of 15 RAC members will be selected at random (using existing caucuses – 3 RWMG; 2 water supply; 2 water quality; 3 natural resources; and 5 at large). These members will remain on the RAC for a 2-year term (2013-2014). The other half of the RAC members will be dismissed at the end of the calendar year; these members may then apply for the newly opened seats, if so desired.

The following RAC selection process will be implemented by December 2012:

1. The RWMG will solicit applications from all interested IRWM stakeholders, including those former RAC members not selected for a two-year term. Applications will be held to a firm deadline, after which applicants will no longer be considered. **Attachment B** of this document contains the RAC Application that will be accepted from November 1 – December 4, 2012.
2. A RAC Membership Workgroup will be convened to develop recommendations for the 2012 RAC selection. The Workgroup will be comprised of three RWMG (one from each agency), 1 water supply; 1 water quality; 2 natural resources; and 2 at large members, for a total of 9 members. To avoid self-appointments, the Workgroup members will be limited to current RAC members whose term is not expiring. Workgroup members are limited to those RAC members selected for a two-year term. The RAC caucuses will deliberate over email/phone and inform the RAC of their chosen representatives by December 4, 2012.
3. The RAC will review the proposed Workgroup members at the December 5, 2012 RAC meeting and provide a recommendation to the RWMG. If the RAC cannot reach a consensus recommendation, it will inform the RWMG of this situation.
4. The RWMG will review the recommendation. Applicants will be notified by the RWMG of their appointment to the Workgroup.
5. The RWMG will review the RAC member applicants to confirm that they meet the RAC Member Composition stipulated in **Attachment A**, as well as other selection criteria recommended by the RAC. The RWMG will distribute the list of applicants to the Workgroup.
6. If the RWMG does not receive applications to fill each open seat on the RAC, it will reopen the application period for one week and the Workgroup meeting will be delayed.
7. The Workgroup representatives from each caucus may distribute the list of applicants to their caucus and work with caucus members to develop a recommendation for the new members of their caucus, if desired.
8. In December 2012, the Workgroup will meet to review the applicants and provide a recommendation to the RWMG on the RAC membership (except RWMG seats). The recommendation must be specific enough to ensure that RAC membership is retained as specified in the RAC Member Composition in Attachment A. If the Workgroup cannot reach a consensus recommendation, it will inform the RWMG of this situation.
9. The RWMG will review the recommendation. Applicants will be notified by the RWMG of their appointment to the RAC, and at that time will be asked to appoint a permanent alternate who is suitable to participate on the RAC under the member composition guidelines described in Section 4. New RAC members selected by the Workgroup will be assigned a four-year term (2013-2016).
10. The new RAC membership will be effective on January 1, 2013.

RAC member selection as established within this section only applies to the 2012 RAC member selection process. All future member replacement will be completed as described in Section 8.

The RAC Membership Workgroup that is convened in December 2012 will remain in place through November 2014 to address any membership issues that arise over those two years, including replacement of a member who retires or resigns.

8. RAC Member Replacement

RAC member replacement will take place every other year in December. As outlined in Section 6, terms for approximately half of the RAC membership shall expire every other year. RAC member replacement shall occur via the process outlined below:

1. The RWMG will solicit applications from all IRWM stakeholders, including RAC members whose terms are expiring. Applications will be held to a firm deadline, after which applicants will no longer be considered. **Attachment B** of this document contains the RAC Application that will be accepted from November 1st through the December RAC meeting date.
2. A RAC Membership Workgroup will be convened to develop recommendations for RAC member replacement. The Workgroup will be comprised of 3 RWMG (one from each agency) and 1 representative from each voting caucus, for a total of 8 members. To avoid self-appointments, the Workgroup members shall be limited to current RAC members whose term is not expiring. The RAC caucuses shall deliberate over email/phone and inform the RWMG of their chosen representative by the December RAC meeting date.
3. The RAC will review the proposed Workgroup members and provide a recommendation to the RWMG. If the RAC cannot reach a consensus recommendation, it will inform the RWMG of this situation.
4. The RWMG will review the recommendation. Applicants will be notified by the RWMG of their appointment to the Workgroup.
5. The RWMG will review the RAC member applicants to confirm that they meet the RAC Member Composition stipulated in **Attachment A**. The RWMG will distribute the list of applicants to the Workgroup.
6. If the RWMG does not receive applications to fill each open seat on the RAC, it will reopen the application period for one week and the Workgroup meeting will be delayed.
7. The Workgroup representative from each caucus may distribute the list of applicants to their caucus and work with the caucus members to develop a recommendation for the new members of their caucus, if desired.
8. In December, the Workgroup will meet to review the applicants and provide a recommendation to the RWMG on the RAC membership (except RWMG seats). The recommendation must be specific enough to ensure that RAC membership is retained as specified in the RAC Member Composition in Attachment A. If the Workgroup cannot reach a consensus recommendation, it will inform the RWMG of this situation.
9. The RWMG will review the recommendation. Applicants will be notified by the RWMG of their appointment to the RAC, and at that time will be asked to appoint a permanent alternate who is suitable to participate on the RAC under the member composition guidelines described in Section 4. RAC members selected by the Workgroup will be assigned a four-year term.
10. The new RAC membership will be effective on January 1st of the following year.

Each RAC Membership Workgroup will remain in place for two years to address any membership issues that arise over those two years, including replacement of a member who retires or resigns.

9. Member and Alternate Attendance

All RAC members and their alternates are required to sign the RAC Attendance Policy document (refer to **Attachment C**), which stipulates that no more than two absences are allowed in a 12-month period. If RAC members cannot be present during a meeting or meetings, their alternates are expected to fill the RAC member's position without interruption to the RAC.

At the end of each calendar year, the RWMG will review attendance of each RAC member and their alternates over the past 12 months to determine if they are in compliance with the RAC Attendance Policy.

At the first RAC meeting of each calendar year, the RWMG will present its attendance findings to the RAC, which will be responsible for deciding if members are in violation of the RAC Attendance Policy and therefore should be replaced as stipulated in Section 8.

10. Member Termination

In the event that the RWMG and RAC determine that a RAC member is not complying with the RAC member attributes and duties in Section 5, termination of that person's membership will be discussed by the RAC Membership Workgroup in closed session. The RAC Membership Workgroup may recommend termination and replacement to the RWMG, which will review the recommendation and inform the person of their termination. Replacement of that person will also be recommended by the RAC Membership Workgroup and approved by the RWMG.

11. RAC Chair and Vice Chair Roles

The RAC Chair and Vice Chair must be RWMG members.

Although not required, the following attributes are desirable for the Chair and Vice Chair:

- Chair: prior experience working in the role of a Chair of a committee.
- Vice Chair: attributes and ability to assume Chair role and responsibilities, but not necessarily as much experience as the Chair.
- Chair and Vice Chair should come from different caucus groups (refer to Section 4).
- Should have already served at least 2 years on RAC, so they are familiar with the purpose, structure, and content of meetings.
- Willing and able to attend each RAC meeting during 2-year term.
- Ability to even-handedly articulate all interests.
- Consensus-builder.

The role of the Chair and Vice Chair will vary between RAC meetings; however, the Vice Chair's primary role is to take on Chair responsibilities in the absence of the Chair and/or at the discretion of the Chair. General responsibilities for the Chair are as follows:

1. Review RAC agenda prior to finalization and distribution to stakeholders (one week prior to RAC meetings).
2. Meet with the RWMG at least 30 minutes prior to each RAC meeting to go over the RAC agenda and presentation(s) so that the RAC meeting runs smoothly and without interruption.
3. Manage the RAC agenda, select members to speak in turn, and keep the RAC on task and on time.
4. Convene each RAC meeting and initiate introductions.
5. Organize and call on public speakers during appropriate agenda items (if applicable), and determine if it is appropriate to reduce the overall time for each public speaker to less than three minutes (refer to Section 15).
6. Identify when the RAC has reached an impasse and needs to move forward with formal voting to resolve an issue (refer to Section 12).
7. Summarize key decisions and action items at the end of each RAC meeting.
8. Close meetings.
9. Review and provide comments on RAC meeting notes.

The Chair and Vice Chair will serve for a period of two (2) years, concurrently. There is no limit to the number of terms served.

12. RAC Decision Process

The RAC, as an advisory body to the RWMG, will strive to achieve consensus to the maximum extent possible. If consensus is not achievable, the Chair or Vice Chair shall call for a vote. All financial matters require a vote.

Decision Making by Consensus

The RAC will strive to achieve consensus through discussion and debate at RAC meetings. For purposes of the RAC, consensus is defined as Level 1-4 on the list of consensus levels provided below:

1. I can say an **unqualified 'yes'** to the decision. I am satisfied that the decision is an expression of wisdom of the group.
2. I find the decision **perfectly acceptable**. It is the best of the real options we have available to us.
3. I can **live with** the decision. However, I'm not especially enthusiastic about it.
4. I do not fully agree with the decision and need to register my view about it. However, I do not choose to block the decision and will **stand aside**. I am willing to support the decision because I trust the wisdom of the group.
5. I do not agree with the decision and feel the need to **block** the decision being accepted as consensus.
6. I feel that we have no clear sense of unity in the group. We need to do more work before consensus can be achieved.

During discussion, the RAC Chair shall ask for a show of hands indicating each members "consensus level" for the specific decision at hand. If all RAC members are a "consensus level" 1-4, the decision may proceed as a consensus decision. If not all the RAC members are in consensus (one or more members are at "consensus level" 5 or 6), the RAC shall continue discussions to try and reach consensus. The RAC Chair is responsible for deciding when the RAC is at an impasse, and will call for a vote at that point.

Voting Procedures

The RAC will make non-consensus decisions by vote:

- For approving all non-financial matters, if a vote is necessary due to the lack of consensus, a simple majority vote will be sufficient.
- For approving all financial matters (e.g. submission of projects for a grant application), a super majority (2/3 vote) of the RAC will be required.
- In any case where the RAC is at a formal voting impasse and cannot make a decision, it will be up to the RWMG's discretion to decide how to resolve the issue.

Once the RAC Chair has determined that the RAC is at an impasse and a vote is necessary, he/she will ask for a motion and a second. After the motion has been seconded, the RAC members will be given an opportunity for further discussion on the specific components of the motion. Following this discussion, the RAC Chair will call for a show of hands to pass or fail that motion.

13. Workgroup Member Selection

Periodically, the RAC will request the organization of an ad-hoc Workgroup to meet separately and work on an issue or topic that cannot readily be resolved in the broader RAC setting. Workgroups have historically been convened to provide direction to the RAC on matters such as project selection for grant funding. Note that the role of Workgroups is to provide a recommendation to the RAC; Workgroups are not charged with making decisions for the IRWM Program.

The RWMG may include a non-voting, non-RAC member to any Workgroup, if deemed appropriate for transparency and to provide expert knowledge.

Ad-Hoc Workgroups

The following process shall be followed when convening ad-hoc Workgroups:

1. The RWMG and RAC will determine that a Workgroup is necessary and the number of members per caucus in the Workgroup. Some Workgroups may not set limits on the number of representatives per caucus; in this case, Workgroup volunteers will be compiled and Step 2 will be skipped.
2. The RAC caucuses will deliberate and inform the RAC of their chosen representative(s) to the Workgroup. Workgroup members do not have to be current RAC members, but can be other stakeholders representing the caucus. If the caucus cannot reach a consensus recommendation, it will inform the RAC of this situation.
3. The RAC will review the proposed Workgroup members and provide a recommendation to the RWMG. If the RAC cannot reach a consensus recommendation, it will inform the RWMG of this situation.
4. The RWMG will review the recommendation. Applicants will be notified by the RWMG of their appointment to the Workgroup.

Project Selection Workgroups

The following process shall be followed when convening Project Selection Workgroups to review and select projects for inclusion within a funding application:

1. The Project Selection Workgroup will be comprised of 3 RWMG (one from each agency) and 1 representative from each voting caucus, for a total of 8 members.
2. The RAC caucuses will deliberate and inform the RAC of their chosen primary representative and alternate to the Workgroup. Project Selection Workgroup members must be current RAC members. If the caucus cannot reach a consensus recommendation, it will inform the RAC of this situation.
3. The RAC will review the proposed Workgroup members and provide a recommendation to the RWMG. If the RAC cannot reach a consensus recommendation, it will inform the RWMG of this situation.
4. The RWMG will review the recommendation. Applicants will be notified by the RWMG of their appointment to the Workgroup.

14. Workgroup Decision Process

Workgroups, as advisory bodies to the RAC, will strive to achieve consensus to the maximum extent possible. If consensus is not achievable, the Chair or Vice Chair shall call for a vote. All financial matters require a vote. **Attachment D** provides a summary of the Workgroup Decision Process.

Project Selection Workgroups

Because they address financial matters, the Project Selection Workgroups have a unique decision process. In addition to the ground rules, consensus definitions, and Chair selection process provided in Attachment D, the following policies shall be followed when convening Project Selection Workgroups:

- A professional facilitator will be used, when possible, to keep Workgroup to the Ground Rules.
- Workgroup discussion will be limited to primary members, not alternates. Agenda will include multiple scheduled breaks so primary and alternate members have a chance to caucus and discuss progress of meeting. Alternates must still attend to hear the discussion should they need to serve in primary capacity at a later meeting.
- Consultant will be directed to contact local project sponsors (LPS) with clarification questions and any proposed changes in the grant request, rather than having members volunteer to contact and

report back (to prevent bias by Workgroup members). Workgroup members shall not be the named LPS point of contact on any project being discussed by the group.

- Any Workgroup member with a personal financial interest in a submitted project (see conflict of interest definition in Section 6) must step down from the Workgroup. If this arises, the Workgroup member will be replace by his/her alternate and a new alternate will be selected.
- The Workgroup will schedule one meeting day where LPS should make themselves available to answer Workgroup questions via in-person interview or conference call.
- Primary members only should vote, even in informal polling (otherwise representation is skewed). If a primary member abstains for any reason, their alternate may vote.
- Workgroup members may vote on packages that contain projects submitted by their agency or organization; however, they will recues themselves from discussing and/or advocating for projects.

15. Public Comments at RAC Meetings

All RAC meetings are open to the public, and public comments are welcomed and encouraged. In order to ensure that members of the public have an adequate chance to provide comments, and also to ensure that such comments are received in a timely manner, the following public comment rules will be implemented:

- Speaker cards will be available at each RAC meeting. Members of the public will be asked to fill out a speaker card to indicate their name, affiliation, contact, and the specific agenda item they wish to speak to (if applicable).
- Speaker cards will be limited to one per person per agenda item. Participants may submit multiple speaker cards to address multiple agenda items.
- The RAC Chair or Vice Chair will invite those who submitted speaker cards to address the agenda item prior to calling for a consensus decision and/or vote on that item.
- Speaker cards will generally allow three minutes of public speaking time per speaker. However, in the event that there are a multitude of public speaker comments, it will be up to the discretion of the RAC Chair or Vice Chair to reduce the time for each public speaker to ensure that all agenda items are addressed and that the RAC meeting closes on time.
- Additionally, an open public comment period will be offered at the end of each RAC meeting to allow members of the public to speak to non-agenda topics.

Attachment A: RAC Member Composition

RAC Membership Composition

Regional Water Management Group (3)

1. City of San Diego
2. County of San Diego
3. San Diego County Water Authority

Water Supply (5)

Agencies and entities tasked with supplying water to homes, businesses, and agriculture

1. Retail (North County- Inland)
2. Retail (North County- Coastal)
3. Retail (East County)
4. Retail (South County)
5. Retail (At Large)

Water Quality (6)

Agencies and entities tasked with managing storm runoff, both quantity and quality, in man-made conveyances and/or collecting and disposing of wastewater, including water recycling

1. Stormwater Management (North County)
2. Stormwater Management (South/East County)
3. Water Quality (NGO)
4. Water Quality (NGO)
5. Wastewater/Recycled Water (Metro JPA)
6. Wastewater/Recycled Water (Non-Metro JPA)

Natural Resources and Watersheds (5)

Agencies and entities tasked with preserving, enhancing, and managing natural resources and watersheds

1. Water Conservation (NGO)
2. Protection and Restoration (NGO)
3. Protection and Restoration (NGO)
4. Recreation
5. Coastal Ecosystems (Bays, Estuaries, Lagoons)

DAC/Environmental Justice (2)

Agencies and entities who represent disadvantaged communities and/or environmental justice concerns

1. Urban DAC
2. Rural DAC

Other Members (7)

Other agencies and entities with interest in and/or impact on water resource management

1. Flood Management
2. Business Community
3. Agriculture
4. Tribal (Southern California Tribal Chairs Association designee)
5. Land Use Planning
6. Climate Change
7. At Large*
8. At Large*

** For At Large seats, consideration should be given but not limited to the following criteria: academia, climate change, energy/water nexus, solid waste/water nexus, sustainability.*

Total voting members: 28

Non-Voting Members (6)
State, federal, and regional agencies who are interested parties

1. Regional Water Quality Control Board (staff)
2. U.S. Bureau of Reclamation
3. Military Community
4. Tri-County FACC (Upper Santa Margarita RWMG)
5. Tri-County FACC (South Orange County RWMG)
6. State Coastal Conservancy

Attachment C: RAC Attendance Policy

San Diego Integrated Regional Water Management (IRWM) Program
Regional Advisory Committee (RAC) Membership Application

The RAC was originally formed in December 2006 to assist the RWMG with completion of the San Diego IRWM Plan and prioritization of projects for a Proposition 50 funding application. The IRWM Plan was completed in 2007, and the San Diego Region was successfully awarded approximately $25 million under Proposition 50 and $9 million under Proposition 84. While the original purpose of the RAC has been fulfilled, the RAC continues to serve as an advisory body providing recommendations to the RWMG on key issues related to IRWM planning and funding applications.

Thank you for your interest in serving on the RAC. Having an involved and dedicated RAC is vital to San Diego's successful ongoing IRWM planning efforts. RAC meetings are held **bi-monthly** and are posted for the entire calendar year at www.sdirwmp.org.

The following are desired attributes for RAC members and their alternates:

5. Have knowledge and experience in water resources management.
6. Represents an agency, non-profit organization, tribe, or academia.
7. Have the ability and desire to objectively articulate the perspective of his/her RAC seat and caucus at a level beyond that within his/her individual organization.
8. Provide recommendations with the best interests of the entire San Diego IRWM region in mind.

The following are general duties for which RAC members and their alternates are responsible:

8. Attend meetings consistently – only two absences are acceptable in a 12-month period.
9. Come prepared – review materials ahead of time and provide comments as appropriate.
10. Be responsive to requests between meetings.
11. Act as a point of contact within his/her individual organization for collection and dissemination of information related to the IRWM Program.
12. Disseminate information about the IRWM Program to his/her contacts, as appropriate.
13. Designate an alternate to attend and participate in RAC meetings in his/her absence.
14. Recues his/her self from discussion and voting if he/she has a personal interest or stake in the outcome.

In relation to criterion 3 listed above, RAC members are grouped into seven caucuses, each of which has specific seats that are outlined in **Attachment A**.

The RAC has a formal charter (see www.sdirwmp.org) which contains a robust set of rules and guiding principles established for the RAC. Please review the RAC Charter before submitting your application to ensure that you are able and willing to serve on the RAC and follow the guidelines and rules established in the RAC Charter.

If you have any questions about the San Diego IRWM Program or the RAC, please contact the San Diego IRWM Program Manager Mark Stadler (mstadler@sdcwa.org, (858) 522-6735).

San Diego Integrated Regional Water Management (IRWM) Program
Regional Advisory Committee (RAC) Membership Application

Please return this form to Mark Stadler (mstadler@sdcwa.org) by December 31, 2012. Selected RAC members will be notified by January 18, 2013; their first RAC meeting will be February 6, 2013.

Name: ____

Organization: ____

Email: ______________________________________ Phone Number:________________________

Please indicate which specific seat within the RAC you are applying for (refer to Attachment A for detailed descriptions).

1st Choice:____
Caucus Seat

2nd Choice:____
Caucus Seat

Please indicate if you meet the eligibility criteria:

☐ Represents an agency, non-profit organization, tribe, or academia.

Describe your knowledge and experience related to water management, including participation in the IRWM Program or other water resource policy, planning, outreach, or implementation efforts:

____

____

____

____

Describe how your experience and knowledge allows you to:

1. **Have the ability and desire to objectively articulate the perspective of your RAC seat and caucus at a level beyond that within your individual organization.**
2. **Provide recommendations with the best interests of the entire San Diego IRWM region in mind.**

____

____

____

____

Describe how your position within your organization allows you to:

1. **Act as a point of contact within your individual organization for collection and dissemination of information related to the IRWM Program.**
2. **Disseminate information about the IRWM Program to your contacts, as appropriate.**

____

____

____

____

Attachment C: RAC Attendance Policy

San Diego Integrated Regional Water Management (IRWM) Program
Regional Advisory Committee (RAC) Attendance Policy

Thank you for your commitment to being an active member of the San Diego IRWM RAC. Having an involved and dedicated RAC is vital to San Diego's successful ongoing IRWM planning efforts. Our meetings are held bi-monthly and are posted for the entire calendar year at www.sdirwmp.org.

To that end, the RAC has established an attendance policy that allows no more than two absences in a 12-month period. The RAC recognizes that you may occasionally be unavailable due to schedule conflicts, sickness, or other emergencies. In such case, an alternate may attend in your place to ensure that the RAC benefits from the water resources perspective you represent. Please document your alternate below.

If neither you nor your alternate can attend, absences should be communicated to the San Diego IRWM Program Manager Mark Stadler (mstadler@sdcwa.org, (858) 522-6735). When your absence is foreseeable, please provide as much notice as possible. When you are absent from RAC meetings, your participation is truly missed.

Excessive absences may lead the RAC to request your resignation. If you fail to respond, the RAC will consider that you have voluntarily resigned your position. We appreciate your support, understanding, and acknowledgement of your time commitment to the RAC by your signature below.

I acknowledged and agree by my signature below to abide by this policy to the fullest extent practicable.

RAC Member

Print Name ____

Signature ________________________________ **Date**____________

RAC Alternate

Print Name ____

Attachment D: Workgroup Decision Process

SAN DIEGO
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Water Management

Decision Process for RAC Workgroups

Ground Rules

1. All perspectives are valued: everyone has an opportunity to participate.
2. Focus on new input.
3. Listen as an ally: focus on quality of listening.
4. Be concise.
5. Have fun.

Levels of Consensus

Consensus is achieved if all participants indicate that they are at Levels 1 through 4 (not Levels 5 or 6). The Levels of Consensus are:

1. I can say an **unqualified 'yes'** to the decision. I am satisfied that the decision is an expression of wisdom of the group.
2. I find the decision **perfectly acceptable**. It is the best of the real options we have available to us.
3. I can **live with** the decision. However, I'm not especially enthusiastic about it.
4. I do not fully agree with the decision and need to register my view about it. However, I do not choose to block the decision and will **stand aside**. I am willing to support the decision because I trust the wisdom of the group.
5. I do not agree with the decision and feel the need to **block** the decision being accepted as consensus.
6. I feel that we have no clear sense of unity in the group. We need to **do more work** before consensus can be achieved.

Considerations for Voting Rules

- Workgroups should strive to achieve consensus, which is defined as all Workgroup members voting at Consensus Levels 1 through 4.
- If Workgroup members are not in consensus (one or more members vote at Consensus Level 5 or 6), the Workgroup should continue discussion in an attempt to reach consensus.
- The Workgroup Chair will be responsible for deciding when the group is at an impasse, and is responsible for calling a vote at that point.
- For approving all non-financial matters, if a vote is necessary due to the lack of consensus, a simple majority vote will be sufficient.
- For approving all financial matters (e.g. submission of projects for a grant application), a super majority (2/3 vote) of the Workgroup will be required.

Chair and Vice Chair Selection Process

1. Determine who is eligible: RAC members and alternates, preferably not RWMG members.
2. Provide overview of preferred Chair/Vice Chair attributes:
   - Chair: prior experience in chair role
   - Vice Chair: attributes and ability to assume Chair role and responsibilities, but not as much experience as the Chair
   - Chair and Vice-chair should come from different functional (e.g. water quality, water supply, environmental) areas
   - Willing and able to serve
   - Ability to even-handedly articulate all interests
   - Consensus-builder
3. Outline responsibilities (see below).
4. Nominate and/or volunteer members to be the Chair and Vice Chair.
5. Reach consensus and/or vote.

Responsibilities of Workgroup Chair and Vice-Chair

General

- Oversight of Workgroup meetings and planning topics.
- Vice-Chair will be responsible in the absence of Chair and/or at the discretion of Chair.

Responsibilities Applicable to Workgroup Meetings

- Coordinate with the RWMG or Consultant on elements of the agenda prior to Workgroup meetings to understand overall goals, outcomes, and purpose.
- Convene meetings and initiate introductions.
- Review and provide feedback on draft notes from meetings.
- Identify when the Workgroup has reached an impasse and needs to move forward with formal voting to resolve an issue.
- Summarize key decisions and action items at the end of each Workgroup meeting.
- Close meetings.

Responsibilities Applicable to RAC Meetings

- Report back to the RAC on Workgroup progress at bi-monthly meetings.
- Coordinate with RWMG or Consultant on presentation materials for RAC meetings.
- Coordinate with Workgroup members from various Functional Areas to ensure that all perspectives are incorporated into presentations.

Responsibilities of Workgroup Members

1. Attend meetings consistently.
2. Come prepared (review materials ahead of time).
3. Be responsive to requests between meetings.
4. Follow the Ground Rules.
5. Represent RAC members within your caucus and keep them informed.

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Integrated Regional
Water Management

Appendix 6-C:
Summary of IRWM Program Stakeholder Outreach Activities




Appendix 6-C: Summary of IRWM Plan Stakeholder Outreach Activities

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
County of San Diego	4/4/06 (45 min)	Association of Environmental Professionals	100	Overview of IRWM Plan, status, funding opportunities, and project solicitation; presentation	
Water Authority	7/18/06	Water Authority Member Agency Technical Advisory Committee	25	Overview IRWM Plan; presentation	San Diego County Water Authority
County	7/20/06 (20 min)	San Diego County NPDES/MS4 Storm Water Copermittees	46	Overview of IRWM planning, schedule, and solicitation for input into IRWM Plan; presentation	
Water Authority	8/1/06	Water Authority Member Agency Technical Advisory Committee	25	Proposition 50, Chap. 8 IRWM Guidelines; presentation by DWR	San Diego County Water Authority
All RWMG Agencies	8/28/06 (2 hours)	Public/Stakeholder Workshop	76	Introduction to IRWM Plan & Development of Plan vision, goals, and objectives; presentation, workshop	Encinitas Community and Senior Center
All RWMG Agencies	8/29/06 (2 hours)	Public/Stakeholder Workshop	76	Introduction to IRWM Plan & Development of Plan vision, goals, and objectives; presentation, workshop	Sweetwater Authority, Richard A. Reynolds Groundwater Desalination Plant
All RWMG Agencies	8/30/06 (2 hours)	Public/Stakeholder Workshop	76	Introduction to IRWM Plan & Development of IRWM Plan vision, goals, and objectives; presentation, workshop	San Diego County Water Authority
County of San Diego	9/06 (15 min)	San Luis Rey and Carlsbad Watershed Urban Runoff Management Groups	20	Overview of IRWM Plan, stats, funding opportunities, and project solicitation; update	City of Encinitas
City of San Diego	9/19/06 (15 min)	City SD Park & Recreation, Open Space Division	1	Overview of IRWM Plan, status; meeting	Park & Recreation Department at World Trade Center Building
County of San Diego	9/25/06 (30 min)	San Luis Rey Watershed Council members and stakeholders	15	Overview of IRWM Plan, stats, funding opportunities, and project solicitation; presentation	Fallbrook Public Utility District
County of San Diego	9/27/06 (45 min)	County Watershed Protection Program Staff	40	Overview of IRWM planning process, status, and funding opportunities; presentation	County Operations Center, Topaz Building
Water Authority	10/06 (15 min)	SANDAG: Technical Planning Committee	25	Overview of IRWM Plan, status; meeting	SANDAG
County of San Diego	10/3/06	Tribal Nations of San Diego	37	Request for Participation in IRWM planning process; letter	NA

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
County of San Diego	10/10/06 (15 min)	Carlsbad Watershed Network	15	Overview of IRWM Plan, stats, funding opportunities, and project solicitation; presentation	Agua Hedionda Lagoon Center
County of San Diego	10/11/06 (15 min)	Regional workshop on Proposition 84 (The Nature Conservancy)	39	Overview of IRWM Plan, status, funding opportunities; presentation	County Administration Center
All RWMG Agencies	10/12/06 (15 min)	Metropolitan Water District	3	Overview of IRWM Plan, stats, funding opportunities; presentation	San Diego County Water Authority
County of San Diego	10/13/06 (15 min)	County of San Diego Board of Supervisors Staff Aides (except District 5)	10	Overview of IRWM Plan, status, and funding opportunities; presentation	County Administration Center
County of San Diego	10/16/06 (15 min)	County GP2020 Staff	20	Overview of IRWM planning process, status, and funding opportunities; presentation	County Operations Center Annex
City of San Diego	10/19/06 (15 min)	City of San Diego Metropolitan Wastewater Dept. / Stormwater Pollution Prevention Division and Engineering and Program Management Division	2	Overview of IRWM Plan, status; update	Metropolitan Wastewater Dept. Operations Center, aka “MOC II”
County of San Diego	10/23/06 (15 min)	Wetlands Recovery Project members and stakeholders	15	Overview of IRWM Plan, stats, funding opportunities, and project solicitation; presentation	County Administrative Center
County of San Diego	10/30/06 (30 min)	University of California Cooperative Extension	2	Meeting	County Operations Center, Building 4
County of San Diego	11/06	San Diego County MSCP Stakeholders	310	email	NA
City of San Diego	11/2/06 (15 min)	Regional Chamber of Commerce	40	Overview of IRWM Plan, status; meeting	Regional Chamber of Commerce
Water Authority	11/07/06	Water Authority Member Agency Technical Advisory Committee	25	Formation of RAC, alternatives for future institutional structure; presentation	San Diego County Water Authority
City of San Diego	11/9/06 (20 min)	City of San Diego Metropolitan Wastewater Department/ Technical Advisory Committee (TAC)		Overview of IRWM Plan, status; presentation	Metropolitan Wastewater Dept. Operations Center
County of San Diego	11/16/06 (10 min)	Stormwater Copermittee Management Committee members and stakeholders	50	Update on IRWM Plan process, project solicitation; verbal update	Carlsbad Safety Center, 2560 Orion Way, Carlsbad CA 92010
County of San Diego	11/17/06	Borrego Water District	1	Explanation of the Region as defined in the IRWM Plan; letter	NA

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
County of San Diego	11/21/06 (45 min)	Southern California Wetlands Recovery Project and Coast Keeper representatives	2	Update on IRWM Plan, identify linkages, project solicitation; meeting	County Operations Center, Topaz Building
County of San Diego	12/8/06	IRWM Plan Status Update Newsletter, Issue 1	837	Update on IRWM Plan status, legislation, funding opportunities, upcoming meeting schedule, and references; newsletter	NA
All RWMG Agencies	12/11/06 (2.5 hrs)	RAC Meeting #1	35	IRWM Plan Background, Mission	San Diego County Water Authority
All RWMG Agencies	12/18/06 (2.5 hrs)	RAC Meeting #2	38	RAC Meeting #1 Debrief, Mission Statement IRWM Long-Term Planning Effort, Potential Long-Term Institutional Structure	San Diego County Water Authority
All RWMG Agencies	1/10/07 (2.5 hrs)	RAC Meeting #3	42	Preparation of Draft IRWM Plan, Regional Priorities & Process for Project Prioritization	San Diego County Water Authority
County of San Diego	1/16/07 (45 min)	Campo Planning Group	25	Overview of IRWM Plan, stats, funding opportunities, and project solicitation; presentation	Campo Community Church
Water Authority	2/13/07	Water Authority Member Agency General Managers' meeting	30	Update on IRWM Plan and Prop. 50, Chapter 8 funding; presentation	San Diego County Water Authority
County of San Diego	2/26/07	IRWM Plan Status Update Newsletter, Issue 2	837	Update on IRWM Plan status, legislation, funding opportunities, upcoming meeting schedule, and references; newsletter	NA
All RWMG Agencies	2/27/07 (2.5 hrs)	RAC Meeting #4	31	Update On IRWM Planning and Funding in CA, Discussion on Measurable Targets for Achieving San Diego IRWM Plan Objectives.	San Diego County Water Authority
All RWMG Agencies	3/12/07 (3 hours)	RWMG, RAC, Stakeholders and Public	40	DWR Funding Area, Solicitation for input; presentation and workshop	San Diego County Water Authority
All RWMG Agencies	3/19/07 (2.5 hrs)	RAC Meeting #5	42	Proposed Approach on Integration and Prioritization, Summary of IRWM Objectives Ranking	San Diego County Water Authority

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	4/23/07 (2.5 hrs)	RAC Meeting #6	43	Update on Propositions 50 & 84, Comments on Administrative Draft IRWMP, Review of IRWM Plan Prioritization, Request for Additional Information on Project Proposals, Approach to Funding Application Prioritization	San Diego County Water Authority
All RWMG Agencies	4/25/07	Public Workshop – General Public, Project Proponents	45	IRWM Project Application Workshop: Instructions for Completing, Explanation for How Data Will be Used and Compiled in Plan; public workshop	Scripps Ranch Library
All RWMG Agencies	5/16/07 (2.5 hrs)	RAC Meeting #7	42	Revised Plan Prioritization Process, Approach to Funding Application Prioritization	San Diego County Water Authority
County	5/17/07 (10 min)	San Diego County NPDES/MS4 Storm Water Copermittees	41	Overview of the Public Draft IRWM Plan and projects and solicitation for input; presentation	
All RWMG Agencies	6/12/07 (2.5 hrs)	RAC Meeting #8	40	Public Draft 2007 IRWM Plan, Overview of Public Draft IRWM Short – and Long-Term Implementation Priorities	San Diego County Water Authority
All RWMG Agencies	6/29/07	Public Workshop – General Public, Project Proponents		IRWM Plan Prioritization Process, Approach to Funding Application Process	San Diego Zoo
All RWMG Agencies	7/10/07 (2.5 hrs)	RAC Meeting #9	35	Public Outreach Plan, RAC Workgroup, Step 1 Application	San Diego County Water Authority
All RWMG Agencies	8/1/07 (2.5 hrs)	RAC Meeting #10	30	Step 1 Application, RAC Workgroup	San Diego County Water Authority
All RWMG Agencies	8/14/07	Public Workshop – General Public, Project Proponents		IRWM, Proposition 50 and Proposition 84 Update	San Diego County Water Authority
All RWMG Agencies	9/5/07 (2.5 hrs)	RAC Meeting #11	28	Proposed Modifications to Draft IRWM Plan, Measurable Targets	San Diego County Water Authority
All RWMG Agencies	9/19/07 (2.5 hrs)	RAC Meeting #12	34	Finalize Measurable Targets, Consider Recommendation that RWMG Governing Bodies Adopt the IRWM Plan, Workgroup Update and Proposed Funding Package	San Diego County Water Authority
County	9/20/07 (10 min)	San Diego County NPDES/MS4 Storm Water Copermittees	38	Update on IRWM Plan and projects selected for Prop 50 application; presentation	

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	10/9/07 (2.5 hrs)	RAC Meeting #13	31	Institutional Structure, RAC Workgroup Update, Other Updates	San Diego County Water Authority
County	11/29/07 (5 min)	San Diego County NPDES/MS4 Storm Water Copermittees	39	Update on IRWM Plan and status of Prop 50 application; presentation	
All RWMG Agencies	12/11/07 (2.5 hrs)	RAC Meeting #14	25	RAC Workgroup Report, IRWM Funding Program Update, Implications for IRWM Planning, Revision in the Proposition 50 Application Package	San Diego County Water Authority
All RWMG Agencies	1/8/08 (2.5 hrs)	RAC Meeting #15	30	Workgroup Recommendations: Prop 50 Proposal Modifications, Other Updates	San Diego County Water Authority
All RWMG Agencies	2/4/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	4/14/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	5/12/08 (2.5 hrs)	RAC Meeting #16		Recap of May 8th Public Workshop, Lobbying Approach, Approach to Modifying Project List, Prop 84 Update	San Diego County Water Authority
All RWMG Agencies	6/9/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	6/11/08 (2.5 hrs)	RAC Meeting #17		San Diego Region Water Supply Update, Final Prop 50 IRWM Grant List, Prop 84 Funding Area Discussions	San Diego County Water Authority
All RWMG Agencies	7/14/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	6/25/08 (30 min)	San Diego Regional Water Quality Control Board	50	IRWM Program Overview, Prop 50 project package, and Prop 84 funding opportunities	San Diego Regional Water Quality Control Board
All RWMG Agencies	8/18/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	8/25/08 (2.5 hrs)	RAC Meeting #18	47	Updates on IRWM Program and La Jolla Shores Integrated Coastal Management Plan, Watershed Panel	San Diego County Water Authority
All RWMG Agencies	9/22/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	10/20/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	12/8/08	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	12/10/08 (2.5 hrs)	RAC Meeting #19	41	San Diego IRWM Updates, Planning Region Recommendation, Basin Plan Triennial Review	San Diego County Water Authority
All RWMG Agencies	1/13/09	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	1/26/09	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	2/9/09	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	2/11/09 (2.5 hrs)	RAC Meeting #20	26	San Diego IRWM Updates, Water Supply for Agricultural Resources	San Diego County Water Authority
County & Water Authority	2/13/09 (2 hrs)	San Diego CoastKeeper	3	Outreach to DACs	San Diego County Water Authority
All RWMG Agencies	3/16/09	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
Water Authority	3/30/09 (1.5 hrs)	Rural County Assistance Corporation	2	Outreach to DACs, particularly small rural water systems	San Diego County Water Authority
County & Water Authority	4/1/09 (1.5 hrs)	California Rural Water Association	4	Outreach to DACs, particularly small rural water systems	San Diego County Water Authority
County of San Diego	4/9/09 (15 min)	Chollas Creek Project Implementation Stakeholder Group	9	Updates on IRWM Program and Prop 84 Funding Opportunities; presentation	Jacobs Center, San Diego

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	4/13/09	Tri-County FACC	~10	Discussion and Coordination on Issues of Common Interest to Tri-County FACC Members	Rancho California Water District
All RWMG Agencies	4/15/09 (2.5 hrs)	RAC Meeting #21		San Diego IRWM Updates, RAP Application, SWRCB Draft Policy on Recycled Water	San Diego County Water Authority
County of San Diego	4/24/09 (15 min)	San Diego River Watershed Forum	80	Update on San Diego IRWM Program	City of San Diego Water Dept., Kiowa Drive
SDCWA	5/12/10 (2 hrs)	Cuyamaca College – Conservation Coordinator Certification Class	20	General IRWM Program Overview	Cuyamaca College
County of San Diego	5/18/10 (15 min)	Southern California Tribal Chairman's Association	20	Introduction to San Diego IRWM Program and Call for Projects	Concina Del Charro, City of Escondido
All RWMG Agencies	6/2/10	Outreach to Disadvantaged Community Representatives	11	Introduction to San Diego IRWM Program; Prop 84 Implementation Grant Project Solicitation	San Diego County Water Authority
All RWMG Agencies	6/3/10	Outreach to Tribal Representatives	16	Introduction to San Diego IRWM Program; Prop 84 Implementation Grant Project Solicitation	Viejas Tribal Offices, Alpine, CA
County of San Diego	6/10/10 (40 min)	San Diego River WURMP Workgroup	8	Prop 84 Implementation Grant Project Solicitation	County of San Diego, 5201 Ruffin Rd., 92123
All RWMG Agencies	6/14/10 (2 hrs)	Project Workshop – Prop 84/1E-Round 1 Workshop		IRWM Planning, How to Submit Projects, Explanation of Project Scoring, Prop 84 Requirements	City of Encinitas, City Hall, 505 S. Vulcan Avenue, Encinitas, CA 92024
All RWMG Agencies	6/15/10 (2 hrs)	Project Workshop – Prop 84/1E-Round 1 Workshop		IRWM Planning, How to Submit Projects, Explanation of Project Scoring, Prop 84 Requirements	City of Chula Vista, Public Works Center, 1800 Maxwell Road, Chula Vista, CA 91911
County of San Diego	6/17/10 (10 min)	San Diego Copermittee Regional Management Committee	35	Prop 84 Implementation Grant Project Solicitation	City of Santee City Hall, 10601 Magnolia Avenue, Santee, CA 92071
County of San Diego	6/18/10 (10 min)	San Diego County Board Aide Briefing	10	Prop 84 Implementation Grant Project Solicitation	County Administration Building, 1600 Pacific Hwy, 92101
County of San Diego	6/24/10 (40 min)	San Diego Bay WURMP Workgroup	15	Prop 84 Implementation Grant Project Solicitation	Port of San Diego, 3165 Pacific Hwy, 92101
SDCWA	6/29/10 (1 hr)	SDCWA Staff	10	Prop 84 Implementation Grant Project Solicitation	San Diego County Water Authority

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
SDCWA	6/30/10 (2 hrs)	Cuyamaca College – Conservation Coordinator Certification Class	11	General IRWM Program Overview	Cuyamaca College
County of San Diego	7/8/10 (45 min)	Peñasquitos and San Dieguito WURMP Workgroup	7	Prop 84 Implementation Grant Project Solicitation	Del Mar City Hall, 1050 Camino Del Mar, Del Mar CA, 92014
SDCWA	11/3/10 (75 min)	Cuyamaca College – Water Conservation Certification Class	20	General IRWM Program Overview	Cuyamaca College
City of San Diego	6/2/11 (20 mins)	San Diego Regional Chamber of Commerce, Energy & Water Committee	50	General IRWM Program Overview	Chamber of Commerce 402 West Broadway, 10th floor, San Diego
All RWMG Agencies	6/7/11	Tri-County FACC	8	Implementation Grant Awards, Santa Margarita Nutrient Management Project, Salinity/Nutrient Management Planning, IRWM Plan Updates	County of Orange, 2301 N. Glassell Street, Orange, CA 92865
All RWMG Agencies	7/7/11	Tri-County FACC Overlay Committee	15	Santa Margarita Nutrient Management Project, Salinity/Nutrient Management Planning, Coordination Needs	San Diego County Water Authority, 610 West 5th, Escondido, CA
All RWMG Agencies	8/3/11 (2.5 hrs)	RAC Meeting #33	50	San Diego IRWM Updates, IRWM Report Card, Stormwater Permitting Panel, City of San Diego Climate Change Adaptation Plan	San Diego County Water Authority
All RWMG Agencies	10/3/11 (2.5 hrs)	RAC Meeting #34	32	San Diego IRWM Updates, Los Penasquitos Watershed Planning Panel, Chollas Creek Runoff Reduction and Groundwater Recharge Project	San Diego County Water Authority
All RWMG Agencies	11/9/11	Tri-County FACC	10	Santa Margarita Nutrient Management Project, Salinity/Nutrient Management Planning, IRWM Plan Updates, USM Planning Grant-Round 2	San Diego County Water Authority, 610 West 5th, Escondido, CA
All RWMG Agencies	11/30/11 (2.5 hrs)	RAC Meeting #35		Grant Administration, IRWM Plan Update Kickoff, Suggestions for DWR Process Improvement Workshops	San Diego County Water Authority
All RWMG Agencies	1/27/12 (2 hrs)	Governance and Financing Workgroup Meeting #1	14	IRWM Overview, Decision Process, RAC Membership Guidelines	San Diego County Water Authority

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	1/31/12 (2 hrs)	Regulatory Workgroup Meeting #1	19	IRWM Overview, Workgroup Organization, Report Objectives, Issues of Interest, Report Outline	San Diego County Water Authority
All RWMG Agencies	2/2/12 (2 hrs)	Priorities and Metrics Workgroup Meeting #1	17	Workgroup Organization, IRWM Vision and Mission, Water Resource Conflicts and Challenges	San Diego County Water Authority
All RWMG Agencies	2/29/12	IRWM Summit	84	Keynote, Local and State Perspectives, Water Resources Management in the San Diego Region	Malcolm X Library Community Room, 5148 Market Street, 92114
All RWMG Agencies	3/23/12 (2 hrs)	Priorities and Metrics Workgroup Meeting #2	15	IRWM Summit Outcomes, IRWM Objectives, Prioritizing Objectives	County of San Diego Operations Center
All RWMG Agencies	4/4/12 (2.5 hrs)	RAC Meeting #36		Grant Administration, IRWM Plan Update, Overview of IRWM Summit	San Diego County Water Authority
All RWMG Agencies	4/5/12 (2 hrs)	Governance and Financing Workgroup Meeting #2	10	RAC Membership Guidelines, Funding/Financing Options	San Diego County Water Authority
All RWMG Agencies	4/18/12 (2 hrs)	Regulatory Workgroup Meeting #2	20	IRWM/RWQCB Collaboration Opportunities	City of Oceanside San Luis Rey Water Reclamation Plant
All RWMG Agencies	5/2/12 (3 hrs)	Land Use Planning Workshop #1	40	IRWM Overview, General Plans, Survey Results, Strengths and Challenges, Overcoming Challenges	SDG&E Energy Innovation Center, 4760 Clairemont Mesa Blvd., 92114
All RWMG Agencies	5/16/12 (2 hrs)	Priorities and Metrics Workgroup Meeting #3	14	IRWM Objectives, Metrics and Targets, Project Integration	San Diego County Water Authority
All RWMG Agencies	5/29/12 (2 hrs)	Regulatory Workgroup Meeting #3	18	Prioritization of Issues, Approach for Developing Action Plan	San Diego County Water Authority
All RWMG Agencies	5/30/12 (2.5 hrs)	RAC Meeting #37	41	DWR Update, Grant Administration, IRWM Plan Update, San Diego Region Updates	San Diego County Water Authority
All RWMG Agencies	6/19/12 (2 hrs)	Governance and Financing Workgroup Meeting #3	9	Draft RAC Charter, Funding/Financing Options	San Diego County Water Authority
All RWMG Agencies	6/26/12 (2 hrs)	Integrated Flood Management Workshop #1		IRWM Overview, Definition of Integrated Flood Management	
All RWMG Agencies	6/28/12 (2 hrs)	Climate Change Workgroup Meeting #1	12	IRWM Overview, Workgroup Organization, Climate Change Information, Discuss and Prioritize Vulnerabilities	County of San Diego Operations Center
All RWMG Agencies	7/18/12 (2 hrs)	Priorities and Metrics Workgroup Meeting #4	12	Project Integration, IRWM Objectives, Metrics and Targets	San Diego County Water Authority

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	7/24/12 (2 hrs)	Regulatory Workgroup Meeting #4	17	Review Prioritization, Potential Collaborative Strategies, Workgroup Report	San Diego County Water Authority
All RWMG Agencies	7/26/12 (2 hrs)	Climate Change Workgroup Meeting #2	10	Vulnerability Prioritization Results, Discuss and Prioritize Adaptation Strategies	San Diego County Water Authority
All RWMG Agencies	8/1/12 (3 hrs)	RAC Meeting #38/Public Workshop	43	DWR Update, Grant Administration, Prop 84-Round 2 Implementation Grant Opportunity, IRWM Plan Update, City of San Diego Recycled Water Study	San Diego County Water Authority
All RWMG Agencies	8/13/12 (2 hrs)	Targeted Outreach Meeting to North County Tribes	13	IRWM Overview, Tribal Characterization in Plan, Grant Opportunities, Tribal Water Stories	Pala Administration Bldg, 35008 Pala Temecula Road, 92059
All RWMG Agencies	8/20/12 (2 hrs)	Targeted Outreach Meeting to South County Tribes	15	IRWM Overview, Tribal Characterization in Plan, Grant Opportunities, Tribal Water Stories	Viejas Casino and Outlet Center, 5000 Willows Rd #C, 91901
All RWMG Agencies	8/21/12 (3 hrs)	Land Use Planning Workshop #2	40	Review of Model General Plan Policies, Prioritization of Draft Recommendations	SDG&E Energy Innovation Center, 4760 Clairemont Mesa Blvd., 92114
All RWMG Agencies	8/23/12 (2 hrs)	Climate Change Workgroup Meeting #3	10	Finalize Management Strategies	San Diego County Water Authority
All RWMG Agencies	9/12/12 (3 hours)	Strategic Integration Workshop for Prop 84 Round 2		Prop 84-Round 2 Grant Cycle, Preliminary Integration and Partnership Opportunities	SDG&E Energy Innovation Center, 4760 Clairemont Mesa Blvd., 92114
All RWMG Agencies	9/18/12 (2 hrs)	Targeted Outreach Meeting to Rural DACs	12	IRWM Overview, Water Supply and Water Quality Needs of DACs, Grant Opportunities	Indian Health Services, 1320 West Valley Parkway #309, 92029
All RWMG Agencies	9/20/12 (1.5 hrs)	Targeted Outreach Meeting to Urban DACs	12	IRWM Overview, Water Supply and Water Quality Needs of DACs, Grant Opportunities	Malcolm X Library Community Room, 5148 Market Street, 92114
All RWMG Agencies	9/21/12 (1.5 hrs)	Watershed Workshop – Los Penasquitos and San Diego River Watersheds	52	Watershed Characterization, Water Management Issues in Watersheds, IRWM Priorities for Watersheds	Mission Valley Library. 2123 Fenton Parkway, 92108
All RWMG Agencies	9/25/12 (1.5 hrs)	Watershed Workshop – San Juan, Santa Margarita, and San Luis Rey Watersheds	22	Watershed Characterization, Water Management Issues in Watersheds, IRWM Priorities for Watersheds	City of Escondido, Mitchell Room, 201 N. Broadway, Escondido, CA 92025

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	9/25/12 (1.5 hrs)	Watershed Workshop – Carlsbad and San Dieguito Watersheds	26	Watershed Characterization, Water Management Issues in Watersheds, IRWM Priorities for Watersheds	City of Escondido, Mitchell Room, 201 N. Broadway, Escondido, CA 92025
All RWMG Agencies	9/27/12 (1.5 hrs)	Watershed Workshop – Pueblo, Sweetwater, Otay, and Tijuana Watersheds	40	Watershed Characterization, Water Management Issues in Watersheds, IRWM Priorities for Watersheds	City of Chula Vista, Public Works Center, 1800 Maxwell Road, Chula Vista, CA 91911
All RWMG Agencies	10/3/12 (3 hrs)	RAC Meeting #39/Public Workshop	36	DWR Update, Grant Administration, Prop 84-Round 2 Implementation Grant Opportunity, IRWM Plan Update, Proposal for RAC Reorganization	San Diego County Water Authority
All RWMG Agencies	12/3/12 (2 hrs)	Regulatory Workgroup Meeting #5		Review Draft Workgroup Report	San Diego County Water Authority
All RWMG Agencies	12/4/12 (2 hrs)	Integrated Flood Management Workshop #1		Integrated Flood Management Strategies	
All RWMG Agencies	12/5/12 (3 hrs)	RAC Meeting #40/Public Workshop	35	DWR Update, Grant Administration, IRWM Plan Update – Goals and Objectives, Prop 84-Round 2 Implementation Grant Opportunity, RAC Reorganization	San Diego County Water Authority
All RWMG Agencies	12/12/12 (2.5 hrs)	Priorities and Metrics Workgroup Meeting #5 & Project Selection Workgroup Debrief	16	Project Review Process	San Diego County Water Authority
All RWMG Agencies	2/6/13 (3 hrs)	RAC Meeting #41/Public Workshop	45	RAC Reorganization, DWR Update, Grant Administration, City of San Diego Recycled Water Study, IRWM Plan Update – Workgroup Reports	San Diego County Water Authority
All RWMG Agencies	4/3/13 (3 hrs)	RAC Meeting #42/Public Workshop	36	DWR Update, Grant Administration, IRWM Plan Update – Project Selection and Implementation	San Diego County Water Authority
All RWMG Agencies	5/1/13 (2 hrs)	Targeted Outreach Meeting to North County Tribes	14	Tribal Nations Chapter in Plan, Tribal Water Stories, Adjacent Tribes	Pala Administration Bldg, 35008 Pala Temecula Road, 92059
All RWMG Agencies	5/4/13 (2 hrs)	Targeted Outreach Meeting to South County Tribes	8	Tribal Nations Chapter in Plan, Tribal Water Stories, Adjacent Tribes	R.M. Levy Water Treatment Plant, 9550 Lake Jennings Park Road, 92040
All RWMG Agencies	6/5/13 (3 hrs)	RAC Meeting #43/Public Workshop	40	Public Draft of IRWM Plan released, Implementation Commitments	San Diego County Water Authority

RWMG Agency(s)	Date (Duration)	Audience	Audience Size	Topic and Method	Location
All RWMG Agencies	7/11/13 (2 hrs)	Watershed Workshop San Juan, Santa Margarita, San Luis Rey	23	Watershed Chapter in Plan, DAC characterization in Plan	Oceanside Civic Center 330 North Coast Highway, 92054
All RWMG Agencies	7/12/13 (2 hrs)	Watershed Workshop Pueblo, Sweetwater, Otay, Tijuana	18	Watershed Chapter in Plan, DAC characterization in Plan	Chula Vista Civic Center Branch Library 365 F Street, 92154
All RWMG Agencies	7/17/13 (2 hrs)	Watershed Workshop Carlsbad, San Dieguito	27	Watershed Chapter in Plan, DAC characterization in Plan	Vista City Hall 200 Civic Center Drive, 92084
All RWMG Agencies	7/19/13 (1.5 hrs)	Watershed Workshop Peñasquitos, San Diego River	27	Watershed Chapter in Plan, DAC characterization in Plan	Mission Valley Library 2123 Fenton Parkway, 92108
All RWMG Agencies	8/7/13 (3 hrs)	RAC Meeting #44/Public Workshop	46	Response to public comments in Plan, Potable Reuse Project Results	San Diego County Water Authority

SAN DIEGO
Integrated Regional Water Management

Appendix 6-D:
Stakeholder Comments on 2019 Draft IRWM Plan - Phase 1




Comments Received on the Draft 2019 IRWM Plan - Phase 1

Comment Period: August 17 - September 14, 2018

#	Date Received	Commenter	Plan Section	Page Number	Comment	Response
32	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-8	[Regarding Environmental Justice communities] What is this? Not a recognized area or community so would stay with DAC, EDA, etc.	Revised to "communities affected by environmental justice (EJ) issues"
33	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-8	[If EJ is removed per comment above] add "and" between "…(EDA, and underrepresented communities (URC)."	Revised sentence for grammar
45	9/14/2018	Rincon del Diablo	Table 1-2	1-18	[4. Stakeholder Involvement] Delete references to EJs	No change.
75	9/14/2018	Rincon del Diablo	3.3.3 Underrepresented and Environmental Justice Communities	3-13	Recommend deleting "Environmental Justice Communities"	Revised introduction language for EJs to explain it means "communities experiencing EJ issues" and that EJs are a subset of URCs. Added a call-out box explianing the differences between DACs, EDAs, URCs, and EJs. Call out box explains how these communities are mapped or not. Revised language associated with mapping EJs (Section 3.3.3) to reflect the EJScreen and CalEnvrioScreen tools shows communities that experience EJ issues.
76	9/14/2018	Rincon del Diablo	3.3.3 Underrepresented and Environmental Justice Communities	3-13	U.S. EPA Environmental Justice definition is] too nebulous and it really applies to all	See response to comment 75
77	9/14/2018	Rincon del Diablo	3.3.3 Underrepresented and Environmental Justice Communities	3-13	[first paragraph, about EJ] This is getting too much into social engineering issues and beyond IRWM. Too much.	See response to comment 75
79	9/14/2018	Rincon del Diablo	3.3.4 DAC, EDA, and URC Considerations	3-15	Delete references to EJ as part of URCs	See response to comment 75
80	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-20	Technically we're all EJs, as it all impacts us/everyone in San Diego.	See response to comment 75
81	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-21	Remove reference to EJs.	See response to comment 75
86	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-22	[Third paragraph] remove references to EJ	See response to comment 75
90	9/14/2018	Rincon del Diablo	Community Support for DACs, EDAs, URCs, and EJs	3-26	Remove reference to EJs.	See response to comment 75
100	9/14/2018	Rincon del Diablo	Table 3-20	3-45	[Southern Regional treatment facility] is a part of SRTTP recycled water discharge is in San Luis Rey Watershed actually - most of it.	R9-2009-0021 indicates permitted use locations to be in Santa Margarita Watershed and San Luis Rey Watershed. Moved this to San Luis Rey Watershed
140	9/14/2018	Rincon del Diablo	Carlsbad Watershed - Internal Boundaries and Land Uses	5-32	Did [population growth from 500,000 to 700,000 people by 2015] happen?	No change. Based on the ACS estimates for Cities of Carlsbad, Escondido, Vista, San Marcos, Encinitas and one-third the population of Oceanside, the population is around 600,000, but in reality may be higher. Population estimates not available in WQIP; Project Cleanwater says 565,000 people based on 2010 Census data.
146	9/14/2018	Rincon del Diablo	6.1 Overview	6-1	Remove reference to EJs.	See response to comment 75
152	9/14/2018	Rincon del Diablo	6.3.1 Regional Water Management Group - photo	6-7	Replaced with an updated photo of the RWMG members.	Done.
156	9/14/2018	Rincon del Diablo	6.4.1 Environmental Justice and Disadvantaged Communities	6-24	[Environmental Justice] is everyone. No matter who or where, so let's not go overboard. DAC/EDA/URC is focus.	See response to comment 75
157	9/14/2018	Rincon del Diablo	6.4.1 Environmental Justice and Disadvantaged Communities	6-24	[this page] is a repeat of other chapters	This section is intended to summarize what is described in more detail in Chapter 3. Have shortened to remove detailed definitions of DACs that repeated Chapter 3.
158	9/14/2018	Rincon del Diablo	6.4.1 Environmental Justice and Disadvantaged Communities	6-25	Remove reference to EJs.	See response to comment 75
160	9/14/2018	Rincon del Diablo	6.4.1 Environmental Justice and Disadvantaged Communities - Directed Outreach Programs for DACs and EJ Communities	6-25	[First paragraph, regarding comments disproportionally impacted…due to race, culture, or income] Dangerous! Rules, rates, laws set at various levels and Prop 218/26 require certain things to be done. We all face the same thing.	See response to comment 75
164	9/14/2018	Rincon del Diablo	6.4.1 Native American Tribes	6-30	There has also been 2 recent bills passed to related to tribe and water from natural agencies. That's a positive. SDCWA also had issues with tribes, so it's a 2-way street.	Will revise to reframe focusing on progress made, and acknowledge past issues while focusing on positive changes since then. Will consider 1944 and the Sycuan/SDCWA/Padre Dam agreement from last year and see if we can fold those in.
196	9/14/2018	Rincon del Diablo	10.2.1 Data Needs - Invest in DAC-EDA-URC-EJ Water Systems	10-3	Remove references to EJs	See response to comment 75
197	9/14/2018	Rincon del Diablo	10.2.1 Data Needs - Invest in DAC-EDA-URC-EJ Water Systems	10-3	EJ communities are not real things - DAC, EDA, and URC are - EJ is a concept.	See response to comment 75

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206	9/14/2018	Rincon del Diablo	11.3.1 Potential Benefits and Impacts - Benefits and Impacts to DACs, EDAs, URCs, EJs, and Native American Tribal Communities	11-15	Remove references to EJs. There is no such thing as an EJ community.	See response to comment 75
207	9/14/2018	Rincon del Diablo	11.3.1 Potential Benefits and Impacts - Benefits and Impacts to DACs, EDAs, URCs, EJs, and Native American Tribal Communities	11-16	Remove references to EJs.	See response to comment 75
208	9/14/2018	Rincon del Diablo	Table 11-3 Summary of Potential Impacts and Benefits	11-17	[Objective B] remove references to EJs	See response to comment 75
209	9/14/2018	Rincon del Diablo	Table 11-3 Summary of Potential Impacts and Benefits	11-21	[Objective H] Remove references to EJs. This should be DAC/URC or EDA instead.	See response to comment 75
220	9/17/2018	City of Oceanside	1.3.2 City of San Diego	1-13	[think BLUE logo] check that City of SD is still using this... I had thought the copermittees all rallied under the Project Clean Water banner now, but I could be mistaken.	City approved use of Think Blue Logo. No Change.
236	9/17/2018	City of Oceanside	3.3.4 DAC, EDA, and URC Considerations	3-25	editorial comment: throughout this entire section, "DACs, EDAs, and URCs" is used so much to where it eats up space and disconnects the reader's attention from your message. use a singular term, like "disadvantaged areas" if possible to reduce the clutter.	No change.
247	9/17/2018	City of Oceanside	5.3 San Luis Rey Watershed	5-22	[last paragraph] if possible I recommend updating this section (and for each watershed where applicable) with information from the WQIPs as they describe current jurisdictional projects to improve water quality. Should probably also mention applicable TMDLs (bacteria at the pacific ocean shoreline)	Chapter 5 is not being updated comprehensively for the 2019 IRWM Plan. Have added WQIP briefly into San Luis Rey Watershed section
248	9/17/2018	City of Oceanside	5.3 San Luis Rey Watershed	5-23	[fifth paragraph] update here with WQIPs "…which focuses on management activities that can be taken to reduce stormwater runoff and associated water quality…"	Chapter 5 is not being updated comprehensively for the 2019 IRWM Plan. Have added WQIP briefly into San Luis Rey Watershed section
4	9/14/2018	Karin Zirk, Friends of Rose Canyon	N/A	N/A	The absence of integrated planning efforts for Rose Creek is a serious omission as the health of Rose Creek significantly impacts all these projects [related to planning in northeast corner of Mission Bay].	Outreach made to Friends of Rose Canyon for guidance on desired edits. Ultimately no changes made.
5	9/14/2018	Karin Zirk, Friends of Rose Canyon	Appendix 7B, Table 3-5: Examples of Community Watershed Programs	3-18 of App. 7B	…you listed Friends of Rose Creek. We do not focus on Los Penasquitos Creek…The Rose Creek Watershed Alliance, of which we are a member, focuses on the entire Rose Creek Watershed.	Thank you, this has been corrected in the Integrated Flood Management Study.
7	9/14/2018	Rincon del Diablo	Acronyms and Abbreviations	pg. xii	Header and Footer have the wrong dates and say "FINAL" instead of Draft	Corrected.
9	9/14/2018	Rincon del Diablo	1. Introduction	1-1	"one of the most populous areas in the nation" - this should be cited (according to Wikipedia, SD County is the 5th most populous county in the US. SD is the 8th most population City in the US)	ACS estimates for 2017 shows County of San Diego as the 5th most populous County in the U.S. Add citation "American Community Survey. 2017. American Fact Finder - Annual Estimates of the Resident Population: April 1 2010 to July 1, 2017. 2017 Population Estimates."
10	9/14/2018	Rincon del Diablo	1. Introduction	1-1	"The 2019 IRWM Plan Update presents and overarching assessment of the San Diego region's water supply, water quality and ecosystem challenges and provides recommendations for sustainable ~~answers~~ solutions."	Revised.
12	9/14/2018	Rincon del Diablo	1. Introduction	1-2	What about water agencies partnering with other water agencies on regional, beneficial programs that deal with issues across the board? - We need to say more about water agency partnerships	Recommend adding a bullet to the list: "Water agencies have successfully partnered with one another on regional, beneficial programs, supported through IRWM and through their own initiatives. How can agencies and regulators in the region better support and encourage effective partnerships?"
13	9/14/2018	Rincon del Diablo	1. Introduction	1-2	[Second bullet] "New Stormwater runoff regulations align well with water conservation best management practices (BMPs)…"	Revised.
14	9/14/2018	Rincon del Diablo	1. Introduction	1-2	[Fourth bullet] add comma to "…regulators, and others…"	Revised.
15	9/14/2018	Rincon del Diablo	1. Introduction	1-2	[Sixth bullet] How can federal and state/local resources be better combined and maximized?	Recommend adding a bullet to the list: "The Region includes land use and water resource jurisdictions that span federal, state, and local levels. How can federal, state, and local resources be leveraged together to increase benefits to the region's water-related resources?"
16	9/14/2018	Rincon del Diablo	1. Introduction	1-2	[Seventh bullet] add comma to "…regulators, and others…"	Revised.
17	9/14/2018	Rincon del Diablo	1. Introduction	1-2	"These are but a few of the questions that the San Diego region ~~must begin~~ have begun to answer"	Revised.
18	9/14/2018	Rincon del Diablo	1. Introduction	1-2	"This often creates jurisdictional complexity for water management"	Revised.
19	9/14/2018	Rincon del Diablo	1.1 IRWM Planning	1-2	Revise "IRWM planning is ~~a relatively new~~ evolved from a California initiative…"	Revised.
20	9/14/2018	Rincon del Diablo	1.1 IRWM Planning	1-3	"San Diego RWMG published its first IRWM Plan in 2007…"	Revised.
21	9/14/2018	Rincon del Diablo	1.1 IRWM Planning	1-4	Nothing else [to add to the list of Phase 1 Plan updates]?	Include SWRP into the list of updates to the Plan.

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22	9/14/2018	Rincon del Diablo	1.1.1 The "I" in IRWM	1-4	This [the first paragraph of this section] makes it sound that water agencies and others (humans) are destroying the environment by being water purveyors and users.	Revise to "These human influences can change the natural flow of water within the hydrologic cycle, and where the potential for negative impacts to occur is present, must be managed to avoid negative outcomes, while supporting the positive goals of water-resource projects (such as decreasing reliance on imported water, protecting water quality, etc.) ~~ensure that negative impacts don't result~~."
23	9/14/2018	Rincon del Diablo	1.1.1 The "I" in IRWM	1-4	There are many positive impacts from these water resource actions - reduced GHGs, less dependence on imported water, improved groundwater and meeting nutrient loads, etc. [regarding "These human influences change the natural flow of water within the hydrologic cycle and must be managed to ensure that negative impacts don't result."]	See response to comment #22
24	9/14/2018	Rincon del Diablo	1.1.1 The "I" in IRWM	1-4	They [organizations] already do [work together in a mutually supportive manner].	Revised sentence to read "IRWM planning seeks to integrate decision-making by the different water managers so that their management activities can further work together in a mutually supportive manner."
25	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-6	Should we add AB 1668 and SB 606 as new requirements, or mention them?	Agreed. AB 1668 and SB 606 are being incorporated into the Plan where appropriate.
26	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-6	"…(the other two member agencies are not large enough to ~~not~~ meet the threshold for preparing an UWMP)…"	Revised.
27	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-6	Add comma to "These UWMPs provide a summary of water use, wastewater volumes, and recycled water opportunities…"	Revised.
28	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-6	"The San Diego Water Board is responsible for regulating activities that affect the quality of the Region's…"	Revised.
29	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-7	[Second full paragraph, regarding the 10 WMAs] Be nice to reference their watersheds again or refer to a figure	Added a new figure to show watersheds and water management areas
30	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-7	[Last paragraph , regarding the 15 Adaptation Concepts] So is this later addressed? Maybe breakout, since they are important	Added a call-out box of the 15 Adaptation Concepts in the Basin Study
31	9/14/2018	Rincon del Diablo	1.2.4 Existing Planning Environment	1-8	Add comma to list at the top of the page "…environmental justice, and other values in the region."	Revised.
34	9/14/2018	Rincon del Diablo	Table 1-1: Summary of Water Management Responsibilities for Regional Water Management Group	1-9	If its member agencies have it [water supply], shouldn't the SDCWA's boxes be checked…like Yuima and groundwater? Escondido and recycled water? Etc.	Added footnote to Water Authority column that open dots (provides planning support) generally indicates that its member agencies are responsible for these categories as related to the Water Authority's purview (e.g., even though some of the Water Authority's member agencies are responsible for Municipal Stormwater NPDES Management, it's not related to the Water Authority's purview, and is therefore not included for the Water Authority)
36	9/14/2018	Rincon del Diablo	1.3.1 San Diego County Water Authority	1-12	Move the "City of San Diego is the Water Authority's largest member agency in terms of land area, population, and water purchases." to Section 1.3.2 City of San Diego.	Moved per suggestion
38	9/14/2018	Rincon del Diablo	1.3.1 San Diego County Water Authority	1-13	They [SDCWA] are taking credit here [for recycled water use, development of local groundwater supplies] but not in the chart on pg. 1-9 [Table 1-1]	A footnote has been added to Table 1-1 clarifying the Water Authority is supporting these efforts by its member agencies.
39	9/14/2018	Rincon del Diablo	1.3.2 City of San Diego	1-13	[First sentence] "…administers a number of programs that provide opportunities to pursue integrated approaches…" Opportunities for who?	Clarified "opportunities for the City and its partners to pursue integrated approaches.."
41	9/14/2018	Rincon del Diablo	1.3.2 City of San Diego	1-13	[Last paragraph] Capitalize City at end of first sentence	Revised.
42	9/14/2018	Rincon del Diablo	1.3.2 City of San Diego	1-14	[End of first sentence] revise to say "…to protect and improve the water quality of rivers, creeks, bays and estuaries, and the ocean within its jurisdiction."	Revised.
43	9/14/2018	Rincon del Diablo	1.5 Addressing the Region's Water Management Challenges	1-17	There is a weird line break [just above the photo]	This has been corrected in the Word file.
44	9/14/2018	Rincon del Diablo	1.5 Addressing the Region's Water Management Challenges	1-17	[Photo] Has it helped? The picture says 'no'	Revised caption to say "Rural Community Assistance Corporation (RCAC) is addressing water quality concerns in the Tijuana River Valley (including trash, shown here) through a project funded through Proposition 84."
46	9/14/2018	Rincon del Diablo	2.2 Describing the Process	2-1	Update bullet list to match the style on pages 1-3, 1-5, etc. Start each bulleted item with lowercase	Revised
47	9/14/2018	Rincon del Diablo	2.2 Describing the Process	2-3	[First line] add "and" immediately before "…2) identify pressing regional issues…"	Revised.
48	9/14/2018	Rincon del Diablo	2.2 Describing the Process	2-3	[List at end of Section 2.2] Add comma "…ensuring that the IRWM vision, mission, goals, and objectives…"	Revised.
49	9/14/2018	Rincon del Diablo	2.3 Sustainability of Water Resources	2-3	[Last sentence of first paragraph] "~~Below you will find t~~The San Diego IRWM Program's definition of sustainability is shown below."	Revised.
50	9/14/2018	Rincon del Diablo	2.3 Sustainability of Water Resources - Definition of Sustainability for the 2019 IRWM Plan	2-3	[Bullet 1] "...maintaining ~~the~~ a community's quality of life…" [Bullet 3] "…water resources that supports the regional economy."	Revised.
51	9/14/2018	Rincon del Diablo	2.3 Sustainability of Water Resources	2-3	[List in final paragraph] Add comma to "…wetland and surface water conditions greenhouse gas emissions, resiliency, and life cycle costing…"	Revised.
52	9/14/2018	Rincon del Diablo	2.6 IRWM Goals - What do the San Diego IRWM Goals Mean for Me?	2-5	Title of call out box changes the tone. Kind of dumbs down this important document.	Revised to "How the IRWM Plan Goals Address Issues and Needs in the Region ~~What do the San Diego IRWM Goals Mean for Me?~~"
53	9/14/2018	Rincon del Diablo	2.7 IRWM Objectives	2-5	"Table 2-1 provides a "crosswalk" of the Plan…"	Revised.

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57	9/14/2018	Rincon del Diablo	Table 2-1: Crosswalk of San Diego IRWM Plan Goals and Objectives	2-6	Objective I and J - add open dot to Goal 1	Agree to add open dot to Goal 1 for Objective I. No change for Objective J because advanceing water-based enriching experiences does not impove reliability and sustainbility of water supplies directly or indirectly.
59	9/14/2018	Rincon del Diablo	Objective G	2-13	Photo caption - or infrastructure maintenance of old pipelines	Revised caption to say "One way to address c~~C~~ommunity flood damage loss ~~can be addressed~~ is through integrated flood management solutions."
60	9/14/2018	Rincon del Diablo	Objective G	2-13	[Final paragraph] Add comma to list "Pollution loads due to runoff will reflect the change in residential, commercial, industrial, construction, and agricultural activities…"	Revised.
61	9/14/2018	Rincon del Diablo	Objective G	2-14	[Sentence at top of page] Add comma "…can prevent or decrease its impacts, mitigate its negative effects, and address the economic impacts…"	Revised.
62	9/14/2018	Rincon del Diablo	2.7.2 Climate Change Considerations	2-17	Can this [significant threat to the Region's water resources] be quantified?	San Diego Basin Study is quantifying impacts of climate change on water supply, but is still in development. Added statement that the Basin Study will be completed in 2019 and include this information.
63	9/14/2018	Rincon del Diablo	2.7.2 Climate Change Considerations	2-17	"We are already seeing the effects of climate change in the region, with extreme drought…" - yet SDCWA says we have the water to handle this. May want to review.	SDCWA's 2015 UWMP included climate change scenario planning (Chapter 10, Scenario 5) and strategies for addressing this uncertainty included studies to evaluate impacts of climate change on demand and supplies at the local level and development of local, drought-proof, supplies such as recycled water, potable reuse, etc. that are not likely to be strongly affected by climate change. Acknowledged that even under projected climate change impacts, there is supply reliability
64	9/14/2018	Rincon del Diablo	2.7.2 Climate Change Considerations	2-17	"We are already seeing the effects of climate change in the region…" - [we've experienced] 2 inches [of sea level rise] in the last 20 years. How much effect has that really had?	Revised to say "We are already seeing the effects of climate change in the region, with extreme drought, altered fire seasons, and moderate sea level rise."
65	9/14/2018	Rincon del Diablo	Climate Change framework graphic	2-18	Climate Resilience graphic - not appropriate! Looks like an exploding world.	Revised the graphic to avoid perception of exploding world.
66	9/14/2018	Rincon del Diablo	2.10 IRWM Plan Targets	2-19	"The targets and metrics for each objective are described in Table 2-3. ~~below.~~"	Revised.
67	9/14/2018	Rincon del Diablo	Table 2-3	2-26	[Objective F, Item 3] Add "X" to Water Supply, Wastewater, and Recycled Water	Agreed. Revised.
69	9/14/2018	Rincon del Diablo	3.1 Region Overview - Population	3-1	[Last sentence of "Population" section] "The portion of the County's population outside the Water Authority services area is mainly dependent on local groundwater supply."	Revised.
71	9/14/2018	Rincon del Diablo	"Wastewater Service"	3-11	Add a space after the hyphen and before the word "through"	Revised.
73	9/14/2018	Rincon del Diablo	3.3 Disadvantaged Communities, Economically Distressed Areas, and Underrepresented Communities	3-12	Second sentence - DACs should not be plural.	Revised.
74	9/14/2018	Rincon del Diablo	3.3.2 Economically Distressed Areas	3-12	MHI was previously defined in Section 3.3.1 (redundant)	Revised to use the initialism only here.
82	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-22	[First paragraph, regarding stormwater conveying pollutants] This is true for non-DAC areas as well	Revise to: "Stormwater runoff (as well as dry weather urban runoff) may thus convey pollutants contributing to the poor surface water quality in Urban DACs and EDAs, similar to how runoff conveys pollutants in other urban and developed areas."
83	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-22	[Second paragraph] "Although ~~Though~~ huge investments have been made…"	Revised.
84	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-22	[water quality issues in the Bay] Not just a DAC/EDA issue	Paragraph already notes that many (but not all) fishermen affected by pollution in the Bay are from DACs and EDAs. Revise "…additional water quality monitoring in Bay wetlands, again many of which are located near or in Urban DACs and EDAs. Low-lying Urban DACs and EDAs near the Bay will also suffer disproportionately from the effects of sea level rise as a result of climate change compared to their non-DAC or EDA counterparts that may also be directly affected by sea level rise."
85	9/14/2018	Rincon del Diablo	Urban DACs/EDAs/URCs Issues and Needs	3-22	[Third paragraph, last sentence] "…including newly planted fruit trees, which help to ~~improve~~ increase access to fresh and healthy food options."	Revised.
87	9/14/2018	Rincon del Diablo	Rural DACs/EDAs/URCs Issues and Needs	3-23	"Rural DACs, EDAs, and URCs are primarily located outside of the jurisdictional boundaries…"	The SDIRWM Program has elected to define Rural communities as those not receiving municipal services. Added clarification that DACs with rural characteristics that receive municipal services are considered Urban DACs for the purposes of the IRWM Plan.
88	9/14/2018	Rincon del Diablo	Rural DACs/EDAs/URCs Issues and Needs	3-25	Some redundancy on issues throughout this section.	Section has been revised to reduce redundancy within the section. Some issues are common to both urban and rural DACs/EDAs/URCs, and so are included in both sections.
91	9/14/2018	Rincon del Diablo	Table 3-11: Member Agency Water Supply - Water Authority Service Area	3-29	Revise Rincon Del Diablo's supply numbers to match the 2015 UWMP: Total: 8,882 AFY Water Authority: 5,744 AFY Local: 3,138 AFY	Revised the table and updated all numbers to reflect 2015 volumes.
92	9/14/2018	Rincon del Diablo	Table 3-11: Member Agency Water Supply - Water Authority Service Area	3-29	Double check percent of supply from local sources, specifically for National City, Camp Pendleton, Rincon, San Dieguito WD, and Yuima MWD.	Revised the table and updated all numbers to reflect 2015 volumes.

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93	9/14/2018	Rincon del Diablo	3.5 Water Management Systems - Water Supply Outside Water Authority Service Area	3-31	This is where I think they have it wrong. There are 24 member agencies in their service area. The 24 member agencies contain "all but a small fraction…"	Revised to "All but a small fraction of the Region's over 3.2 million residents live within the service areas of the Water Authority's 24 member agencies ~~service area~~ (refer to Table 3-1)."
95	9/14/2018	Rincon del Diablo	3.5.1 Water Authority Supplies - Imported Water	3-32	[Figure 3-6] shows Bud Lewis Desal Plant. Need correct figure [should refer to figure showing the aqueducts]	Revised to refer to Figure 3-7 not 3-6.
97	9/14/2018	Rincon del Diablo	Figure 3-6	3-35	On page 3-32, Figure 3-6 is said to show the aqueducts.	Have updated the reference on Page 3-32, per comment #95, above. Leave existing Figure 3-6 as-is.
98	9/14/2018	Rincon del Diablo	Table 3-14: Desalination Plant	3-35	What does the "2" stand for? Is it needed to be noted? [missing footnote]	Delete the placeholder for footnote 2
99	9/14/2018	Rincon del Diablo	3.5.4 Wastewater	3-44	I would have to believe that there is a lot of septic in the County (which could contribute to groundwater contamination). Perhaps worth discussing?	Add a paragraph discussing septic - generally where it's located, how it works, and any concerns that may be associated with septic, including what leads to the problems (faulty systems, high density of septic). Acknowledge that properly designed, installed, maintained septic is a safe treatment option.
101	9/14/2018	Rincon del Diablo	Table 3-20	3-45	Revised Southern and Northern Regional to include "TTP" at the end	Revised.
102	9/14/2018	Rincon del Diablo	Table 3-20	3-45	STP 11 and STP 12 - These [permitted secondary treatment capacity] are zero. SRTTP replaced the STPs in the south part of the base.	In 2015, Camp Pendleton reported 148 mgd secondary water used for percolation from STP 11 and STP 12. Future projected use was 0. Have revised footnote 42 to reflect this information.
103	9/14/2018	Rincon del Diablo	Table 3-20	3-45	Harmony Grove - should not be City of Escondido - it should be County of San Diego. Rincon is taking over.	WDR R9-2012-0054 was issued to County of San Diego Sanitation District. Revised agency to "County of San Diego/Rincon Del Diablo Municipal Water District."
104	9/14/2018	Rincon del Diablo	3.5.4 Wastewater	3-47	"Tertiary treatment filters secondary effluent through a medium such as ~~coal~~ cloth or sand/disinfection to reduce total dissolved solids…"	Revised.
105	9/14/2018	Rincon del Diablo	3.5.4 Wastewater	3-47	"Planned projects would increase this capacity to 270 mgd and 230 mgd, respectively, by 2045" - of what? Primary? Tertiary?	Revised sentence to state "Planned projects would increase the Region's secondary and tertiary capacities ~~this capacity~~ to 270 mgd and 230 mgd, respectively."
106	9/14/2018	Rincon del Diablo		3-48	First bullet - Also brine from CPEN's AWT RO system	Will add to the list of brine discharged at the OOO
107	9/14/2018	Rincon del Diablo		3-50	Add fire suppression to the list of recycled water uses	Revised.
108	9/14/2018	Rincon del Diablo		3-50	"Since ~~most~~ current recycled water is ~~currently~~ predominantly used for irrigation, recycled water demands vary…"	Revised
109	9/14/2018	Rincon del Diablo	Potable Reuse	3-52	IPR and DPR are now just PR. Changes in terminology - recent (quirk) law/legislation on all this - CA Water Reuse Pros. Good info.	Recommend revising to use "potable reuse" when talking generally about the topic, and limit use of IPR and DPR to only where the distinction matters.
110	9/14/2018	Rincon del Diablo	3.5.6 Groundwater Resources	3-55	"Alt~~T~~hough this IRWM Plan uses the groundwater basins defined by Bulletin 118…"	Revised.
111	9/14/2018	Rincon del Diablo	3.5.6 Groundwater Resources	3-58	Bullet 3 - missing space between "approximately" and "7,000 AFY"	Revised.
112	9/14/2018	Rincon del Diablo	3.5.7 Conservation	3-60	add …"both the SDCWA and all other agencies' systems" at the end of Item 1.	Revised.
113	9/14/2018	Rincon del Diablo	3.5.7 Conservation	3-60	delete the word "are" in the third sentence.	Revised.
114	9/14/2018	Rincon del Diablo	3.5.7 Conservation - Water Use Reduction Programs	3-60	There's the annual water audits that must be completed by the districts	Added.
115	9/14/2018	Rincon del Diablo	3.5.7 Conservation - Water Use Reduction Programs	3-61	There is no mention of SB 606/AB 1668, plus the new MWELO standards	Added.
116	9/14/2018	Rincon del Diablo	3.5.7 Conservation - Graywater	3-62	[second paragraph] "…permitting and regulations have presented significant barriers…" - It's a health issue and concern. This makes it sound like permits, rules, and regulations are bad!	Revised sentence to read: "Although the potential for graywater reuse to reduce potable water demand has long been recognized, potential public health issues related to the use of graywater required additional time to develop permitting processes and regulations. As the use of graywater becomes more attractive to consumers, permitting and regulations are becoming more streamlined, helping to reduce ~~permitting and regulations have presented significant~~ barriers to widespread implementation of graywater systems in the Region."
117	9/14/2018	Rincon del Diablo	3.5.7 Conservation - Graywater	3-62	Weird break/text not justified in second paragraph.	Corrected.
118	9/14/2018	Rincon del Diablo	3.5.7 Conservation - Rainwater Capture	3-62	"…benefits water quality through reduced stormwater runoff." - Yes and no - takes away from natural stream flows and can help "dilute"	Revised to "…can benefit~~s~~ water quality through reduced stormwater runoff…"
119	9/14/2018	Rincon del Diablo	3.5.7 Conservation - Rainwater Capture	3-62	[rainwater capture] it can potentially adversely alter natural flows into riparian habitat - which is not necessarily a good thing.	Added that rainwater capture can minimize peak flows and retain pollution onsite, but reduces flows to local watersheds.
120	9/14/2018	Rincon del Diablo	3.5.8 Stormwater Management - WQIP Call Out Box	3-65	"A key feature of the 2013 MS4 Permit is that ~~is~~ it provides an…"	Revised.
121	9/14/2018	Rincon del Diablo	3.5.8 Stormwater Management	3-66	How about weather variability - infrequent storm or rainfall, etc. [as a challenge to managing stormwater in the region].	Added to challenge of managing stormwater.
122	9/14/2018	Rincon del Diablo	3.5.8 Stormwater Management	3-68	We often see coastal flooding due to high surf during storms [non-precipitation-induced flooding].	Added to list of non-precipitation-induced flooding
124	9/14/2018	Rincon del Diablo	Table 3-25: District Operated Water Systems Outside the Water Authority Service Area	3-75	Where is Del Dios?	Supporting text for the table says that it includes only those MWCs and services districts with more than 200 service connections. Del Dios has fewer than 200 service connections, and therefore has been excluded. Revised the caption on the table to "Figure 3-25: District-Operated Water Systems Outside the Water Authority Service Area With More Than 200 Connections"
125	9/14/2018	Rincon del Diablo	3.6.7 Environmental Organizations	3-80	What about RCDs? Also resource management. [regarding list of conservancy groups]	Added.

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126	9/14/2018	Rincon del Diablo	Table 3-34: Recycled Water Quality	3-93	Harmony Grove - should not be City of Escondido - it should be County of San Diego/Rincon	WDR R9-2012-0054 was issued to County of San Diego Sanitation District. Revised.
127	9/14/2018	Rincon del Diablo	Wildlife and Endangered Species - photo	3-101	"The San Diego River provides an~~d~~ important habitat..."	Revised.
128	9/14/2018	Rincon del Diablo	Wildlife and Endangered Species	3-101	Add a semicolon at the end of Item (1)	Revised.
129	9/14/2018	Rincon del Diablo	Cost of Water Supply Diversification	3-114	We know actual cost now [of seawater desalination] - $2,511 per AF	Reflect actual cost
130	9/14/2018	Rincon del Diablo	3.14 Climate Change	3-120	Add space between section number and section title	Revised.
131	9/14/2018	Rincon del Diablo	3.14 Climate Change	3-120	[Bullet 1] Add degree symbol to 7-9 degrees F	Revised.
132	9/14/2018	Rincon del Diablo	3.14 Climate Change	3-121	[second bullet, *Wildfire*] - second half of paragraph, starting with "With predicted changes in precipitation..." - Not in San Diego area. In other areas, yes.	Revised to "For example, the fall of 2017 experienced extremely warm, drive, and in some parts of the state, fiery conditions, followed by extreme rain events. As a result, severe erosion and mudslides occurred, washing the recently burned material downstream. While San Diego did not experience mudslides in 2017, the conditions that led to mudslides elsewhere in the state are present in the San Diego region, and associated risk expected to increase due to the effects of climate change."
133	9/14/2018	Rincon del Diablo	5 Watershed Characterizations	5-1	First sentence, lower case "s" for "...(HUs)..."	Revised.
134	9/14/2018	Rincon del Diablo	Santa Margarita Watershed - Water Systems	5-11	"The westernmost segment of the Santa Margarita Watershed lies largely within the jurisdiction of the SDCWA's member agencies: ~~lies largely within the juristic ion of the San Diego County Water Authority, which provides imported water supplies to three of its member agencies located in the watershed:~~..."	Revised.
135	9/14/2018	Rincon del Diablo	Santa Margarita Watershed - Water Systems	5-11	Add comma to list at the end of the second to last paragraph, after "Camp Pendleton"	Revised.
136	9/14/2018	Rincon del Diablo	Santa Margarita Watershed	5-13	Add comma to list in final bullet	Revised.
137	9/14/2018	Rincon del Diablo	Santa Margarita Watershed - Stormwater and Flood Management	5-14	Delete "the USMC" in front of "Camp Pendleton" for consistency	Revised.
138	9/14/2018	Rincon del Diablo	Santa Margarita Watershed - Natural Resources	5-14	Add comma to list in second sentence of first paragraph, after "oak woodlands"	Revised.
141	9/14/2018	Rincon del Diablo	Carlsbad Watershed	5-34	"The SNMP...determine if any reduction in loading is necessary, and identify potential ways to achieve load reduction."	Revised.
142	9/14/2018	Rincon del Diablo	Carlsbad Watershed - Natural Resources	5-35	Did the [power plant cooling system conversion to serve as intake for the Carlsbad Desal Plant] happen?	Revised. SDCWA currently working on intake modification permitting.Revised to "The intake for the Carlsbad Desalination Plant is located in the western reach of the Agua Hedionda Lagoon. The Water Authority is working on permitting required to modify the intake.~~These concerns will continue to be addressed through ongoing compliance with permitting requirements during the construction and operation of the desalination facility.~~"
143	9/14/2018	Rincon del Diablo	San Dieguito Watershed - Internal Boundaries and Land Uses	5-42	Add or delete space for "55-mile"	Revised.
144	9/14/2018	Rincon del Diablo	San Dieguito Watershed - Water Quality and Water Quality Impairments	5-43	"Pollutants of concern and stressors within the watershed include nutrients, pathogens, salinity, pesticides, metals/metalloids, toxicity, and other organics and inorganics compounds"	Revised.
145	9/14/2018	Rincon del Diablo	San Dieguito Watershed - Water Quality and Water Quality Impairments	5-43	What about the toxic plume from the Superfund site on Bernardo/Felicita? Chatham Bro. Barrel Yard.	Added.
147	9/14/2018	Rincon del Diablo	6.1 Overview	6-1	Bring the picture down a bit so that the last line [on the page] doesn't stand alone.	Corrected.
148	9/14/2018	Rincon del Diablo	Table 6-1: Evolution of the San Diego IRWM Program	6-3	[2013 IRWM Plan Implementation - third bullet] delete space at beginning	Revised.
149	9/14/2018	Rincon del Diablo	Table 6-1: Evolution of the San Diego IRWM Program	6-3	[Future IRWM Plan Implementation - last bullet] move first half to end, so bullet reads "Will update the IRWM Plan in approximately 5 years, which will require corresponding outreach efforts, if funding is available or a need is identified."	Revised.
150	9/14/2018	Rincon del Diablo	6.3 IRWM Governance Structure	6-6	"Information-sharing and decision-making processes in the Region usually funnel up from the Workgroups or down from the Tri-County FACC..."	Revised.
151	9/14/2018	Rincon del Diablo	6.3 IRWM Governance Structure	6-6	References to Figure 6-2 are missing the "2"	Revised.
159	9/14/2018	Rincon del Diablo	6.4.1 Environmental Justice and Disadvantaged Communities - Directed Outreach Programs for DACs and EJ Communities	6-25	Remove reference to EJs and use DAC acronym	See response to comment 75
162	9/14/2018	Rincon del Diablo	6.4.1 Native American Tribes	6-29	What does the "lack of trust" mean?	Revised to focus more on positives.
163	9/14/2018	Rincon del Diablo	6.4.1 Native American Tribes	6-30	[first full paragraph, about past experiences of tribes dealing with County and State on water issues] Does stating this enforce their fears?	Will revise to reframe focusing on progress made, and acknowledge past issues while focusing on positive changes since then.

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165	9/14/2018	Rincon del Diablo	6.4.1 Native American Tribes - Engaging Native American Tribes	6-30	Remove periods at end of final bullet and third from final bullet. Revise final bullet to say "...allowing tribal projects to proceed"	Revised.
166	9/14/2018	Rincon del Diablo	Table 6-14 Agencies and Organizations Involved in Water and Watershed Management in the San Diego IRWM Region	6-35	Resize column so words don't break across 2 lines in header rows	Corrected.
167	9/14/2018	Rincon del Diablo	Table 6-14 Agencies and Organizations Involved in Water and Watershed Management in the San Diego IRWM Region	6-37	Under Rincon Del Diablo, add solid dot to wastewater column, and solid dot to RAC or Workgroup column. Rincon became a sewer agency this year.	Revised.
168	9/14/2018	Rincon del Diablo	Table 6-14 Agencies and Organizations Involved in Water and Watershed Management in the San Diego IRWM Region	6-39	Under U.S. Marine Corps Camp Pendleton, add open dot to Natural Resources	Revised.
169	9/14/2018	Rincon del Diablo	*Escondido Valley Basin*	7-23	"The Escondido Valley Basin is a Tier B groundwater basin and is managed ~~in part~~ primarily by Rincon del Diablo Municipal Water District..."	Revised.
170	9/14/2018	Rincon del Diablo	7.6.1 Relevant Flood Control Plans	7-26	[First paragraph] Use a hyphen for "flood plain analyses," and fix spacing.	Moved photo to reduce awkward spacing.
171	9/14/2018	Rincon del Diablo	7.6.2 Opportunities for Collaboration	7-26	[first bullet] "interconnecting ~~an interconnection of~~ flood risk management actions..."	Revised.
173	9/14/2018	Rincon del Diablo	7.9.2 Current Climate Change Study Efforts	7-43	"Thirty-eight ~~(38)~~ state agencies provided..."	Revised.
174	9/14/2018	Rincon del Diablo	7.10 Summary of Agency Coordination	7-45	Delete "River" in "Santa Margarita River" in the second paragraph	Revised.
175	9/14/2018	Rincon del Diablo	8.1.1 Resource Management Strategies in *California Water Plan Update 2013*	8-1	"Table 8-1 ~~below~~ lists RMS included within the *CWP Update 2013* ..."	Revised.
176	9/14/2018	Rincon del Diablo	8.2.1 California Water Plan Update 2013	8-4	"Each of these RMS is included in Table 8-1 ~~above~~ and are analogous to those RMS..."	Revised.
177	9/14/2018	Rincon del Diablo	8.4.2 Urban Water Use Efficiency	8-7	"The Water Authority assists local water agencies in ~~Local water agencies assist the Water Authority in~~ implementing urban water use efficiency programs, resulting in additional water conservation savings..."	Revised
178	9/14/2018	Rincon del Diablo	8.4.5 System Reoperation	8-9	There's room to make it [the bullet list] look better! Unjustify the bulleted areas, revised to remove the parentheses but do a hard enter so the reservoir's owner shows up underneath the reservoir name but still part of the same bullet.	Corrected formatting of the bullet list to make it more visually appealing.
179	9/14/2018	Rincon del Diablo	8.4.7 Conjunctive Management and Groundwater	8-11	Revised first sentence to say "10" instead of "ten"	Revised.
180	9/14/2018	Rincon del Diablo	8.4.7 Conjunctive Management and Groundwater	8-11	Last sentence, add "USMC Base" before "Camp Pendleton"	Leaving as-is for consistency with comment #137
181	9/14/2018	Rincon del Diablo	8.4.8 Desalination Brackish and Seawater	8-12	Abbreviate "U.S. Marine Corps" to "USMC"	Deleting U.S. Marine Corps for consistency with comment #137
182	9/14/2018	Rincon del Diablo	8.4.15 Matching Quality to Use	8-16	Recycled water for fire suppression is fairly unique but should be included	Added.
183	9/14/2018	Rincon del Diablo	8.4.17 Salt and Salinity Management	8-17	"Several environmental uses of water can be impacted by excessive salinity."	Add
185	9/14/2018	Rincon del Diablo	8.4.19 Agricultural Land Stewardship	8-19	Add "...and Resource Conservation Districts." to end of first paragraph [list of agencies that assist agricultural land stewardship]	Added.
187	9/14/2018	Rincon del Diablo	8.4.30 Water and Culture	8-24	"The Region's emphasis on conservation ethics means that demand management~~,~~ is ~~particularly~~ important, particularly through times of drought."	Revised.
188	9/14/2018	Rincon del Diablo	9.4 IRWM Project Review	9-7	Number the two fundamental components in the second sentence.	Revised.
190	9/14/2018	Rincon del Diablo	9.4.1 IRWM Project Review and Selection Process	9-8	Weird break in the first paragraph	Corrected.
191	9/14/2018	Rincon del Diablo	9.4.1 IRWM Project Review and Selection Process	9-9	Revise Step 3 to read "Issue a Call for Projects that ~~is long~~ provides enough time to reasonably allow project sponsors to ask questions regarding the database, complete database forms, and revised previously submitted projects."	Revised.
192	9/14/2018	Rincon del Diablo	Table 9-1 Scoring Criteria for IRWM Grant Opportunities	9-12	Define "TBD" in table notes	Added footnote that says "Weighting will be determined by the RAC once a funding cycle has begun, and prior to the Call for Projects."
193	9/14/2018	Rincon del Diablo	10.2.1 Data Needs	10-2	[end of first sentence at top of page] Add comma to list, after "integrated planning"	Revised.
194	9/14/2018	Rincon del Diablo	10.2.1 Data Needs	10-2	[final paragraph in section before Sustainable Water Development] add "and" between item #3 and item #4	Revised.

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195	9/14/2018	Rincon del Diablo	10.2.1 Data Needs - Sustainable Water Development	10-2	Revise second sentence "…Colorado River Aqueduct (CRA) is expected to decrease, as impacts of climate change~~,~~ such as drought and changing precipitation patterns~~,~~ are more likely to occur in the future."	Revised.
198	9/14/2018	Rincon del Diablo	10.2.1 Data Needs - Enhance Infrastructure	10-4	"Asset management across the Region ~~has been~~ can be fragmented and siloed."	Revised.
199	9/14/2018	Rincon del Diablo	11.2.1 Implementation Action Plans for Regional Priorities	11-2	Add comma to the numbered list in the second paragraph	Revised.
200	9/14/2018	Rincon del Diablo	11.2.1 Implementation Action Plans for Regional Priorities - Land Use Planning Study	11-2	[Second sentence] "Since the 2013 IRWM Plan, a model sustainable landscape~~s~~ guide, a model stormwater…"	Revised.
201	9/14/2018	Rincon del Diablo	11.2.1 Implementation Action Plans for Regional Priorities - Land Use Planning Study	11-3	"The ~~2nd~~ second IRWM Summit, held February 29, 2016…"	Revised.
202	9/14/2018	Rincon del Diablo	11.2.1 Implementation Action Plans for Regional Priorities - Land Use Planning Study	11-3	"At the summit, one speaker ~~touched on~~ acknowledged the relationship between water resources and land use planning…"	Revised
203	9/14/2018	Rincon del Diablo	11.3 Benefits and Impacts	11-14	Move photo down one line.	Moved.
204	9/14/2018	Rincon del Diablo	11.3.1 Potential Benefits and Impacts - Regional Benefits and Impacts	11-14	"Implementation of the 2013 IRWM Plan (and achievement of the San Diego IRWM Objectives) ~~is~~ has resulted in substantial benefits to the Region.	Revised.
212	9/14/2018	Rincon del Diablo	11.5.1 Methods to Evaluate Plan Performance	11-35	What was the resulting grade [from the Report Card]?	Add summary sentence and link to report card on website.
213	9/17/2018	City of Oceanside	1 Introduction	1-2	[second bullet] …and with regulators "How might stormwater and water agencies work together…"	Revised to "How might stormwater and water agencies work together and with regulators to efficiently partner on conservation programs?"
214	9/17/2018	City of Oceanside	1 Introduction	1-2	[fifth bullet] and what methods can the IRWM use to effectively solicit feedback from and engage these communities? "How can DACs most effectively participate in water management…"	Revised to "How can DACs most effectively participate in water management projects benefitting them, and what methods can the IRWM Program use to effectively solicit feedback from and engage these communities?
215	9/17/2018	City of Oceanside	1.1 IRWM Planning	1-3	[last paragraph] and new science of climate change "...changes implemented as a results of the recent drought, new planning documents, and the ongoing succes…"	Added new understanding of climate change and its potential impacts to the list of reasons the Plan was updated.
216	9/17/2018	City of Oceanside	1.1 IRWM Planning	1-4	[first bullet] does this IRWM plan update also require inclusion of the regional Stormwater Resource Plan SWRP? "…understanding of stormwater resource capture and reuse opportunities for the region…"	Added the SWRP is being incorporated into the IRWM Plan.
217	9/17/2018	City of Oceanside	1.2.3 Benefits of Regional Approach	1-6	and across diverse disciplines (or expertise) "… and address the challenges that potentially exist among multiple planning efforts..."	Revised to " The IRWM planning process provides a mechanism for stakeholders to work together to identify and address the challenges that potentially existing among multiple planning efforts and across diverse disciplines."
219	9/17/2018	City of Oceanside	1.3 Regional Water Management Group	1-12	[first paragraph] suggest ch[a]nging this to "Copermittees under the Regional MS4 permit" (or however referenced in the rest of the document) ... the language used here references RURMP which was a relic of the '07 MS4 permit. "…are the largest Copermittees in the regional urban runoff management program (stormwater program)."	Revised.
222	9/17/2018	City of Oceanside	2.3 Sustainability of Water Resources	2-3	[call out box; first bullet] I'm surprised to not see "affordability" (or equitable) here for provision of safe, reliable water supply… "Social: Fostering public health and safety and maintaining the community's quality of life through provision of…"	Revised.
223	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective B	2-9	[first paragraph] …and also finding ways to *listen to the community* . true, education is needed but also developing tools that let DAC residents communicate their concerns more effectively, and give managers suggestions for water-integrated community projects "Increasing public knowledge and understanding of the importance..."	Revised to "Increasing public knowledge and understanding of the importance of water resource management, as well as finding ways to listen to the community and solicit input on finding solutions to common challenges, is essential for garnering public support for IRWM projects..."
224	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective D	2-10	[second paragraph after call out box] I'd recommend "peer-reviewed scientific understanding" stated somewhere in here.	Revised.

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225	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective H	2-14	[second paragraph after call out box] specify "Federal Clean Water Act 303(d) list" if not stated earlier for clarity "...and 13 reservoirs are listed on the 303(d) list of impaired water bodies..."	Revised.
226	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective H	2-14	[second paragraph after call out box] suggest giving an example here of how climate change can exacerbate pollution issues; such more frequent storms contributing wet weather pollutants, prolonged drought contributing to higher "first flush" pollutant loads, TDS issues in groundwater etc. you want to strengthen this linkage. "...systems better ables to withstand the impacts from climate change."	Revised.
227	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective H	2-14	[third paragraph after call out box] or "from being placed on the Clean Water Act 303(d) list" "...and prevent waters that currently meet the standards from slipping into non-attainment."	Revised.
228	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective I	2-16	[first paragraph] and local water supply "...an additional benefit of improving water quality, particularly when used..."	"Stormwater captured and used to sustain habitat <u>and support local water supply</u> often achieves dual benefits..."
229	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective J	2-16	[third paragraph after call out box] aging sanitary sewer infrastructure, spills and maintenance issues also cause this. If the focus is all water management in this section, include these as well since it prioritizes wastewater mgmt alongside stormwater. "Urban and agriculture stormwater runoff frequently degrades the water quality...resulting in the posting of advisories of potential public healthy threats..."	Agreed. Revised.
230	9/17/2018	City of Oceanside	2.7 IRWM Objectives - Objective J	2-16	[fourth paragraph after call out box] conservation areas/easements "...restrictions on recreation (limiting public access, limiting certain recreational activities..."	Add conservation areas/easements to the list of things that place restrictions on recreational uses to protect water supply and other beneficial uses.
231	9/17/2018	City of Oceanside	2.11 References	2-32	looks like this TOC page was incorrectly placed at end of section 2.	Yes. This is being removed.
232	9/17/2018	City of Oceanside	Table 3-5: Existing and Projected Land Use within the County (Acres)	3-5	does undeveloped land include preserved open space / protected habitat?	Added clarification.
233	9/17/2018	City of Oceanside	3.3.4 DAC, EDA, and URC Considerations	3-15	[second paragraph] but for project proponents, funding is often contingent upon demonstrating benefits to a DAC/URC etc., correct? so, proponents should try to explain these benefits within the context of the DWR / State definitions. this is especially important for this document as a tool to comply with qualification requirements for IRWM grant funding. "...explain how their community or project area comprises EDA or URCs."	Revised to "...encourages stakeholders and project proponents to explain how their community or project area comprises EDAs or URCs <u>as defined in this 2019 IRWM Plan or in appropriate governmental guidelines</u>."
234	9/17/2018	City of Oceanside	3.3.4 DAC, EDA, and URC Considerations	3-21	[footnote] earlier in section 3.3 the definitions of DACs, EDAs etc are described, but also want to make sure the 2019 criteria are explained. think if there's a purpose to listing CPAs/ cities here that once qualified for DAC areas but in the next phase of the IRWM plan they dont qualify, per DWR's definitions.	Revised footnote to indicate changes are related to shifts in the MHI of the state and local communities over time, but the definition of DAC has not changed. Also added note that EDA and URC definitions are new and only apply to the 2019 IRWM Plan.
235	9/17/2018	City of Oceanside	3.3.4 DAC, EDA, and URC Considerations	3-23	[footnote] same comment as above re: 2019 DAC criteria.	See response to comment #234
239	9/17/2018	City of Oceanside	3.5.4 Wastewater	3-44	[last paragraph] if it fits within the priorities of IRWM, shouldn't septic be included here?	Agreed. Incorporating septic to Section 3.5.4.
240	9/17/2018	City of Oceanside	3.5.7 Conservation	3-64	[first paragraph] citation? "...and will enter waters during the first flush event - the first major storm event following the dry season."	Revised to "Although reduced runoff <u>can</u> contribute~~s~~ to improved water quality..."
241	9/17/2018	City of Oceanside	3.5.8 Stormwater Management	3-65	[third bullet] new development (or if you use PDP, define it here) "...rates and durations from all Priority Development Projects..."	Revised.
242	9/17/2018	City of Oceanside	3.5.8 Stormwater Management	3-65	[second paragraph] this section not current and thus not relevant to the IRWM plan update, focus on the 2013 MS4 permit	Reviewed section and added clarification regarding which permit. Removed 2013 MS4 permit items where possible.
245	9/17/2018	City of Oceanside	Table 3-29: Adopted TMDLs	3-86	Loma Alta Slough is actually subject to an "alternative" to TMDL, using the MS4 permit to achieve WQOs.	Revised.
249	9/17/2018	City of Oceanside	5.3 San Luis Rey Watershed	5-23	[sixth paragraph] flood control section not current. the City of Oceanside routinely mows vegetation from the riverbed under permit from USACE and CDFW; the USACE continues to oversee habitat management and restoration activities in the lower river.	Updated to indicate City's efforts.
250	9/17/2018	City of Oceanside	5.3 San Luis Rey Watershed	5-26	[first paragraph] wasn't Gregory Canyon project postponed or cancelled?	Yes. Gregory Canyon has been removed from this section.
251	9/17/2018	City of Oceanside	5.4 Carlsbad Watershed	5-33	[third paragraph] Carlsbad WQIP accepted in 2016 I think. Update text	Carlsbad WQIP was accepted in 2016, and revised and finalized in 2018. Revised text.
252	9/17/2018	City of Oceanside	5.4 Carlsbad Watershed	5-34	[fifth paragraph] replace WURMP with WQIP	Revised.

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253	9/17/2018	City of Oceanside	8.4.16 Pollution Prevention	8-17	[first paragraph] and also to assign loads/responsibilities to watershed agencies "…purpose of TMDLs is to determine pollutant loads and implement activities…"	Revised.
254	9/17/2018	City of Oceanside	10.3.2 Technical Analysis and Methods	Table 10-3: Technical Analysis and Methods Used in the 2013 IRWM Plan	[comment on pg 10-20] does not look like this table has been updated (e.g. MS4 permit references 2007).	Updated table to reflect both the 2013 and 2019 IRWM Plans
1	9/14/2018	Karin Zirk, Friends of Rose Canyon	2.6 IRWM Goals	2-5	We support all of the IRWMP Goals, and high-level support for Objectives A, B, G, I, and J.	Thanks. No change.
2	9/14/2018	Karin Zirk, Friends of Rose Canyon	N/A	N/A	Rose Creek Watershed has been excluded from list of projects	Follow up with Friends of Rose Canyon regarding getting on the list and encouraging attendance at upcoming Call for Projects related workshops
3	9/14/2018	Karin Zirk, Friends of Rose Canyon	9.2.4 Geographical Integration	9-4	Disappointed that…responsible agencies are ignoring the opportunities for enhancement in the [Rose Creek] watershed - enhancements that will positively impact Mission Bay as Rose Creek is currently the largest source of dry-weather freshwater inflows	Followup meeting with Friends of Rose Canyon to discuss the IRWM Project Selection Process.
6	9/14/2018	Karin Zirk, Friends of Rose Canyon	N/A	N/A	We request being added to the stakeholder email distribution list.	info@saverosecreek.org was added to the SDIRWM stakeholder email list on 9/14/18
8	9/14/2018	Rincon del Diablo	1. Introduction	1-1	Shows part of Orange County, so should include them in area description	The San Diego IRWM Region only includes areas within San Diego County. The portion of the San Juan Watershed within San Diego County is included in the SDIRWM Region. The remaining portion of the San Juan Watershed is in the South Orange County IRWM Region.
11	9/14/2018	Rincon del Diablo	1. Introduction	1-1	"…and the population of these areas is expected to increase by 29% by 2050, to over 4.0 million, according to the San Diego Association of Governments…" - *!@#	No change.
35	9/14/2018	Rincon del Diablo	1.3 Regional Water Management Group	1-12	"The City of San Diego, the Region's largest retail water agency, is involved in water management within six of the Region's eleven watershed." - Why must we say this? We count too I hope.	This section is discussing the RWMG agencies only. No change.
37	9/14/2018	Rincon del Diablo	1.3.1 San Diego County Water Authority	1-12	[SDCWA logo] - New tag line? Like using this logo!	No change.
40	9/14/2018	Rincon del Diablo	1.3.2 City of San Diego	1-13	[Second to last paragraph] "non-potable" in 2nd sentence is redundant	Used "non-potable recycled water" to emphasize the difference between non-potable reuse and potable reuse, which is discussed in following sentence. Leaving as-is.
54	9/14/2018	Rincon del Diablo	2.7 IRWM Objectives	2-5	Where is Table 2-2? Should come before 2-3 and after 2-1.	Table 2-2 is on page 2-20, immediately before Table 2-3.
55	9/14/2018	Rincon del Diablo	Table 2-1: Crosswalk of San Diego IRWM Plan Goals and Objectives	2-6	Objectives B and D - shouldn't these be solid dots across all goals?	These objectives do not directly address all goals, but rather support them. No change.
56	9/14/2018	Rincon del Diablo	Table 2-1: Crosswalk of San Diego IRWM Plan Goals and Objectives	2-6	Objective H "Effectively reduce sources of <u>water-related</u> pollutants and environmental stressors…"	Objective H is further defined on page 2-14, where it explains that the objective is focused on water-related issues. No change.
58	9/14/2018	Rincon del Diablo	Table 2-1: Crosswalk of San Diego IRWM Plan Goals and Objectives	2-6	I know we can't change this but Objective I - land use? What is Objective J?	Per Rincon - does not need to be addressed. No change.
68	9/14/2018	Rincon del Diablo	N/A	2-32	Why is Chapter 2 contents at the end? Why not precede Chapter 2 content?	This was included in error. Page has been removed for Final IRWM Plan - Phase 1
70	9/14/2018	Rincon del Diablo	3.2 Defining Boundaries for the Region - Appropriateness of Region	3-10	This is stated word-for-word in a previous chapter.	No change.
72	9/14/2018	Rincon del Diablo	3.3 Disadvantaged Communities, Economically Distressed Areas, and Underrepresented Communities	3-12	A large number of pages devoted to [Section] 3.3 as compared to many of the other sections in this chapter - why?	The 2016 Guidelines include additional DAC, EDA, URC guidance. Because the San Diego IRWM Plan does not have a separate DAC, EDA, URC, EJ chapter, the bulk of that discussion is instead incorporated into Chapter 3 Region Description.
78	9/14/2018	Rincon del Diablo	3.3.3 Underrepresented and Environmental Justice Communities	3-13	Why such a huge focus and write up on DAC/EDA/URC?	See response to Comment #72
89	9/14/2018	Rincon del Diablo	Community Support for DACs, EDAs, URCs, and EJs	3-26	That's [community support] great but why do we specifically break these out?	DWR has an emphsis on DAC engagement (see DAC Involvement program). This section highlights the efforts already in the Region to support and engage DACs. No change.
94	9/14/2018	Rincon del Diablo	3.5 Water Management Systems - Water Supply Outside Water Authority Service Area	3-31	[regarding community well systems outside the Water Authority's service area not being metered for production] If it's outside of their area, how would they know this?	No change.
96	9/14/2018	Rincon del Diablo	Table 3-13: Imported Water Reliance within the Region, 1999-2016	3-33	Would be better to follow page 3-30 as it's referenced on page 3-28.	Table 3-13 is currently located after the discussion of the Water Authority's imported water supplies. While it's referenced earlier in the chapter, moving it earlier would present the information before the reader has the context. No change.
123	9/14/2018	Rincon del Diablo	3.5.9 Flood Management	3-68	101,000 is an odd number [people exposed to flood risk]	This number is consistent with the 2013 IRWM Plan. No change.

#	Date Received	Commenter	Plan Section	Page Number	Comment	Response
139	9/14/2018	Rincon del Diablo	Figure 5-4 San Luis Rey Watershed (Hydrologic Unit)	5-20	San Diego County has 6 bottled water companies, three of which are known to extract water from wells/springs (i.e. Palomar) at an estimated rate of 30 million gallons/year (cumulative). Does this merit being included in this report?	While this is a high water use, it is captured in commercial/industrial uses. No change.
153	9/14/2018	Rincon del Diablo	Table 6-2: San Diego RAC Membership	6-9	Should they [County, City of San Diego, and SDCWA) be included since they are the RWMG?	Yes. The RWMG are also on the RAC.
154	9/14/2018	Rincon del Diablo	*Newsletters and Notices*	6-17	The member agencies would like to distribute [the information flyer] too	A flyer will be provided at the October RAC meeting and is available upon request.
155	9/14/2018	Rincon del Diablo	6.4.1 Environmental Justice and Disadvantaged Communities	6-23	Seems interesting that 6 pages are devoted to DAC as compared to other aspects of Governance	See response to comment #72
161	9/14/2018	Rincon del Diablo	6.4.1 Native American Tribes	6-29	First sentence "San Diego County features the largest number of Tribes and Reservations of any county in the United States" was previously stated multiple times.	Repeated here for readers who didn't read the entire Plan. No change.
172	9/14/2018	Rincon del Diablo	7.9 Relation to Climate Change Planning	7-40	[list of three climate change impacts closely related to water resource management] Won't the cold get colder? If so, it should say Temperature changes (or great range in temperature variation)	Temperature is projected to increase in the Region; cold spells are not projected to get colder (see Section 3.14 of the IRWM Plan). No change.
184	9/14/2018	Rincon del Diablo	8.4.17 Salt and Salinity Management	8-17	There are loads of environmental uses [regarding loss of beneficial uses due to salinity issues]	No change.
186	9/14/2018	Rincon del Diablo	8.4.27 Other Strategies - Rainfed Agriculture	8-21	Nopales and cactus apples!	No change.
189	9/14/2018	Rincon del Diablo	9.4 IRWM Project Review	9-7	"The IRWM Plan is a living document" was circled, but no comment.	No change.
205	9/14/2018	Rincon del Diablo	11.2.2 Implementation Issues for Priority Projects - Regulatory Requirements	11-13	First half of the paragraph has been stated before [Tribal concerns about CEQA requirement]	Worth reiterating here.
210	9/14/2018	Rincon del Diablo	11.4.1 Plan Financing	11-23	[First bullet, *Business as usual*] Add "and its member agencies" after "San Diego County Water Authority"	Member agencies pay the Water Authority, but do not directly contribute to the RWMG's costs to maintain the IRWM Program. No change.
211	9/14/2018	Rincon del Diablo	11.4.1 Plan Financing	11-23	[Fourth bullet, *Participation fee*] We already do [pay a fee] as rate payers.	The participation fee would be a new fee that you pay specifically to participate in IRWM. No change.
218	9/17/2018	City of Oceanside	1.2.4 Existing Planning Environment	1-8	[second paragraph] if possible I'd suggest a graphic or table to link the above narrative of the multitude of planning efforts in the region. something the reader can quickly look to and see how the plans are interrelated by discipline (e.g. the WQIPs fulfill stormwater regulatory requirements, but also can use strategies like habitat restoration to meet objectives - which ties into MSCP, SWRP etc...)	The requested graphic would be extremely complicated. With a limited budget and time to develop such a graphic, the RWMG has elected to focus resources on other changes. No change.
221	9/17/2018	City of Oceanside	1.6 IRWM Plan Development	Table 1-13: Organization of the 2013 IRWM Plan	curious, but is there a reason the current plan did not simply use the mandated sections provided by the Guidelines, was this a product of the RAC? will this affect plan acceptance/review by DWR?	We will submit to DWR the Plan Standards Review form in which we document where we've addressed each standard. The outline we use in the Plan aligns with how our Region thinks about these topics.
238	9/17/2018	City of Oceanside	3.5.1 Water Authority Supplies	Figure 3-6: Conveyance Facilities for Carlsbad Desalination Project	unnecessary and cluttered figure to present here.	Figure shows how the Carlsbad Desalination Plant connects to the regional water system. No change.
243	9/17/2018	City of Oceanside	3.5.8 Stormwater Management	3-66	[photo] this appears to be a photo of Loma Alta Slough in Oceanside, not Santa Margarita	The photo was provided by the Project Manager. It looks similar to Loma Alta Slough but has an additional structure to the left of the photo that doesn't exist at Loma Alta Slough
244	9/17/2018	City of Oceanside	3.7.2 Surface Water Quality	3-83	[call out box] well said	Thanks. No change.
246	9/17/2018	City of Oceanside	3.8 Environmental Resources	3-99	section heading highlighted	No change.

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Appendix 7-A:
Regulatory Workgroup Report

Potential IRWM/Regional Board Collaborative Opportunities, 2013 IRWM Plan




REGULATORY
WORK GROUP REPORT

Potential Opportunities for Collaboration:

San Diego IRWM Program &
Regional Water Quality Control Board

INTEGRATED REGIONAL
WATER MANAGEMENT (IRWM) PLAN
2013 Update

SAN DIEGO
Integrated Regional
Water Management

FINAL REPORT

July 2013

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ABBREVIATIONS AND TERMS

Basin Plan.............	*Water Quality Control Plan for the San Diego Region*
CAA	Cleanup and Abatement Account
CWA	Clean Water Act
DWR	State of California Department of Water Resources
EPA	United States Environmental Protection Agency
IRWM...................	San Diego Integrated Regional Management
NA	not applicable
NNE	Nutrient Numeric Endpoint
Practical Vision	Strategic planning document being developed by the RWQCB
RAC......................	IRWM Regional Advisory Council
RWMG	IRWM Regional Water Management Group
RWQCB	California Regional Water Quality Control Board, San Diego Region
SEP	Supplemental Environmental Project
SNMP	Salt and Nutrient Management Plan
SSOs	site-specific water quality objectives
State Board	State Water Resources Control Board
303(d)	Section 303(d) of the Clean Water Act (impaired water)
TMDL	Total Daily Maximum Load
TRAC	Basin Plan Triennial Review Advisory Committee
Work Group..........	IRWM Regulatory Work Group

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Contributing IRWM Regulatory Work Group Participants

Category	Organization	Representative[1]
Regional Water Management Group (RWMG)	County of San Diego[2,3]	Todd Snyder
	San Diego County Water Authority	Leslie Dobalian Toby Roy Mark Stadler
	City of San Diego[2,3]	Ruth Kolb Jeff Pasek Cathy Pieroni Goldy Thach
Retail Water Agencies	Helix Water District	Mark Umphries
	Sweetwater Authority	Peter Baranov Scott McClelland
Water, Wastewater and Recycled Water Agencies	City of Oceanside[2,3]	Mo Lahsaie, Work Group Vice-Chair Cari Dale
	Padre Dam Municipal Water District	Arne Sandvik
Stormwater Management	City of Encinitas[2,3]	Crystal Najera
	University of California, San Diego[3]	Kimberly O'Connell
Non-Government Organizations	Coastal Environmental Rights Foundation	Livia Borak
	Floodplain Management Association	Iovanka Todt, Work Group Chair
	San Diego Coastkeeper	Travis Pritchard
	San Diego County Farm Bureau	Eric Larsen
Federal Agencies:	U.S. Marine Corps Base Camp Pendleton[4]	Jeremy Jungreis
Regulatory Agencies:	Regional Water Quality Control Board	Jeremy Haas Bruce Posthumus

1 Representatives who participated in one or more IRWM Regulatory Work Group workshops.
2 Agency is also a stormwater copermittee.
3 Organization that participates in the San Diego Region Municipal Stormwater Copermittees Management Committee.
4 U.S. Marine Corps Base Camp Pendleton also is a water, wastewater, and recycled water agency.

EXECUTIVE SUMMARY

IRWM Program. The San Diego Integrated Regional Water Management (IRWM) Program is an interdisciplinary effort of San Diego Region water management organizations and stakeholders to enable the San Diego Region to apply for grants issued under the State of California IRWM Grant Program. The IRWM Program covers an area within the jurisdiction of the San Diego Regional Water Quality Control Board (RWQCB), a state agency with responsibilities for establishing and enforcing state and federal water quality standards. The current San Diego IRWM Plan was adopted in 2007, and in part:

- establishes an IRWM Plan mission and objectives that define the Region's water management needs,
- identifies general water management strategies for attaining the goals and objectives, and
- implements a screening process for identifying, prioritizing, and funding water management projects, programs, and plans that help achieve the IRWM goals and objectives.

The San Diego IRWM Program is led by a Regional Water Management Group (RWMG) comprised of the San Diego County Water Authority, City of San Diego, and County of San Diego. IRWM Program guidance is provided by a Regional Advisory Committee (RAC) comprised of a diverse array of regional water management and environmental organizations.

Work Group and Purpose of Report. An effort is currently underway to update the 2007 IRWM Plan. Recognizing the similarity of missions and objectives between the IRWM Program and RWQCB, one of the tasks identified within the IRWM Plan update is to identify means for the IRWM Program to collaborate with and support the RWQCB in regional efforts to maintain and enhance water resources. To this end, a Regulatory Work Group (hereinafter Work Group) that represents a broad range of stakeholder interests has been organized to evaluates potential opportunities for IRWM and RWQCB collaboration to achieve mutual water quality protection and water management goals. Work Group input was provided through a series of facilitated workshops. The purpose of this report is to present the findings and recommendations of the Work Group on potential opportunities for IRWM and RWQCB collaboration.

Desired Outcomes of IRWM/RWQCB Collaboration. The following general approach was utilized by the Work Group to identify potential IRWM and RWQCB collaborative opportunities:

1. Identify potential issues of mutual interest to the IRWM Program and RWQCB.
2. Prioritize the potential issues of interest to identify issues with strong and broad Work Group support and identify desired outcomes for IRWM/RWQCB collaboration.
3. Identify IRWM Program assets and identifying potential collaborative measures that could be undertaken to achieve the desired outcomes.

After identifying, assessing, and prioritizing potential issues of IRWM and RWQCB interest, the Work Group selected the following desired outcomes for IRWM/RWQCB collaboration:

Desired Outcome No. 1: Support Science-Based Basin Plan Objectives. Support the RWQCB triennial review process and RWQCB programs and efforts to update science-based assessments of relations between Basin Plan objectives and beneficial use protection.

Desired Outcome No. 2: Support Science-Based Impaired Water Listings and Compliance. Support RWQCB programs and efforts to (1) update impaired water listings that are based on science and robust data and (2) achieve water quality compliance and protect beneficial uses.

Desired Outcome No. 3: Support Prioritization of Habitat Restoration Needs and Opportunities. Support the RWQCB in implementing a process for prioritizing wetlands and riparian habitat restoration needs and opportunities, and coordinate with resource agencies to address regional restoration needs and issues.

Recommended Early Action Items and IRWM Plan Update Actions. The Work Group recognized that the RWQCB has encouraged stakeholder participation in both the Basin Plan review and 303(d) review processes (Desired Outcome Nos. 1 and 2). As a first step in working toward the desired outcomes, the Work Group encouraged organized and ongoing IRWM stakeholder participation in these RWQCB stakeholder processes.

As a means of initiating IRWM/RWQCB collaboration efforts toward achieving the three designated outcomes, the Work Group recommended the implementation of several immediate IRWM/RWQCB collaborative actions (deemed "early action items"). The Work Group also recommended associated actions to update the IRWM Plan to promote the desired outcomes. Early action items and IRWM Plan update actions recommended to initiate IRWM/RWQCB collaboration are summarized in Table EX-1 (page EX-3).

Table EX-1
Summary of Recommended IRWM/RWQCB Collaboration
Early Action Items and IRWM Plan Update Actions

Recommended Overarching Action Items to Facilitate Desired Outcome Nos. 1, 2, and 3:

- Assign an IRWM liaison to the RWQCB
- Provide the RWQCB with periodic IRWM progress reports for inclusion in Executive Officer reports to the RWQCB
- Monitor development of the RWQCB Practical Vision
- Coordinate with RWQCB to ensure consistency between IRWM Plan and RWQCB Practical Vision

Recommended Early Action Items to Facilitate Desired Outcome No. 1:

- Convene caucus of IRWM stakeholders to:
    - review existing RWQCB Basin Plan triennial review priorities, allocated RWQCB resources, and schedules
    - identify additional Basin Plan review priorities of interest to IRWM stakeholders
    - determine IRWM stakeholder interest in supporting and coordinating with the RWQCB to address additional Basin Plan review priorities
- Organize IRWM stakeholder participation in the RWQCB Triennial Review process to promote priority RWQCB action on the Basin Plan issues targeted by IRWM stakeholders, including evaluating and identifying:
    - Basin Plan modification priorities identified by IRWM stakeholders
    - research, data collection, data management, data assessment, and resource needs required to support science-based evaluation of the additional Basin Plan priorities

CXB

- Convene caucus of IRWM stakeholders to:
    - review the existing RWQCB 303(d) listings
    - identify 303(d) listings that may warrant reevaluation or reclassification
    - determine IRWM stakeholder interest in supporting RWQCB reassessment or reclassification of the identified 303(d) listings of concern
- Organize IRWM stakeholder participation in the RWQCB 303(d) review process to promote priority RWQCB action on the 303(d) listing issues targeted by IRWM stakeholders, including evaluating and identifying:
    - 303(d) receiving waters that may warrant reevaluation or reclassification
    - potential IRWM projects or actions that could improve water quality and attain water quality objectives
    - potential alternative means to traditional TMDLs to achieve water quality objectives
    - research, data collection, data management, data assessment, and resources required for science-based reevaluation or reclassification for the identified 303(d) listings of concern

Recommended Early Action Items to Facilitate Desired Outcome No. 3:

- Convene workshop with RWQCB to discuss potential means to:
    - identify, coordinate, and prioritize restoration needs and opportunities
    - develop an action plan for creating and maintaining a habitat restoration needs and opportunities priority list
    - coordinate IRWM Program support with the RWQCB SEP process and other compensatory mitigation programs
- Convene meeting with resource agencies to discuss needs and opportunities for improving coordination of ecosystem restoration, channel maintenance and invasive species removal

Recommended IRWM Plan Update Actions:

- Acknowledge priority themes from the RWQCB Practical Vision in the updated IRWM Plan
- Update IRWM Plan and modify project funding screening and scoring criteria to encourage projects that target Desired Outcome Nos. 1, 2, or 3

Section 1
INTRODUCTION

1.1 Integrated Regional Water Management (IRWM) Plan

IRWM Program. The San Diego Integrated Regional Water Management (IRWM) Program is an interdisciplinary effort of San Diego Region water management organizations and stakeholders to enable the San Diego Region to apply for grants issued under the IRWM Grant Program administered by the State of California Department of Water Resources (DRW) and State Water Resources Control Board (State Board). The IRWM Program addresses water management issues in the portion of San Diego County that is tributary to the Pacific Ocean, and is one of three IRWM programs within the jurisdiction of the San Diego Regional Water Quality Control Board (RWQCB).

The San Diego IRWM Program is led by a Regional Water Management Group (RWMG) comprised of the San Diego County Water Authority, City of San Diego, and County of San Diego. IRWM Program guidance is provided by a Regional Advisory Committee (RAC) comprised of a diverse array of regional water management and environmental organizations. The RWQCB, U.S. Bureau of Reclamation, and representatives from the other two IRWM programs in the San Diego Region (south Orange County and south Riverside County) serves as an advisory representatives to the RAC.

Existing IRWM Plan. The current San Diego IRWM Plan was adopted by the respective RWMG agencies in 2007, and establishes water management goals and IRWM procedures for attaining the goals. The 2007 IRWM Plan:

- presents and evaluates the Region's complex groundwater and surface water management issues, challenges, and conflicts,
- establishes an IRWM Plan mission and objectives that define the Region's water management needs,
- identifies general water management strategies for attaining the goals and objectives,
- evaluates governance structures for San Diego IRWM planning,
- develops a transparent screening process for identifying and prioritizing water management projects, programs, and plans that help achieve the IRWM goals and objectives,
- evaluates stakeholder outreach needs,
- assesses regional data management programs and needs, and
- establishes a program for monitoring and measuring program success.

Program Funding. The IRWM Program provides a regional mechanism for evaluating, prioritizing, and allocating resources to optimize attainment of the Region's water management goals and objectives. Using the screening and prioritization processes established as part of the 2007 IRWM Plan, the San Diego IRWM program by June 2012 had allocated approximately $34 million in grants for San Diego Region water resources and environmental protection projects consistent with achieving the IRWM Plan goals and objectives.

1.2 Potential for IRWM/RWQCB Collaboration

Influence of RWQCB on Regional Water Planning. The RWQCB regulates water quality within the San Diego Region, and RWQCB requirements and actions are of critical importance in influencing water resources management and IRWM activities within the Region. As set forth in the Porter-Cologne Water Quality Control Act (Division 7, *California Water Code*), the primary responsibility of the San Diego RWQCB is to protect the quality of groundwater and surface water within the San Diego Region by:

- formulating and adopting water quality standards and plans for the Region's groundwater and surface water bodies, and
- prescribing and enforcing requirements on waste discharges or threatened waste discharges to groundwaters or surface waters.

Through powers delegated by the U.S. Environmental Protection Agency (EPA), the RWQCB is also responsible for establishing water quality standards for surface waters, regulating discharges to surface waters, and assessing conformance with the standards pursuant to regulations established under the federal Clean Water Act (CWA).

RWQCB Resource Needs. The RWQCB regulatory mandates are wide-ranging, and the RWQCB's ability to respond or address regional water quality issues is dependent on available funding and resources. While RWQCB regulatory mandates have expanded over the years, resources available to the RWQCB has not kept pace with the expansion of these regulatory responsibilities. As a result, the RWQCB utilizes its limited resources to address what it deems to represent the highest priority regional water resource protection needs.

The IRWM Program is, in essence, a stakeholder-driven resource allocation process. In areas where IRWM and RWQCB goals and responsibilities are compatible, the potential exists for resources provided through the IRWM Program to assist the RWQCB in addressing a greater range of water quality issues and priorities. In addition to potential funding through the IRWM's funding apparatus, the IRWM governance structure (RWMG and RAC) allows for stakeholder coordination or outreach which could assist the RWQCB in developing and achieving its priorities and goals.

Potential Benefits to IRWM Stakeholders. RWQCB standards and requirements may significantly influence water resources management projects or activities of IRWM stakeholders. As a result, IRWM stakeholders could potentially derive significant benefit from collaboration with the RWQB to address the Region's water quality protection and water resource management needs. Potential benefits to IRWM stakeholders from IRWM/RWQCB collaboration may include:

- improved RWQCB understanding of IRWM stakeholder issues,
- improved stakeholder understanding of RWQCB issues and responsibilities,
- improved RWQCB ability to effectively address regional water quality issues and standards,
- increased RWQCB input in support of the IRWM planning and resource allocation process,
- improved regional coordination of water resources protection and management, and
- improved regional coordination of data collection and evaluation.

1.3 Purpose of Report

IRWM Plan Update. The RWMG and RAC are currently engaged in an effort to update the 2007 IRWM Plan. Recognizing the similarity of missions and objectives between the IRWM Program and RWQCB, one of the tasks identified within the IRWM Plan update is to identify means for the IRWM Program to collaborate with and support the RWQCB in regional efforts to protect and enhance San Diego Region water resources.

Formation of Regulatory Work Group. To this end, the RWMG and RAC organized a Regulatory Work Group (hereinafter Work Group) that represented a broad range of stakeholder interests which mirrored the composition of the RAC. Organizations represented within the Work Group included:

- RWQCB staff,
- non-government organizations that represent resource protection, floodplain management, environmental justice, and agriculture,
- water and recycled water agencies, and
- stormwater agencies.

Objectives of the Work Group included:

- serving as an ideas forum or "think tank" to develop suggestions on how the IRWM Program and RWQCB can collaborate to more effectively address regional water issues, and
- providing direction in the preparation of an issues paper (Work Group Report) that summarizes potential IRWM and RWQCB collaborative opportunities and identifies recommended actions to pursue sensible collaborative opportunities.

Report Objectives. The purpose of this report is to present the findings and recommendations of the Work Group on potential opportunities for IRWM and RWQCB collaboration. Additional objectives of this report are to (1) provide input into the San Diego IRWM Plan update, and (2) stimulate agency interest and discussion in taking advantage of the suggested potential collaborative opportunities.

Recommendations on potential IRWM and RWQCB collaborative opportunities are presented herein for the consideration of the RWMG, RAC, and RWQCB, and are not binding on any organization.

Work Group Approach. Work Group input was provided through a series of five organized and facilitated workshops. Table 1-1 summarizes the focus of the five workshops. A technical team led by RMC Water and Environmental supported the Work Group effort. Technical team responsibilities included:

- coordinating with the Work Group chair to establish workshop agendas,
- organizing Work Group directives and input into draft support documents for group review,
- facilitating Work Group meetings, and
- preparing draft and revised versions of the Work Group Report for the consideration, revision, and approval of the Work Group.

Table 1-1
Summary of Regulatory Work Group Approach and Workshops

Workshop	Work Group Focus
No. 1	• Review Work Group objectives • Establish Work Group ground rules and select Work Group chair and co-chair • Review IRWM and RWQCB issues and needs
No. 2	• Review RWQCB priority themes • Identify issues of common interest between the IRWM Program and RWQCB
No. 3	• Organize and prioritize issues of common IRWM/RWQCB interest • Solicit ideas on potential strategies for addressing the issues of interest
No. 4	• Identify desired outcomes to be achieved by IRWM/RWQCB collaboration • Provide directional input on implementation strategies and action plans for achieving the desired outcomes • Provide directional input on the preparation of the Work Group report
No. 5	• Review desired outcomes and recommended implementation actions • Review and comment on the draft Work Group Report

Section 2
PRIORITY ISSUES AND OUTCOMES

2.1 Work Group Approach

Regulatory Agency Influence on IRWM Planning. The Work Group acknowledged that a number of regulatory agencies (see Table 2-1) influence IRWM Planning. State and federal resource agencies are involved in flood management, environmental protection, and endangered species protection. Health agencies are involved in regulating water supply, recycled water use, and environmental water quality.

Table 2-1
Summary of Key Regulatory Agencies that Influence IRWM Planning

Category	Agency
Resource Agencies	• U.S. Army Corps of Engineers • U.S. Fish and Wildlife Service • U.S. National Oceanographic and Atmospheric Administration Fisheries Service • California Department of Fish and Wildlife • California Coastal Commission
Health Agencies	• California Department of Public Health • County of San Diego Department of Environmental Health
Water Quality	• RWQCB • State Water Resources Control Board (State Board) • U.S. Environmental Protection Agency (EPA)

Focus on RWQCB Collaboration. Potential benefits of IRWM collaboration with resource and health agencies are limited by the narrow focus, restricted regulatory mandates, and staff-dependent decision-making processes of the agencies. The RWQCB purview, on the other hand, extends over a broad range of IRWM planning activities. Additionally, the RWQCB consults with the resource agencies, health agencies, EPA, and State Board in establishing San Diego Region water quality standards and permit requirements. In addition to these reasons, the Work Group agreed to focus on potential IRWM and RWQCB collaboration, noting that special and wide-ranging opportunities and benefits exist for RWQCB and IRWM collaboration, in part because:

- the IRWM Program and RWQCB each focus on issues specific to the San Diego Region,
- parallels exist in the water quality protection goals of the IRWM Program and RWQCB,

- the IRWM Program and RWQCB operate under open processes that encourages public participation and stakeholder input,
- the RWQCB enjoys flexibility in establishing water quality standards that are specific to the water quality and beneficial use protection needs of the San Diego Region,
- resources are not available to allow the RWQCB to adequately address all regional issues of importance and the RWQCB must allocate the limited resources to the highest priority issues, and
- opportunities exist for the IRWM Program to assist in addressing the RWQCB resource limitations.

General Approach. The following general approach was utilized by the Work Group to identify IRWM and RWQCB collaborative opportunities and implementation recommendations:

1. Identify potential issues of mutual interest to the IRWM Program and RWQCB.
2. Prioritize the potential issues of interest to identify issues with strong and broad Work Group support, and identifying desired outcomes for IRWM/RWQCB collaboration.
3. Identify IRWM Program assets and identify potential collaborative measures that could be undertaken to achieve the desired outcomes.
4. Identify a recommended "early action plan" to implement collaborative measures that appear to offer strong benefits and can readily be implemented.
5. Identify IRWM Plan updates recommended to support the desired outcomes of IRWM/RWQCB collaboration.

2.2 Potential Issues of IRWM/RWQCB Interest

IRWM Objectives and RWQCB Priority Themes. As a first step in assessing potential collaborative opportunities between the IRWM Program and RWQCB, the Work Group reviewed RWQCB priorities and IRWM Program objectives. Table 2-2 (page 2-3) presents a summary of missions and objectives of the RWQCB and IRWM Program.

The RWQCB regularly establishes strategic plans which set forth RWQCB priorities and intended future direction. The most recent RWQCB strategic planning was presented in "The Regionalization of the SWRCB Strategic Plan" (revised July 2005). The RWQCB is in the process of addressing updated strategic objectives in the development of the RWQCB's "Practical Vision". While the RWQCB Practical Vision is in the development phase and a draft has not yet been distributed for public review and comment, RWQCB staff presented key priority themes (see Table 2-2) to the Work Group that are expected to be emphasized within the Practical Vision document. In presenting these priority themes, RWQCB staff also advised that IRWM and RWQCB collaboration should be directed toward the shared IRWM/RWQCB goals of improving water quality and environmental conditions.

Table 2-2
Summary of IRWM Plan and RWQCB Missions and Objectives

RWQCB	IRWM Plan
Mission: Preserve and enhance the quality of California's water resources and to ensure their proper allocation and efficient use for the benefit of present and future generations.	**Mission:** To develop and implement an integrated strategy to guide the San Diego Region toward protecting, managing, and developing reliable and sustainable water resources. Through a stakeholder-driven process and adaptive process, the Region can develop solutions to water-related issues and conflicts that are economically and environmentally preferable, and that provide equitable resource protection for the entire Region.
Priority Themes[1] • Support recovery of wetlands and riparian areas • Ensure the health of ground and surface waters • Support sustainable local water supplies • Effective monitoring and assessment • Effective public communication and stakeholder input	**2007 IRWM Plan Objectives**[2] • Maximize stakeholder/community involvement and stewardship • Effectively obtain, manage, and assess water resource data and information • Further the scientific and technical foundation of water management • Develop and maintain a diverse mix of water resources • Construct, operate, and maintain a reliable infrastructure system • Reduce the negative effects on waterways and watershed health caused by hydromodification and flooding • Effectively reduce sources of pollutants and environmental stressors • Protect, restore and maintain habitat and open space • Optimize water-based recreational opportunities

1 Priority themes identified by RWQCB staff as being presented within the current draft RWQCB "Practical Vision", which sets forth the RWQCB's proposed strategic plan for the next five years.
2 Objectives identified in 2007 San Diego Region IRWM Plan.

As shown in Table 2-2, strong parallels exist between the RWQCB priority themes and objectives established in the 2007 IRWM Plan. Work Group Workshop Nos. 2 and 3 focused on exploring and identifying issue of common interest between the RWQCB and IRWM program. Potential issues of mutual interest identified in the workshop can be grouped into the following five categories:

I. *Enhancing Communication and Stakeholder Input*
II. *Basin Plan Support*
III. *303(d)/TMDL Support*
IV. *Effective Data Management and Assessment*
V. *Restoration and Mitigation Support*

I. Enhancing Communication and Stakeholder Input. The RWQCB priority themes and IRWM Plan objectives each emphasize public communication and stakeholder input. The Work Group identified a number of potential issues of mutual IRWM/RWQCB interest related to communication and stakeholder input, including:

I.A Improve top-level communication between the IRWM Program and RWQCB.

I.B Educate permittees on RWQCB issues.

I.C Improve understanding of RWQCB staff of issues facing permittees.

I.D Ensure stakeholder input to State Board and EPA on San Diego Region issues.

I.E Enhance stakeholder awareness of RWQCB issues, priorities, and decisions.

I.F Improve coordination between IRWM resources and RWQCB resource needs.

I.G Improve coordination between the San Diego RWQCB and IRWM Program and other state regions.

Appendix B presents the rationale for IRWM and RWQCB interest in improving communication in these areas.

II. Basin Plan Support. RWQCB water quality standards, implementation policies, and requirements are established within the Basin Plan. The Basin Plan affects all areas of water quality regulation within the San Diego Region, and is of critical importance in influencing water resources management in the Region.

CWA Section 303(c) and the Porter-Cologne Act require the RWQCB to update the Basin Plan a minimum of every three years, but many of the Basin Plan water quality objectives and implementation policies date to the original 1975 version of the Basin Plan. The most recent Basin Plan triennial review process was completed in 2011, and included significant stakeholder involvement through a Triennial Review Advisory Committee (TRAC). An IRWM representative served on the 2011 TRAC. The RWQCB's 2011 triennial review process (see Attachment A) identified a wide array of potential Basin Plan modifications or evaluations to consider, but concluded that only a fraction of the modifications could be addressed due to limited RWQCB resources.[1]

The Work Group acknowledged the overarching importance of the Basin Plan in almost all areas of regional water management, and identified a number of potential issues of mutual IRWM/RWQCB interest, including:

II.A Address the lack of RWQCB staff resources to assess prioritized Basin Plan modifications.

II.B Update scientific assessments of relations between Basin Plan objectives and beneficial use protection.

II.C Develop outcome-based biological objectives to protect beneficial uses.

1 *2011 Review of the Water Quality Control Plan for the San Diego Basin (Basin Plan) Final Staff Report* (RWQCB, 2011) identified 25 potential Basin Plan modification efforts to make the Basin Plan more protective, and 33 to make the Basin Plan more reasonable. (See Appendix A) The staff report, however, concluded that only 6.0 personnel-years were available to address Basin Plan issues, and that only six of the Basin Plan modification efforts could be addressed under the anticipated resources.

II.D Enhance stakeholder input to the Basin Plan modification process.

II.E Support development of Salt and Nutrient Management Plans (SNMPs) required under the State Board's Recycled Water Policy.[2]

II.F Update the Basin Plan to account for seasonal or flow-based water quality protection needs.

II.G Update the Basin Plan to promote and accommodate indirect potable reuse.

Appendix B presents the rationale for IRWM and RWQCB interest in the above Basin Plan issues. Each of the identified issues of interest support and address the RWQCB priority themes of (1) ensuring the health of ground and surface waters, and (2) supporting sustainable local water supplies. The identified issues of potential interest also reflect the lack of existing RWQCB staff resources to address and evaluate important Basin Plan modifications.

III. 303(d)/TMDL Support. Under delegated authority from EPA, the RWQCB is responsible for implementing provisions of Section 303(d) of the Clean Water Act (CWA). Pursuant to CWA Section 303(d), the RWQCB identifies surface waters not complying with applicable water quality standards (impaired waters), and establishes priorities and schedules for the preparation Total Daily Maximum Load (TMDL) and waste load allocations required to attain and maintain the standards. The RWQCB is required to update the 303(d) impaired water body list a minimum of every two years.

Work Group attention focused on how impaired water 303(d) listings and TMDL schedules can affect significantly affect regional water management. The Work Group acknowledged that federal regulations and State Board policy establish significant constraints under which the RWQCB must operate in addressing 303(d) impaired water listings. Within the constraints within which the RWQCB must operate, however the Work Group identified a series of potential issues of interest related to 303(d) listing, 303(d) delisting, and TMDLs, including:

III.A Enhance stakeholder input to the 303(d) listing process.

III.B Reevaluate appropriateness of including imported water storage reservoirs in the 303(d) listings.

III.C Ensure that existing and proposed 303(d) listings are based on science and robust data.

III.D Assess the potential for streamlining the 303(d) delisting process.

2 The State Board's 2009 Recycled Water Policy requires RWQCBs to support recycled water use and develop SNMPs for each California groundwater basin by 2014 (or by 2016 with approved extensions). The SNMP evaluations would assess salinity management opportunities to be considered in managing water quality within each groundwater basin, and would allow for a determination of whether existing Basin Plan groundwater quality objectives are appropriate for protecting beneficial uses.

Appendix B presents the rationale for IRWM and RWQCB interest in the 303(d)/TMDL issues of interest. Each of the identified issues of interest support the RWQCB priority themes of ensuring the health of ground and surface waters and supporting sustainable local water supplies.

IV. Effective Data Management and Assessment. RWQCB staff cited effective monitoring and assessment as a RWQCB priority theme to be addressed in the RWQCB Practical Vision. The IRWM Plan also includes an objective related to effective monitoring and assessment.

Effective monitoring and assessment has been the focus of the RWQCB's development of a regional monitoring and assessment framework[3] that focuses on reducing discharger-based "end-of-pipe" monitoring in favor of a question-driven regional water body-based monitoring and assessment program. The water body-based monitoring and assessment program would be directed toward assessing the health of water bodies, identifying the causes of adverse conditions, and evaluating the effectiveness of management actions.

The Work Group expressed support for this ongoing RWQCB regional monitoring effort, and identified the following issues of mutual IRWM/RWQCB interest in achieving this goal:

IV.A Improve standardization of data collection and assessment.

IV.B Eliminate disincentives for data collection and transfer.

IV.C Eliminate duplicative data collection, management, and assessment efforts.

IV.D Ensure that collected data are useful and effectively analyzed, and focus on question-driven issues.

Appendix B presents the rationale for IRWM and RWQCB interest in these data management and assessment issues.

V. Habitat Restoration and Recovery. The RWQCB priority themes and IRWM Program goals each focus on wetlands and riparian habitat restoration, recovery, and protection. Work Group participants identified the following potential issues of interest that could help support the mutual RWQCB and IRWM objectives of effective habitat protection and restoration:

V.A Streamline permitting requirements for stormwater system maintenance (both routine and emergency maintenance), invasive species removal, and ecosystem restoration.

V.B Prioritize regional restoration and habitat protection needs.

3 As set forth in the RWQCB "A Framework for Monitoring and Assessment in the San Diego Region (Working Draft, May 2012). Available at: www.srwcb.ca.gov/sandiego/board_info/agendas/2012/jun/item9/eosr0612MonitoringFramework.SD1.pdf

V.C Improve IRWM support for cleanup and abatement efforts.

V.D Identify and pre-approve Supplemental Environmental Projects (SEPs) that achieve mutual RWQCB and IRWM goals.

V.E Develop and maintain mitigation banks.

V.F Improve coordination between Cleanup and Abatement (CAA) funding and funding/support for SEPs.

Appendix B summarizes the Work Group rationale for these issues of interest.

2.3 Desired Outcomes of IRWM/RWQCB Collaboration

Work Group Prioritization Exercise. Work Group Workshop No. 3 focused on organizing and prioritizing the potential issues of mutual IRWM/RWQCB interest. As part of the workshop, a three-step prioritization exercise was conducted in which Work Group members participated in:

- a polling exercise to determine which of the potential issues of interest received strong and broad Work Group support,
- follow-up discussion to determine if any of the issues of interest should be refined or combined, and
- a final Work Group exercise to identify which of the issues of potential interest are deemed to represent the highest importance for potential RWQCB and IRWM collaboration.

Prioritization of Issues of Interest. Through this process, the Work Group identified a priority issue of interest from each of the five issue categories. Results of the prioritization exercise are summarized in Table 2-3 (page 2-8).

Focus on Desired Outcomes. After reviewing the priority issues of interest (see Table 2-3), the Work Group agreed that:

- communication and data management represented tools or processes to achieve desired outcomes, and
- the IRWM/RWQCB collaborative effort should focus on "desired outcomes" where the IRWM Program can play a role to support both the RWQCB's stated priority themes and the IRWM Program mission and goals.

Table 2-3
Summary of Work Group Priority Issues of Interest

Priority Issue of Interest	Basis of Work Group Support for Issue of Interest
I. Communication and Stakeholder Input Improve understanding between regulators and stakeholders.	• Belief that permittees could better understand RWQCB issues and the RWQCB could better understand stakeholder issues. • Acknowledgement that both the RWQCB and IRWM program already promote stakeholder input and water quality understanding, and that the RWQCB participates in RAC meetings and RAC workshops. • Acknowledgement that RWQCB has implemented stakeholder input processes for 303(d) listings and Basin Plan modifications.
II. Basin Planning Update scientific assessments of relations between Basin Plan objectives and beneficial use protection, including addressing seasonal and flow-dependent beneficial use protection needs.	• Strong and broad Work Group support for an initiative to develop outcome-based objectives that scientifically relate water quality objectives to beneficial use protection needs. • Development of outcome-based objectives is in keeping with stated RWQCB priorities of ensuring the health of ground and surface waters and developing sustainable water supplies. • Acknowledgement that the RWQCB and State Board are working toward the development of outcome-based biological objectives. • Acknowledgement that additional RWQCB resources will be required to take on the challenge of developing outcome-based objectives, and that the IRWM Program could provide resources. • Recognition that sensible science-based Basin Plan modifications may be required to support and promote recycled water use, imported raw water storage, and indirect potable reuse. • Recognition that additional resources may be necessary to develop SNMPs required under the State Recycled Water Policy. • Belief that "one-size-fits-all" objectives may not be protective of beneficial uses, and that beneficial use protection needs may vary with season or with streamflow.
III. 303(d)/TMDL Support Ensure 303(d) listings are based on science and robust data.	• EPA regulations and State implementation policies establish processes and statistical methodology for listing and delisting 303(d) constituents, and stakeholder input must work within the constraints of this methodology. • 303(d) listings for imported water reservoirs are not consistent with regional water management needs and may constrain the RWQCB and regional water agencies from implementing indirect potable reuse as a sustainable source of potable supply. • Establishing appropriate science-based Basin Plan water quality objectives that are consistent with regional water management needs and beneficial uses can support the process for ensuring that 303(d) listings are also science-based.
IV. Effective Data Collection and Management Ensure that collected data are useful and effectively analyzed.	• Work Group consensus is in keeping with the stated RWQCB priority of developing a revised framework for regional monitoring and assessment. • Strong Work Group support exists for the regional outcome-based monitoring strategy proposed by the RWQCB.
V. Habitat Restoration and Recovery Regional coordination and prioritization of restoration needs and opportunities.	• Regional coordination and prioritization of restoration needs and opportunities is in keeping with the RWQCB priority of promoting habitat restoration and recovery. • Stormwater channel maintenance and invasive species removal are critical activities that can benefit the Region's water quality and habitat objectives while addressing public safety concerns. • Strong and broad Work Group support exists for IRWM Program collaboration with resource agencies and the RWQCB to identify restoration priorities and opportunities. • Acknowledgement that this effort could lead to the development of pre-approved Supplemental Environmental Projects (SEPs) that are in keeping with prioritized regional restoration needs.

Desired Outcomes and Rationale. The Work Group selected the following desired outcomes for IRWM/RWQCB collaboration:

Desired Outcome No. 1: Support Science-Based Basin Plan Objectives. Support the RWQCB triennial review process and RWQCB programs and efforts to update science-based assessments of relations between Basin Plan objectives and beneficial use protection.

Desired Outcome No. 2: Support Science-Based Impaired Water Listings and Compliance. Support RWQCB programs and efforts to (1) update impaired water listings that are based on science and robust data and (2) achieve water quality compliance and protect beneficial uses.

Desired Outcome No. 3: Support Prioritization of Habitat Restoration Needs and Opportunities. Support the RWQCB in implementing a process for prioritizing wetlands and riparian habitat restoration needs and opportunities, and coordinate with resource agencies to address regional restoration needs and issues.

Table 2-4 summarizes how the desired outcomes identified by the Work Group parallel the priority themes being addressed within the RWQCB Practical Vision.

Table 2-4
Conformance of Work Group Desired Outcomes with RWQCB Priority Themes

RWQCB Practical Vision Priority Theme	Desired Outcome for IRWM/RWQCB Collaboration		
	1. Basin Plan Support Support the RWQCB triennial review process and RWQCB programs and efforts to update science-based assessments of relations between Basin Plan objectives and beneficial use protection	**2. Impaired Water Support and Compliance** Support RWQCB programs and efforts to (1) update impaired water listings that are based on science and robust data and (2) achieve water quality compliance and protect beneficial uses	**3. Habitat Restoration Support** Support the RWQCB in implementing a process for prioritizing wetlands and riparian habitat restoration needs and opportunities, and coordinate with resource agencies to address regional restoration needs and issues
Innovative restoration			●
Ensure health of ground and surface waters	●	●	●
Supporting sustainable local water supplies	●	●	
Effective monitoring and assessment	●	●	●
Effective public communication and stakeholder input	●	●	●

Desired Outcome No. 1: Support Science-Based Basin Plan Objectives. Basin Plan support was cited by the Work Group as a key potential area for IMWM/RWQCB collaboration. The Work Group noted that the development of scientific based water quality objectives (see R-26 in Appendix A) was considered as part of the most recent RWQCB Basin Plan triennial review process, but was not given a top priority within the most recent triennial review. The Work Group also noted, however, that ensuring the scientific basis of Basin Plan water quality objectives is a key concept embedded within the RWQCB's priority themes of ensuring the health of ground and surface waters and supporting sustainable local water supplies.

Resources provided through the IRWM Program could allow the RWQCB to more rapidly address Basin Plan triennial review priorities that involve scientific assessment of Basin Plan water quality objectives. For example, IRWM Program resources may allow the RWQCB to address a range of Basin Plan issues related to supporting sustainable local water supplies, including:

- developing a Basin Plan policy and water quality objectives consistent with supporting indirect potable reuse and other sustainable supplies,
- developing Basin Plan objectives consistent with SNMPs prepared pursuant to the State's Recycled Water Policy, and
- evaluating the appropriateness of flow-dependent or season-dependent water quality objectives.

Precedent exists for coordination between the IRWM Program and RWQCB to evaluate science-based Basin Plan water quality objectives. A current IRWM-funded effort is underway to address Basin Plan Modification R-16, which addresses nutrient objectives based on the Numeric Nutrient Endpoint (NNE) framework (see Appendix A). The project, led by the County of San Diego with support from an array of Santa Margarita River watershed stakeholders, involves IRWM funding support for river monitoring, modeling, and data evaluation to support site-specific NNE objectives for the lower Santa Margarita River basin and estuary. The project also involves funding a RWQCB staff position to support RWQCB review of NNE-based site-specific nutrient objectives.

Desired Outcome No. 2: Support Science-Based Impaired Water Listings and Compliance. The Work Group noted the importance of the ongoing RWQCB programs to evaluate Basin Plan compliance, update 303(d) impaired water listings, and pursue TMDLs to achieve compliance. To support the RWQCB's priority themes of ensuring the health of ground and surface waters and supporting sustainable water supplies, IRWM Program support could allow the RWQCB to allocate resources to enhance efforts to address such 303(d)-related issues as:

- developing a Basin Plan policy regarding the 303(d) listing of potable water reservoirs,
- reclassifying 303(d) listings for potable water reservoirs to support indirect potable reuse, imported water storage, and sustainable local supply,
- resolving existing 303(d) listings and scheduled TMDLs through the development of site-specific objectives that support beneficial uses, and
- supporting projects and actions that improve water quality, protect beneficial uses, and attain Basin Plan water quality objectives.

Desired Outcome No. 3: Support Prioritization of Habitat Restoration Needs and Opportunities. The Work Group noted that habitat preservation, ecosystem restoration, and supporting the recovery of wetlands and riparian habitats represent significant IRWM Program and RWQCB objectives, and strong and broad Work Group support existed for supporting such efforts. In particular, the Work Group noted the potential for the IRWM Program to support the RWQCB's habitat recovery priorities through assisting the RWQCB in:

- developing and maintain a list of wetlands and riparian habitat restoration needs and opportunities, and
- coordinating use of the RWQCB SEP process or other compensatory mitigation programs to support priority wetlands and riparian habitat restoration and recovery efforts.

In discussing Desired Outcome No. 3, a number of work group participants also noted the need for fostering improved coordination among resource agencies (e.g. U.S. Fish & Wildlife Service, U.S. Army Corps of Engineers, California Department of Fish and Wildlife) to better and more efficiently achieve joint IRWM Program and RWQCB habitat restoration and recovery goals.

Section 3

RECOMMENDED COLLABORATIVE STRATEGIES

3.1 Potential IRWM Support Mechanisms

RWQCB Support Needs. In recognition of the limited available RWQCB resources and staffing, collaboration between the RWQCB and IRWM Program may be most useful to the RWQCB in areas where such collaboration:

- assists the RWQCB in executing their statutory responsibilities and in complying with state and federal mandates,
- results in increased regulatory resources or efficiency,
- does not result in increased RWQCB staff workloads,
- assists the RWQCB in stakeholder involvement,
- assists the RWQCB in prioritizing and addressing regional water quality problems, and
- generates measurable outcomes that demonstrate conformance with applicable water quality standards, requirements and policies.

IRWM Program Support Assets. The Work Group recommended that potential IRWM/RWQCB collaborative strategies be identified and organized around the assets or benefits that the IRWM Program can provide. As an initial step to identifying potential IRWM/RWQCB collaborative opportunities, the Work Group in Workshop No. 4 identified the following four areas where the IRWM Program can offer support to the RWQCB:

Vision and Advocacy. In establishing regional water management goals and promoting integrated solutions to regional water management issues, the IRWM Program process provides regional leadership, coordination, advocacy, and vision.

Technical Expertise. RWMG and RAC organizations offer a wide variety of technical expertise in regional water management and water quality issues.

Stakeholder Coordination. The stakeholder-driven IRWM Program and its governance structure focus on stakeholder identification, outreach and input, including targeted outreach to disadvantaged communities and tribes. Additionally, the IRWM stakeholders are (1) tasked with approaching water management issues from a regional perspective, and (2) encouraged to seek coordinated and integrated solutions to the management issues.

Project Funding. The IRWM Program provides a regional mechanism for evaluating, prioritizing, and allocating Proposition 50 and Proposition 84 funding to optimize attainment of the Region's water management goals and objectives.

Approach. For purposes of identifying potential IRWM/RWQCB collaborative opportunities, the Work Group recognizes that collaborative actions may include:

- Overarching actions to support the IRWM/RWQCB collaboration process and support all desired outcomes.
- Actions directed toward support of Desired Outcome No. 1 (Support the RWQCB triennial review process and RWQCB programs and efforts to update science-based assessments of relations between Basin Plan objectives and beneficial use protection.)
- Actions directed toward support of Desired Outcome No. 2 (Support RWQCB programs and efforts to (1) update impaired water listings that are based on science and robust data and (2) achieve water quality compliance and protect beneficial uses.)
- Actions directed toward support of Desired Outcome No. 3 (Support the RWQCB in implementing a process for prioritizing wetlands and riparian habitat restoration needs and opportunities, and coordinate with resource agencies to address regional restoration needs and issues.)

Action Items and Follow-Up Actions. The Work Group also recognized that IRWM/RWQCB collaboration will involve an ongoing process. Actions recommended for immediate implementation (deemed "early action items") and IRWM Plan update actions are presented as a means of initiating IRWM/RWQCB collaboration efforts toward achieving the three designated outcomes. Additional follow-up actions are recommended for consideration after implementation of the early action items and IRWM Plan update.

3.2 Recommended Action Plan to Achieve Desired Outcomes

Recommended Overarching Support Actions. The IRWM Program structure provides opportunity within a stakeholder-driven environment for the development and advocacy of integrated solutions to San Diego Region water management issues that achieve multiple IRWM Plan objectives and RWQCB priority themes. Pursuing and promoting IRWM/RWQCB collaboration in achieving the desired outcomes, in part, will be dependent on:

- improving ongoing communication between the IRWM Program and RWQCB, and
- ensuring consistency between the updated IRWM Plan and RWQCB Practical Vision.

Table 3-1 (page 3-3) presents early actions items, IRWM Plan update actions, and potential follow-up actions recommended by the Work Group to achieve the overarching objectives of improving IRWM/RWQCB communication and seeking opportunities for consistency between the IRWM Plan and RWQCB Practical Vision. Table 3-1 also indicates the types of IRWM Program assets involved in supporting the recommended actions.

Table 3-1
Recommended Overarching Actions to Support IRWM/RWQCB Collaboration

Objective to Facilitate Desired Outcomes	**Recommended Overarching Support Actions to Achieve Desired Outcomes**		
	Recommended Early Action Item	**Recommended IRWM Plan Update Action**	**Potential Follow-Up Action**
	Vision & Advocacy / Stakeholder Communication		
Improve communication between the IRWM Program and RWQCB	• Assign an IRWM liaison to the RWQWCB • Provide RWQCB with periodic IRWM progress report for inclusion in Executive Officer reports to the RWQCB	NA	• Organize informational workshops, discussion sessions, or seminars that allow RWQCB staff to educate stakeholders on regulatory issues or allow stakeholders/agencies to educate the RWQCB on stakeholder issues.
	Vision & Advocacy / Stakeholder Communication		
Ensure consistency between IRWM Plan and RWQCB Practical Vision	• Monitor development of RWQCB Practical Vision • Coordinate with RWQCB to ensure consistency between IRWM Plan and RWQCB Practical Vision	• Incorporate priority themes from RWQCB Practical Vision into updated IRWM Plan	• Organize IRWM/RWQCB Coordination Group to periodically meet to discuss water quality and water management issues of mutual interest and RWQCB water quality protection priorities

As noted, overarching actions recommended in Table 3-1 would support each of the three desired IRWM/RWQCB collaborative outcomes. Early action items and IRWM Plan update actions are recommended for immediate consideration and implementation. Potential follow-up actions are recommended for IRWM and RWQCB consideration once the early action items are completed.

Recommended Actions to Support Desired Outcome No. 1. Desired Outcome No. 1 focuses on supporting the RWQCB triennial review process and RWQCB programs and efforts to update science-based scientific assessments of relations between Basin Plan objectives and beneficial use protection. Included as part of this desired outcome is the assessment of the appropriateness of flow-based or seasonal objectives.

The 2011 Basin Plan triennial review (see Appendix A) concluded that existing RWQCB resources are available to assess outcome-based biological objectives (P-9) and NNE-based nutrient objectives (R-16). The triennial review concluded that existing RWQCB resources were not available within the next two years to assess:

- water quality objectives for flow (P-10),
- flow-based or seasonal-based water quality objectives (R-12),
- objectives in imported water storage reservoirs (R-21),
- objectives to support indirect potable reuse (R-22 and R-23), and
- other objectives that may require assessment based on updated data and science (R-26).

The Work Group acknowledged that additional resources may allow the RWQCB to address a number of Basin Plan modifications identified within the 2011 triennial review that scientifically address relations between water quality and beneficial uses. Further, the Work Group noted that supplemental RWQCB resources may allow other Basin Plan modification efforts (over and above those assessed in the 2011 triennial review) to be considered and funded.

The Work Group identified the following objectives for facilitating Desired Outcome No. 1 in order to support the ongoing RWQCB process for scientific update of Basin Plan water quality objectives:

- identify science-based Basin Plan modifications that may warrant higher priority than provided in the 2011 RWQCB triennial review,
- identify research, data collection, data management, data assessment, and resources required to support the RWQCB's process for science-based evaluation of the prioritized Basin Plan objectives, and
- support and secure funding for research, data collection, data management, data assessment and resources required to support the RWQCB's process for science-based evaluation of the prioritized Basin Plan objectives.

Table 3-2 (page 3-5) presents early action items, IRWM Plan update actions, and potential follow-up actions recommended by the Work Group to achieve objectives required to facilitate Desired Outcome No. 1. Table 3-2 also indicates the types of IRWM Program assets involved in supporting the recommended actions. As shown in Table 3-2, as a recommended early action item to support Desired Outcome No. 1, an initial caucus of IRWM stakeholders would be convened to:

- review existing RWQCB Basin Plan triennial review priorities, allocated RWQCB resources, and schedules,
- identify additional Basin Plan review priorities of interest to IRWM stakeholders, and
- determine IRWM stakeholder interest in coordinating with and supporting the RWQCB to address the additional identified Basin Plan review priorities.

Table 3-2
Recommended IRWM/RWQCB Collaborative Actions to Support Desired Outcome No. 1
Support Science-Based Basin Plan Objectives

Objective to Facilitate Desired Outcome	Recommended Actions to Achieve Desired Outcome No. 1		
	Recommended Early Action Item	Recommended IRWM Plan Update Action	Potential Follow-Up Action
	Technical Expertise / Stakeholder Communication		
Identify science-based Basin Plan modifications that may warrant higher priority than provided in 2011 triennial review	• Convene caucus of IRWM stakeholders to (1) review existing RWQCB Basin Plan triennial review priorities, allocated RWQCB resources, and schedules, (2) identify additional Basin Plan review priorities of interest to IRWM stakeholders, and (3) determine IRWM stakeholder interest in supporting the RWQCB to address the additional Basin Plan review priorities • Organize IRWM stakeholder participation in the RWQCB Triennial Review process to discuss and promote priority RWQCB action on the Basin Plan issues targeted by IRWM stakeholders	NA	NA
	Technical Expertise / Stakeholder Communication		
Identify research, data collection, data management, data assessment, and resources required to support the RWQCB's process for science-based evaluation of the prioritized Basin Plan objectives	• Organize IRWM stakeholder participation in the RWQCB Triennial Review process to discuss and promote research, data collection, data management, data assessment, and resources required to address identified objectives that warrant scientific update or development of site-specific objectives	NA	• Identify specific projects that address scientific update of Basin Plan objectives • Identify parties that would conduct identified research, data collection, and scientific assessment • Convene expert/stakeholder workshop with RWQCB to evaluate regional monitoring framework progress and identify monitoring and database requirements to support Basin Plan scientific update
	Project Funding		
Support and secure funding required for research, data collection, data management, data assessment and resources required to support the RWQCB's process for science-based evaluation of the prioritized Basin Plan objectives	NA	• Update IRWM Plan and modify project funding screening criteria to encourage data collection, data management, or data assessment projects that support the development of science-based Basin Plan objectives or site-specific objectives	• Prepare IRWM funding applications for research, data collection, and scientific update of Basin Plan objectives • IRWM approval of funds for research, data collection, and scientific update of Basin Plan objectives

After IRWM stakeholders have identified science-based Basin Plan objectives basin objectives that warrant IRWM resources and priority action, the Work Group recommended organized and ongoing IRWM stakeholder participation in the Triennial Review process to:

- discuss and promote Basin Plan modification priorities identified by IRWM stakeholders,
- discuss research, data collection, data management, data assessment, and resources required to support scientific evaluation of the additional Basin Plan priorities, and
- discuss actions by the RWQCB and IRWM stakeholders required to support evaluation of the additional Basin Plan priorities.

Recommended IMWM Plan update actions include modifying IRWM Plan funding screening and scoring criteria to encourage IRWM funding for research and development of science-based water quality objectives that support RWQCB priority themes and IRWM Program goals.

Recommended Actions to Support Desired Outcome No. 2. Desired Outcome No. 2 focuses on supporting RWQCB programs and efforts to (1) update impaired water listings that are based on science and robust data and (2) achieve water quality compliance and protect beneficial uses.

Within the procedural constraints established within EPA and State Board regulations, the Work Group's intent in formulating Desired Outcome No. 2 is to ensure that 303(d) listings are based on science, robust data, and are reflective of water quality impairment and protection needs. The Work Group acknowledged that scientific update of Basin Plan objectives may influence 303(d) listings and water quality protection needs, particularly in instances where SSOs are developed as part of Basin Plan updates or in parallel with development of TMDLs.

While the Work Group did not focus on any particular receiving water or 303(d) listings that warranted scientific update, the Work Group noted that an update of Basin Plan policies to address imported water storage or indirect potable reuse may influence 303(d) listings for a number of the Region's potable water reservoirs. The Work Group also expressed concerns that some 303(d) listings may have proceeded and been approved on the basis of limited data sets or data skewed to particular flow or time-of-year conditions.

To facilitate Desired Outcome No. 2 and support the RWQCB process for 303(d) evaluations, IRWM/RWQCB collaborative objectives include:

- identify existing 303(d) listings that may warrant re-evaluation or re-classification on the basis of limited data, out-of-date data, or non-representative data,
- identify projects or processes that could improve water quality of 303(d) listed waters and attain water quality objectives,

- identify research, data collection, data management, data assessment, and resources required to support the RWQCB's process for science-based evaluation of the prioritized 303(d) listings, and
- support and secure funding for research, data collection, data management, data assessment, and resources required to support the RWQCB's process for science-based evaluation of the prioritized 303(d) listings.

Table 3-3 (page 3-8) presents early action items, IRWM Plan update actions, and potential follow-up actions recommended by the Work Group to achieve objectives required to facilitate Desired Outcome No. 2. Table 3-3 also indicates the types of IRWM Program assets involved in supporting the recommended actions. As a recommended initial early action item to support Desired Outcome No. 2, a caucus of IRWM stakeholders would be convened to:

- review the current RWQCB 303(d) lists,
- identify 303(d) listings that may conflict with IRWM goals and may warrant scientific update or re-classification, and
- determine IRWM stakeholder interest in coordinating with and supporting RWQCB reassessment or reclassification of the identified 303(d) listings of concern.

After IRWM stakeholders have identified 303(d) listings that may warrant update, the Work Group recommended organized and ongoing IRWM stakeholder participation in the RWQCB 303(d) review stakeholder process to:

- discuss and prioritize 303(d) receiving waters identified by IRWM stakeholders that may warrant reevaluation or reclassification,
- discuss and allocate data collection, data management, data assessment, and resources required to reevaluate or reclassify the identified priority 303(d) listings, and
- discuss actions by RWQCB and IRWM stakeholders required support reevaluation or reclassification of the identified 303(d) listings.

Either as part of the RWQCB 303(d) stakeholder input process or as part of separate joint workshops with the RWQCB, the Work Group recommended IRWM collaboration with the RWQCB to discuss:

- potential IRWM projects or actions that could improve water quality and attain water quality objectives, and
- potential alternatives to traditional TMDLs for attaining water quality objectives.

Recommended IMWM Plan update actions include modifying IRWM Plan funding screening and scoring criteria to encourage projects that support science-based data collection, data management, and data assessments for reevaluating or reclassifying impaired water 303(d) listings

Table 3-3
Recommended IRWM/RWQCB Collaborative Actions to Support Desired Outcome No. 2
Support Science-Based Impaired Water Listings and Compliance

Objective to Facilitate Desired Outcome	Recommended Actions to Achieve Desired Outcome No. 2		
	Recommended Early Action Item	**Recommended IRWM Plan Update Action**	**Potential Follow-Up Action**
	Technical Expertise / Stakeholder Communication		
Identify existing 303(d) listings that may warrant re-evaluation or re-classification	• Convene caucus of IRWM stakeholders to (1) review existing 303(d) listings, (2) identify 303(d) listings that may warrant reevaluation or reclassification, and (3) determine IRWM stakeholder interest in supporting RWQCB reassessment or reclassification of the identified 303(d) listings of concern. • Organize IRWM stakeholder participation in the RWQCB Triennial Review process to discuss and prioritize 303(d) receiving waters that warrant reevaluation or reclassification in order to better support IRWM goals and RWQCB Practical Vision priorities	NA	NA
	Technical Expertise / Stakeholder Communication		
Identify projects or actions that could improve water quality of 303(d) listed waters and attain water quality objectives	• Promote discussion among RWQCB and IRWM stakeholders to identify (1) projects that could improve water quality of 303(d) listed waters and (2) alternative means to traditional TMDLs to achieve water quality objectives	NA	[see Project Funding]
	Technical Expertise / Stakeholder Communication		
Identify research, data collection, data management, data assessment, and resources required to support the RWQCB's process for science-based evaluation of the prioritized 303(d) listings	• Organize IRWM stakeholder participation in the RWQCB 303(d) review process to discuss and prioritize data collection, data management, data assessment and resources required to reevaluate or reclassify 303(d) listings	NA	• Identify parties that would conduct identified monitoring and data evaluation • Convene expert/stakeholder workshop with RWQCB to evaluate regional monitoring framework progress and identify monitoring and database requirements to support scientific assessment of 303(d) listings
	Project Funding		
Support and secure funding for research, data collection, data management, data assessment, and resources required to support the RWQCB's process for science-based evaluation of the prioritized 303(d) listings	NA	• Update IRWM Plan and modify project funding screening criteria to encourage data collection, data management, or data assessment projects that support science-based 303(d) reevaluation or reclassification efforts	• Prepare IRWM funding applications for research, data collection, and/or data assessments to support science-based 303(d) listings • IRWM approval of funds for research, data collection, and scientific update of Basin Plan objectives

Recommended Actions to Support Desired Outcome No. 3. Desired Outcome No. 3 focuses on supporting the RWQCB in implementing a process for prioritizing wetlands and riparian habitat restoration needs and opportunities, and coordinating with resource agencies to address regional restoration needs and issues.

The Work Group acknowledged the potential difficulty in organizing a regional restoration or coordination effort, but strong and broad Work Group support existed for IRWM and RWQCB collaboration to promote an effort to coordinate and prioritize restoration and mitigation opportunities. Additionally, while RWQCB staff did not express interest in (or indicate available resources for) maintaining a pre-approved SEP list, the Work Group noted potential value in the IRWM Program pursuing opportunities with RWQCB staff for enhancing restoration opportunities through the use of SEPs or other compensatory mitigation programs.

The following facilitating objectives were identified by the Work Group for supporting Desired Outcome No. 3:

- develop and maintain a list of wetlands and riparian habitat restoration needs and opportunities,
- evaluate potential opportunities for coordinating the RWQCB SEP process and/or other compensatory mitigation programs to fund and promote prioritized wetlands and riparian habitat restoration and recovery efforts, and
- support and secure funding for wetlands and riparian habitat restoration and recovery efforts.

Table 3-4 (page 3-10) presents early action items, IRWM Plan update actions, and follow-up actions recommended by the Work Group to achieve objectives required to facilitate Desired Outcome No. 3. Table 3-4 also indicates the types of IRWM Program assets involved in supporting the recommended actions.

Initial recommended early action items focus on meeting with stakeholders and regulatory agencies to assess and promote opportunities for coordinating stormwater system maintenance, invasive species removal, and regional restoration and mitigation efforts.

Additional Resource Agency Coordination. In addition to the above-listed facilitating objectives for Desired Outcome No. 3, a number of work group participants also noted the need for fostering improved coordination among resource agencies to better and more efficiently achieve joint IRWM Program and RWQCB habitat restoration and recovery goals.

The Work Group noted that a number of resource agencies (including the RWQCB) are involved in reviewing and approving restoration, stormwater system maintenance, and invasive species removal. Work Group participants further noted that restoration, invasive species removal, or stormwater system maintenance efforts may be complicated by conflicting requirements from the range of resource agencies for which approval is required.

Table 3-4
Recommended IRWM/RWQCB Collaborative Actions to Support Desired Outcome No. 3
Support Prioritization of Habitat Restoration Needs and Opportunities

Objective to Facilitate Desired Outcome	Recommended Actions to Achieve Desired Outcome No. 3		
	Recommended Early Action Item	**Recommended IRWM Plan Update Action**	**Potential Follow-Up Action**
	Technical Expertise / Stakeholder Communication		
Develop and maintain a list of wetlands and riparian habitat restoration needs and opportunities	• Convene meeting with regulators and IRWM stakeholders to discuss: • means of identifying, coordinating, and prioritizing restoration needs and opportunities • a potential action plan for developing and maintaining a habitat restoration needs and opportunities priority list	NA	• Organize regional work group to (1) coordinate with stakeholders and resource agencies, (2) evaluate regional restoration needs, opportunities, and priorities, (3) develop a draft restoration priorities list, (4) vet the priorities list through the RWQCB and resource agencies, and (5) periodically review and revise the list
	Technical Expertise / Stakeholder Communication		
Evaluate potential opportunities for coordination of the RWQCB SEP process and other compensatory mitigation programs to support and promote habitat restoration and recovery	• Convene meeting with RWQCB to assess means for coordinating IRWM Program support with the RWQCB SEP process and other compensatory mitigation programs	NA	NA
	Project Funding		
Support and secure funding for wetlands and riparian habitat restoration and recovery efforts	NA	• Update IRWM Plan and modify project funding screening criteria to encourage projects that (1) coordinate with stakeholders and resource agencies to evaluate regional restoration needs, opportunities, and priorities, (2) develop a draft restoration priorities list, (3) obtain resource agency approval of the list, and/or (4) maintain and update the priorities list	• Prepare IRWM funding applications to provide resources for funding a regional restoration prioritization efforts • IRWM approval of funds for regional restoration prioritization effort

Within the constraints allowed within the regulations under which each of the resource agencies operate, some Work Group members expressed a desire to initiate dialogue with resource agencies to discuss opportunities for regional coordination that may help to minimize agency conflicts and facilitate (if not streamline) agency approval of regional programmatic permits for stormwater system maintenance and invasive species removal.

While the Work Group did not achieve consensus on promoting such coordination or streamlining efforts, some Work Group members expressed interest in pursuing this concept. To pursue this concept, the Work Group noted that interested stakeholders could convene a meeting with regulators to identify and discuss opportunities for (1) improving resource agency coordination, and (2) exploring means for regional programmatic permitting of invasive species removal, routine and emergency stormwater system maintenance, and ecosystem restoration.

3.3 Implementation Plan Summary

Recommended Early Action Items. Table 3-5 (pages 3-12 and 3-13) summarizes recommended early action items to initiate IRWM/RWQCB collaboration. Each of the recommended early action items can be immediately implemented upon RWMG and RAC approval and involve minimal costs.

Recommended IRWM Plan Update Actions. Table 3-6 (page 3-14) summarizes recommended IRWM Plan update actions to support the designated desired outcomes of IRWM/RWQCB collaboration. As shown in Table 3-6, recommended IRWM Plan updates include:

- incorporating the priority themes of the RWQCB Practical Vision, and
- modifying project screening and scoring criteria to encourage projects consistent with the designated desired outcomes of IRWM/RWQCB collaboration.

Table 3-5
Summary of Recommended Early Action Items
to Achieve Desired Outcomes of IRWM/RWQCB Collaboration

Objective to Facilitate Desired Outcome	**Recommended Early Action Item: IRWM/RWQCB Collaboration**	**Desired Outcome that is Supported by Proposed Early Action Item**		
		1. Basin Plan Support	**2. Impaired Water Support**	**3. Prioritize Habitat Restoration Needs**
Overarching Actions to Achieve Desired Outcome Nos. 1, 2, and 3				
Improve communication between the IRWM Program and RWQCB	• Assign IRWM representative as RWQCB liaison	●	●	●
	• Provide RWQCB with periodic IRWM progress reports for inclusion in Executive Officer reports to the RWQCB	●	●	●
Desired Outcome No. 1: Support Science-Based Basin Plan Objectives				
Ensure consistency between IRWM Plan and RWQCB Practical Vision	• Monitor development of RWQCB Practical Vision	●	●	●
	• Coordinate with RWQCB to ensure consistency between IRWM Plan and RWQCB Practical Vision	●	●	●
Identify science-based Basin Plan modifications that may warrant higher priority than provided in 2011 triennial review	• Convene caucus of IRWM stakeholders to review Basin Plan triennial review priorities and identify Basin Plan objectives that may warrant higher priority or scientific evaluation • Organize IRWM stakeholder participation in the RWQCB Triennial Review process to discuss and promote means for coordinating and supporting the identified Basin Plan priorities	●	●	
Identify research, data and or resources required to support scientific update of Basin Plan objectives	• Organize IRWM stakeholder participation in the RWQCB Triennial Review process to discuss and prioritize research, data collection, data management, data assessment, and resources required to address identified objectives that warrant scientific update	●	●	
Desired Outcome No. 2: Support Science-Based Impaired Water Listings and Compliance				
Identify existing 303(d) listings that may warrant reevaluation or reclassification	• Convene caucus of IRWM stakeholders to review 303(d) listings and identify listings that may warrant update • Organize IRWM stakeholder participation in the RWQCB 303(d) review process to discuss and promote means for coordinating and supporting review of the identified 303(d) listings		●	
Identify research, data, and resources required to support 303(d) re-evaluation or re-classification	• Organize IRWM stakeholder participation in the RWQCB 303(d) review process to discuss and prioritize data collection, data management, data assessment, and resources required to reevaluate or reclassify 303(d) listings	●	●	●

Table 3-5 is continued on page 3-13

Table 3-5 (continued)
Summary of Recommended Early Action Items
to Achieve Desired Outcomes of IRWM/RWQCB Collaboration

Objective to Facilitate Desired Outcome	Recommended Early Action Item: IRWM/RWQCB Collaboration	Desired Outcome that is Supported by Proposed Early Action Item		
		1. Basin Plan Support	2. Impaired Water Support	3. Prioritize Habitat Restoration Needs
Desired Outcome No. 3: Support Prioritization of Habitat Restoration Needs and Opportunities				
Assess and promote resource agency interest in regional restoration prioritization	• Convene initial meeting with regulators and stakeholders to discuss means of identifying, coordinating, and prioritizing restoration opportunities			●
Evaluate potential opportunities for coordination of the RWQCB SEP process and other compensatory mitigation programs	• Convene meeting with RWQCB to assess means for coordinating IRWM Program support with the RWQCB SEP process and other compensatory mitigation programs			●

Table 3-6
Summary of Recommended IRWM Plan Update Actions to Achieve Desired Outcomes of IRWM/RWQCB Collaboration

Objective to Facilitate Desired Outcome	Recommended IRWM Plan Update Action: IRWM/RWQCB Collaboration	Desired Outcome that is Supported by Proposed IRWM Plan Update Action		
		1. Basin Plan Support	2. Impaired Water Support	3. Prioritize Habitat Restoration Needs
Overarching Actions to Achieve Desired Outcome Nos. 1, 2, and 3				
Ensure consistency between IRWM Plan and RWQCB Practical Vision	• Incorporate priority themes from RWQCB Practical Vision into updated IRWM Plan	●	●	●
Desired Outcome No. 1: Support Science-Based Basin Plan Objectives				
Support and secure funding required for research, data collection, data management, data assessment, and resources required to support scientific update of Basin Plan objectives	• Update IRWM Plan and modify project funding screening criteria to encourage data collection, data management, or data assessment projects that support the development of science-based Basin Plan objectives or site-specific objectives	●	●	
Desired Outcome No. 2: Support Science-Based Impaired Water Listings and Compliance				
Support and secure funding required for data collection, data management, data assessment, and resources required to support science-based 303(d) evaluations	• Update IRWM Plan and modify project funding screening criteria to encourage data collection, data management, or data assessment projects that support science-based 303(d) reevaluation or reclassification efforts.		●	
Desired Outcome No. 3: Support Prioritization of Habitat Restoration Needs and Opportunities				
Support and secure funding for wetlands and riparian habitat restoration and recovery efforts	• Update IRWM Plan and modify project funding screening criteria to encourage projects that (1) coordinate with stakeholders and resource agencies to evaluate regional restoration needs, opportunities, and priorities, (2) develop a draft restoration priorities list, (3) obtain resource agency approval of the list, and/or (4) maintain and update the priorities list		●	●

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Appendix A

2011 Basin Plan Triennial Review Priorities

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Integrated Regional Water Management

Table A-1
Unprioritized "P" List
2011 Basin Plan Triennial Review - Suggestions to Make the Basin Plan More Protective

No.	Description	Category of Water Body		Triennial Review Priority and Ranking	
		Ground-water	Surface Water	TRAC Rank[1]	Assigned Tier[2]
P-1	Designate Municipal Supply (MUN) as a beneficial use of San Juan Creek		X	2	1
P-2	Designate Municipal Supply (MUM) as a beneficial use of the San Diego Formation	X		2	2
P-3	Establish new beneficial use subcategories for Wetlands Habitat (WET), Natural Water Quality Enhancement (NWQE), and Flood attenuation (FLD)		X		1[3]
P-4	Establish a beneficial use for non-recreational (e.g. commercial/military) water contact		X		
P-5	Establish objective for pentachlorophenol		X		
P-6	Revise unionized ammonia objective to a formula dependent on temperature, pH and salinity		X		
P-7	Revise chloride water quality objective		X		
P-8	Revise objectives for dissolved oxygen, temperature and toxicity to protect steelhead		X		
P-9	Establish water quality objectives for biological (e.g. Index of Biotic Integrity)		X		1[3]
P-10	Establish water quality objectives for flow to maintain natural flow regimes		X		
P-11	Establish water quality objective for chrome to protect aquatic life		X		
P-12	Establish a water quality objective for trash		X	4	1[3]
P-13	Establish objective to control invasive species		X		
P-14	Prohibit discharges to vernal pools		X		
P-15	Prohibit airports in or on state waters		X		
P-16	Eliminate storm drain discharges to the ocean		X		
P-17	Establish implementation measures to maintain natural floodplain infiltration		X		
P-18	Establish policy that addresses compensatory and punitive mitigation.		X	5	1
P-19	Establish minimum 401 certification requirements (e.g. buffers, BMPs, mitigation)		X	5	1
P-20	Establish sea water desalination policy		X		1[3]
P-21	Establish policy requiring seasonal opening of coastal lagoon mouths.		X	2	1
P-22	Establish policy for treatment and diversion of low-flow runoff		X	1	1
P-23	Establish policy for pollution prevention	X	X		
P-24	Establish decision making policy based on precautionary principle	X	X		
P-25	Establish policy to address emerging contaminants.	X	X		

1 Ranking developed by Triennial Review Advisory Committee (TRAC)
2 Tier 1 indicates priorities that can be addressed by existing RWQCB staff resources. Tier 2 indicates additional items that would be addressed if sufficient RWQCB staff resources become available.
3 Comprehensive statewide policy review is currently underway with the State Water Resources Control Board

Table A-2
Unprioritized "R" List
2011 Basin Plan Triennial Review - Suggestions to Make the Basin Plan More Reasonable

No.	Description	Category of Water Body: Ground-Water	Category of Water Body: Surface Water	Triennial Review Priority and Ranking: TRAC Rank[1]	Triennial Review Priority and Ranking: Assigned Tier[2]
R-1	Evaluate appropriateness of COLD and WILD beneficial use designations in Chollas Creek		X		
R-2	Evaluate appropriateness of MUN and AGR beneficial uses in Salt Creek		X		
R-3	Consider redesignation of beneficial uses for shallow briny coastal aquifers	X			
R-4	Evaluate beneficial uses in San Luis Rey watershed and add Groundwater Recharge (GWR) as a beneficial use	X			
R-5	Establish tiered aquatic life beneficial uses based on condition and attainability		X		
R-6	Clarify where body contact recreation (REC-1) uses apply within state-regulated ocean waters		X	1	1
R-7	Evaluate appropriateness of REC-1 beneficial use in areas with controlled public access		X	1	1
R-8	Establish sub-category for REC-1 areas impacted by bacteriological loads from wildlife waste			1	1
R-9	Establish tiers of REC-1 designations based on degree of public contact		X	1	1
R-10	Evaluate water quality objective for turbidity		X		
R-11	Evaluate water quality objective for fluoride and consider effects of mandated fluoridation	X	X		
R-12	Establish water quality objectives based on seasonal flow variations		X	2	2
R-13	Evaluate water quality objectives for dissolved oxygen in enclosed bays and estuaries		X		
R-14	Evaluate water quality objectives for aluminum, pH, and dissolved oxygen in Sweetwater and Loveland Reservoir		X		
R-15	Replace California Toxics Rule objectives for metals with site-specific objectives		X	5	2
R-16	Develop water quality objectives for nitrogen and phosphorus based on natural background levels and the Numeric Nutrient Endpoint (NNE) framework		X	3	1
R-17	Develop groundwater quality objectives for nutrients on the basis of salt and nutrient management plans	X			
R-18	Evaluate TDS water quality objectives to take into account natural background conditions and imported water quality	X	X		
R-19	Develop region-wide salt and nutrient management plan to address effects of recycled water and imported water use	X			
R-20	Assess appropriateness of TDS groundwater objectives in the Lower Ysidora basin	X			
R-21	Establish variance or policy that addresses imp[lamentation of objectives in imported water storage reservoirs		X		
R-22	Establish variance or policy that addresses implementation of indirect potable recharge to reservoirs		X	4	2
R-23	Establish variance or policy that addresses implementation of indirect potable recharge to groundwater basins	X			
R-24	Evaluate appropriateness of iron and manganese water quality objectives for groundwaters	X			
R-25	Evaluate appropriateness of beneficial use designations for groundwater basins to facilitate recycled water use	X			
R-26	Evaluate water quality objectives and beneficial use designations using updated data and science	X	X		
R-27	Evaluate conformance of "potential beneficial use" with state-mandated "most probable future use" designations	X	X		
R-28	Develop copper, nickel, and zinc translators for San Diego Bay to identify ratio of dissolved:total metals		X		
R-29	Amend conditional waiver for onsite disposal systems to include advance treatment systems	X			
R-30	Exempt septic tank discharges from the Basin Plan nitrate water quality objective	X			
R-31	Establish policy to direct limited RWQCB resources to address most critical threats	X	X		
R-32	Establish policy addressing applicability of water quality objectives to constructed wetlands		X		
R-33	Establish policy that addresses atmospheric deposition and required coordination with air quality regulation		X		

1 Ranking developed by Triennial Review Advisory Committee (TRAC).
2 Tier 1 indicates priorities that can be addressed by existing RWQCB staff resources. Tier 2 indicates additional items that would be addressed if sufficient RWQCB staff resources become available.

Attachment B

Summary of Potential Issues of Interest IRWM/RWQCB Collaboration Opportunities

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Table B-1
Potential Issues of Interest:
I. Effective Communication and Stakeholder Input

Issue of Interest Identified by Work Group	Basis of Work Group Support for Issue of Interest
I.A Achieve top-level coordination and communication between the IRWM Program and RWQCB	• Existing and past staff-level coordination between the IRWM Program and RWQCB is acknowledged by the Work Group as beneficial. • Participation of RWQCB staff and RWQCB Board Member George Loveland in the RAC is acknowledged as beneficial. • Belief that not all RWQCB members are fully informed of the IRWM Program or potential IRWM program benefits. • Belief that continued high-level coordination between the RAC and RWQCB is beneficial to both organizations.
I.B Ensure that RWQCB staff and Board members better understand issues faced by permittees	• Belief that RWQCB staff and Board members could benefit from enhanced understanding of compliance, monitoring, and economic issues faced by permittees.
I.C Ensure that permittees better understand RWQCB requirements	• Belief that permittees would benefit from enhanced understanding of RWQCB regulatory mandates, procedures, and priorities.
I.D Improve coordination with State Board and EPA technical staff	• Recognition that RWQCB routinely confers with EPA and the State Board on issues related to CWA regulation or interpretation of water quality plans. • Belief that EPA and State Board staff understanding of issues would be enhanced with improved San Diego Region stakeholder input.
I.E Enhanced public input and public awareness of RWQCB issues	• Belief that San Diego Region water management stakeholders not directly involved in wastewater discharges may not understand RWQCB influence on regional water management issues.
I.F Ensure that IRWM funding proposals are in line with authorized RWQCB staffing	• Recognition that providing the RWQCB with additional resources may not in itself be sufficient, unless this is accompanied by State authorization of RWQCB staffing levels commensurate with the available resources.
I.G Improved communication with statewide IRWM efforts	• Belief that other IRWM programs within the State may face some of the same regulatory issues as the San Diego Region, and that coordination among the regions could benefit both the IRWM programs and RWQCBs.

Table B-2
Potential Issues of Interest:
II. Basin Planning Support

Issue of Interest Identified by Work Group	Basis of Work Group Support for Issue of Interest
II.A Lack of RWQCB staff resources to address prioritized Basin Plan modifications	• Acknowledgment that existing RWQCB resources allow for only 6.0 personnel years to address Basin Plan issues during the next three years, and that only a few of the high-priority Basin Plan modification issues can be addressed. • Belief that additional resources could allow the RWQCB to tackle additional priority Basin Planning issues.
II.B Need to update scientific assessments of relations between Basin Plan objectives and beneficial use protection	• Belief that Basin Plan objectives should be based on valid impacts thresholds and verifiable cause-and-effect relations between water quality and beneficial use protection needs. • Concerns that Basin Plan objectives derived from secondary (aesthetic) drinking water standards may not be appropriate.
II.C Development of biological objectives	• Acknowledgment that State Board and RWQCB development of biological objectives would allow focus on environmental improvement and outcome-based objectives, rather than compliance with numerical water quality values which may not be protective of beneficial uses.
II.D Increased stakeholder input to Basin Plan modification process	• Recognition that the recent RWQCB triennial review process focused on receiving stakeholder input from a wide variety of San Diego Region water management interests. • Belief that the RWQCB triennial review process could benefit from continued and enhanced stakeholder input.
II.E Salt and Nutrient Management Plans (SNMPs)	• Acknowledgement that past coordination between the RWQCB and San Diego Region stakeholders was instrumental in developing San Diego Region SNMP guidelines. • Belief that the IRWM Program and IRWM Plan may represent effective support mechanisms for SNMPs required under the State of California Recycled Water Policy.
II.F Update water quality objectives to account for seasonal water quality protection needs	• Belief that one-size-fits-all water quality objectives may not be fully protective of beneficial uses, and that seasonal variation and flow-related factors may be important in assessing water quality protection thresholds and water quality protection needs.
II.G Promote Indirect Potable Reuse (IPR)	• Acknowledgement that RWQCB support of indirect potable reuse/reservoir augmentation has been encouraging to implementing agencies. • Recognition that modification of existing RWQCB Basin Plan objectives or implementation policies may be required to foster development of indirect potable reuse/reservoir augmentation.

Table B-3
Potential Issues of Interest:
III. 303(d)/TMDL Support

Issue of Interest Identified by Work Group	Basis of Work Group Support for Issue of Interest
III.A Increased stakeholder input to 303(d) listing process and TMDL scheduling	• Recognition that the recent RWQCB 303(d) review process incorporated stakeholder input from a wide variety of San Diego Region water management interests. • Belief that the RWQCB 303(d) review process could benefit from continued and enhanced stakeholder input.
III.B Evaluate listing of imported water reservoirs on 303(d) list	• Belief that 303(d) listings may not be appropriate for surface reservoirs that are primarily comprised of stored imported water. • Belief that TMDLs should not be required for imported water reservoirs that exceed water quality objectives based on secondary (aesthetic) drinking water standards.
III.C Ensure that 303(d) listings are based on science and robust data	• Belief that 303(d) listings should be based on robust and representative data bases that indicate impairment to beneficial uses. • Beliefs that site-specific objectives may be appropriate for some watercourses on the 303(d) list. • Belief that 303(d) listings should be based on a scientific evaluation of cause and effect relations between water quality and beneficial use impairment.
III.D Streamline the 303(d) delisting process	• Belief that the burden of proof for the 303(d) delisting process is greater than for 303(d) listing.

Table B-4
Potential Issues of Interest:
IV. Effective Data Management and Assessment

Issue of Interest Identified by Work Group	Basis of Work Group Support for Issue of Interest
IV.A Lack of standardization of data collection	• Concerns that lack of standardization between individual compliance monitoring programs and regional monitoring efforts hinders proper assessment of collected data.
IV.B Allow for expansion of data transfer without using data against agencies	• Concerns that agencies have disincentive to perform additional monitoring, as receiving water data made available by stakeholders or agencies may result in 303(d) listings or more stringent requirements.
IV.C Duplicative data collection efforts	• Concerns that point-source compliance monitoring, non-point source compliance monitoring, and regional monitoring and research efforts conducted by various agencies may result in duplicative monitoring.
IV.D Ensure that collected data are useful and effectively analyzed	• Recognition that RWQCB regional monitoring framework is directed toward addressing the issue of effective data management and assessment. • Concerns that some collected data may not be useful in assessing compliance or impacts to beneficial uses. • Concerns that collected data are not always effectively assessed to evaluate compliance or impacts to beneficial uses.

Table B-5
Potential Issues of Interest:
V. Restoration and Mitigation Support

Issue of Interest Identified by Work Group	Basis of Work Group Support for Issue of Interest
V.A Improved streamlining of permit process to remove invasive species or flood channel vegetation	• Multiple agencies involved in approving invasive species removal in flood channels. • Concerns that agencies seeking to clear floodways are sometimes faced with conflicting requirements from differing regulatory agencies.
V.B Regional prioritization of restoration needs and opportunities	• Regional prioritization would be useful in guiding agencies in restoration efforts. • Belief that coordinated regional habitat restoration efforts could provide for greater environmental benefit.
V.C Cleanup and Abatement Support	• Belief that IRWM support of cleanup and abatement efforts could enhance conformance with Basin Plan objectives and protect beneficial uses.
V.D Development of pre-approved SEPs (Supplemental Environmental Projects)	• Belief that a pre-approved list of SEPs that are endorsed by the RWQCB would be useful to ensure that local enforcement monies are directed toward effective restoration and mitigation.
V.E Development of mitigation banks	• Acknowledgement that a number of regional mitigation banks have been established. • Belief that additional habitat-specific or centralized mitigation banks could assist regional agencies in water management decisions.
V.F Align IRWM funding, Cleanup and Abatement Account (CAA) funding, and funding/support for Supplemental Environmental Projects (SEPs)	• Belief that IRWM funding needs could be coordinated with funding support for SEPs or CAA funding.

SAN DIEGO
Integrated Regional Water Management

Appendix 7-B:
Integrated Flood Management Planning Study

INTEGRATED FLOOD MANAGEMENT PLANNING

SAN DIEGO
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APRIL 2013

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1 Introduction

1.1 Background

Flooding is a chronic problem that is experienced throughout the San Diego County region, even with a semi-arid climate, which can result in significant losses and economic damages. The San Diego County region is comprised of 11 watershed units which are unique in their hydrologic responses, as well as their floodplain functions, which lend the flood management planning assessments to a watershed approach. However, flood and stormwater runoff generated from watersheds can also represent a valuable water resource that can be managed successfully rather than just being typically viewed as a hazard. This report has been prepared as a companion document to support the addition of multi-benefit floodplain management into the *San Diego Integrated Regional Water Management (IRWM) Plan Update* as a key water resource element in regional water planning. Floodplain management and flood hazard mitigation is extremely complex with multiple issues and different watershed responses throughout the region to storm/rainfall events. There is not a one size fits all solution, but comprehensive planning is required on a watershed basis to develop an implementable system-wide answer. **Integrated Flood Management (IFM)** combines land and water resources development in a floodplain, within the context of IRWM with a view to maximize the efficient use of the floodplains and minimize loss of property and life.

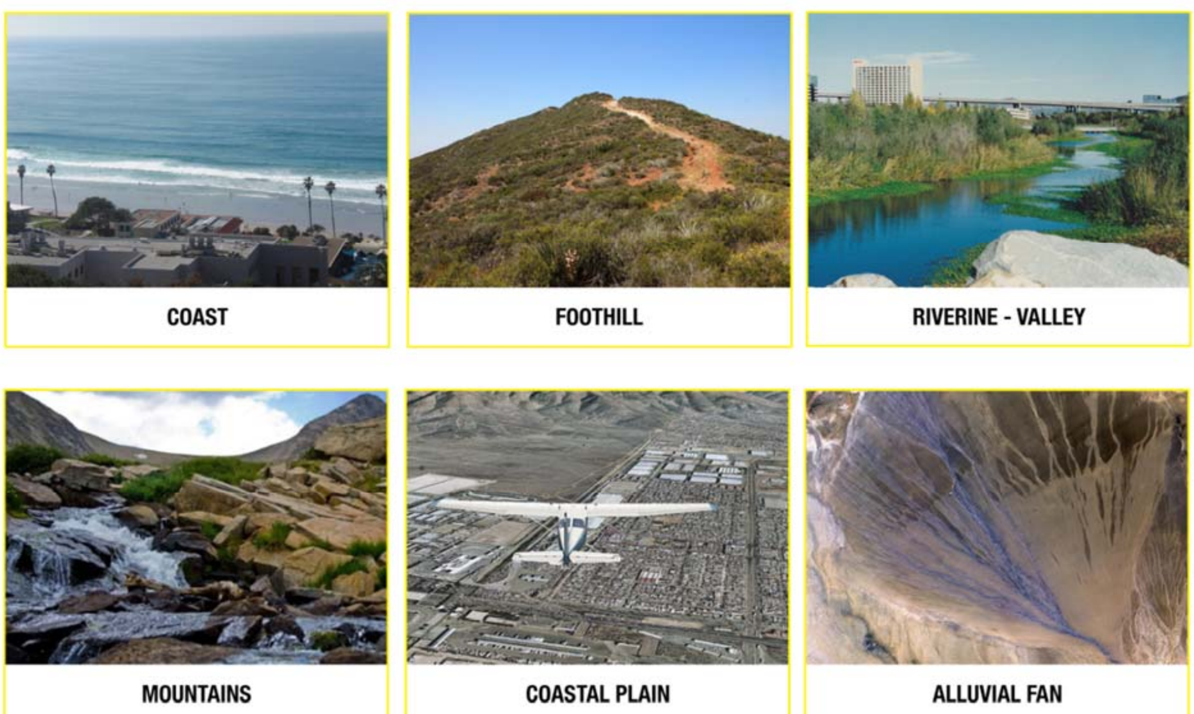


Figure 1-1: San Diego region has a range of different type of flood hazards and associated watershed response based on watershed characteristics

This regional study is not the traditional watershed/flood management planning document since it does not provide specific regional flood mitigation projects as a conventional masterplan would provide. However, the report is intended as a "guidance document" to facilitate an integrated water resources approach to flood management. This assessment is based on readily available information to perform planning level risk assessment in order to provide high level recommendations. In addition, it defines general applicable strategies/approaches, as well as provides planning level tools, to guide flood management decision making on a watershed basis. Watershed management embraces a wide range of watershed considerations and specialized control strategies to preserve the hydrologic functions of the watershed and corresponding water resources. The approach embraces an understanding that with responsible planning of the watershed to take care in protecting the natural integrity of the floodplain and to ensure the maximum value will be realized from protecting key natural resources. The focus of integrated planning is on balancing the community flood management needs with the environmental constraints and watershed resources which will ensure an acceptable solution with the flexibility to adapt to future changes. A sustainable flood and water management approach would recognize the:

- Interconnection of flood risk management actions within broader water resources management, ecosystems, and land use planning
- Value of coordinating across geographic and agency boundaries
- Need to evaluate opportunities and potential impacts from a system perspective
- Importance of environmental stewardship and sustainability
- Need for system flexibility and resiliency in response to changing conditions, such as climate change and population growth

1.2 Integrated Flood Management Approach

IFM is an approach that varies from traditional flood protection with a focus on maximizing the efficient use/net benefit of a floodplain while promoting public safety. IFM is a process that promotes an integrated, rather than fragmented, approach to flood management, and that recognizes the connection of flood management actions to water resources management, land use planning, environmental stewardship, and sustainability. Flood risk management requires the holistic development of a long-term strategy, balancing current needs with future sustainability. Incorporating sustainability means looking for way of working towards identifying opportunities to enhance the performance of a watershed system as a whole.

An integrated strategy usually requires the use of both structural and non-structural solutions. Depending on the characteristic of an individual watershed, various resource management strategies may be used such as: land stewardship, conjunctive water management, conveyance, ecosystem restoration, forest management, land use planning and management, surface storage, urban runoff management, and watershed management. It is important to recognize the level and characteristics of existing risk and likely future changes in risk. Integrated flood management also includes the recognition that flood risk can never be entirely eliminated and that resilience to flood risk can include enhancing the capacity of people and communities to adapt to and cope with flooding.

The benefit of using a regional and system-wide approach is that it takes into account a wide range of causes and effects, reducing potential negative unintended consequences in nearby regions. Regional approaches allow for the best use of public resources by increasing the number of issues considered. This also promotes system flexibility and resiliency by developing solutions that provide the best benefit to the overall system or region. In contrast, localized and narrowly focused projects may solve an issue or problem while transferring the problem up or downstream. One of the benefits of using an IFM approach is the potential to access funding sources that might not have been available to single-benefit projects. This can lead to achieving sufficient and stable funding for long-term flood management.

1.3 General Regional Flood Management Issues

Infrastructure project development, implementation, and operation constraints have changed as public values have evolved. Today, infrastructure projects, including flood management projects, face increased stakeholder involvement, land use constraints, changing regulatory requirements, and new environmental considerations. These issues have led to an increase in the cost of flood management. Addressing these issues will require a move away from the traditional approach to developing flood management projects. Many of these issues were identified during the stakeholder meetings that were conducted as part of the flood management study process. The stakeholders cited specific examples of flood management problems and roadblocks associated with implementation. Many of these same issues have also been encountered by other communities which have been identified during the statewide Flood Management Program Study (see *Section 1.4*).

Specific issues impacting flood management projects include the following:

- **Projects require extensive stakeholder involvement, which increases project planning costs.** Stakeholders have become more educated about project development and environmental requirements. Successful projects require proper engagement of a diverse set of stakeholders. The cost associated with stakeholder engagement activities must be included in planning and implementation costs.
- **Flood management responsibility is fragmented**. Responsibilities for planning, administering, financing, and maintaining flood management facilities and emergency response programs are usually spread among several agencies or between departments within a large agency. There is not a centralized agency coordinating all the flood management activities within the County which make San Diego unique. Flood management responsibilities are often spread out within and between these agencies.
- **Different methodologies and inadequate data make risk assessment complex and costly to complete.** Insufficient data on the specifics of flood hazards in many areas makes it difficult to assess the level of problems. Much of the available data is based on FEMA flood hazard mapping, but this does not identify the chronic flood problems which current on a frequent basis and on smaller storm events other than a 100-year event. In addition, the data

related to existing drainage facilities and the original design capacities is not readily available in digital format which makes it difficult to perform rapid assessments at a regional scale.

- **Land use decisions may not adequately prioritize public safety.** Uninformed residents and policymakers can make decisions that inadvertently put people and property at increased risk. In some cases, providing adequate space for flood management facilities to meet existing and future needs during the development approval process would reduce flooding impacts. Internal and intra-agency coordination is important when local agencies make development decisions. Improving coordination within and between agencies could inform the potential land use decisions to considerations in General Plans, flood managers are not always included in land use discussions.
- **Delayed permit approvals and complex permit requirements are obstacles to flood risk reduction.** Many agencies wait years for permits, resulting in poorly maintained projects and missed funding opportunities for new projects. Often, agencies face conflicting or confusing requirements regarding project permits. Also, regulatory requirements to renew existing permits or obtain new permits frequently require extensive mitigation. This mitigation can greatly increase project costs and cause project delays.
- **Flood management projects are not prioritized from a "watershed" system-wide or multi-benefit perspective.** State and Federal flood management funding has traditionally been provided to local projects by analyzing a narrowly focused and localized set of benefits. In addition, funding levels for flood management are often set without regard to a system-wide prioritization of needs.
- **Flood risk funding as well as long term funding for operations and maintenance.** Funding for flood projects is based upon the potential that a significant flood will occur, rather than providing for day-to-day flood management needs. Inadequate funding for flood management maintenance, operations, and improvements makes flood risk reduction difficult or impossible for many local agencies. Agencies at all levels are facing funding constraints. Local agency funding is often based on county general funds, which have been impacted by the economic downturn. Reductions in Federal funding have occurred, resulting in potential reductions in funding levels for flood risk studies and projects.

1.4 California Statewide Flood Management Program Study

California Department of Water Resources (DWR) has recently completed the initial phase of a Statewide flood management planning study which is similar in many respects to the flood management planning study being development for the San Diego IRWM. The database development for this study mirrored the Statewide information process and resulted in the similar database, as well as inventory issues. The results of the initial Statewide study are available to the public. This report, *California's Flood Future: Recommendations for Managing the State's Flood Risk* (Flood Future Report) presents an overview of the flood threats facing the state, approaches for reducing flood risk, and recommendations for managing California's flood risk. The Flood Future Report is the first statewide report to be developed through collaboration between DWR and the United States Army Corps of Engineers (USACE). This report is the first product of DWR's State Flood Management Planning (SFMP) Program. The SFMP Program was developed under the FloodSAFE Initiative to expand the focus of California's flood management planning statewide in compliance with Public Resources Code (PRC) Section 75032. The SFMP Program was funded under Proposition 84 as part of the DWR FloodSAFE Initiative and IRWM Program.

The first step of the Flood Future Report was accomplished by interviewing representatives of 142 local flood management agencies throughout the state, and asking them to define and characterize the type and location of existing and future flood threats and issues in their local area. Agencies were interviewed regarding existing flood infrastructure, planned flood management projects (including IRWM projects with flood benefits), and flood management challenges and opportunities facing the agency. As a result of the meetings with local agencies, more than 3,800 different documents related to flood management in California were collected. A review of these documents, combined with information from interviews, formed the foundation to explore approaches that address the array of flood risk management issues identified. Using this information, an analysis of exposure to flood hazards was completed to expand the understanding of the exposure threat to flooding statewide. This analysis identified population, structures, crops, and endangered species exposed to flood hazards statewide. Once a basic understanding of the flood threats in California was attained, different approaches to flood management, including structural and nonstructural measures and IWM. Financing and institutional strategies also were explored based on past funding and new, innovative ideas. Finally, an appropriate path forward to manage California's flood risk was identified by formulating technical, legislative, policy, financial, and other recommendations. These recommendations were synthesized from information developed as part of the SFMP Program, including suggestions from flood experts, previous flood management studies, and local agency recommendations.

1.5 Work Program and Objectives

The object of this planning study is to develop planning level tools and processes and the guidance framework/structure for regional collaborative planning of watershed and flood risk management. Developing solutions for effectively managing flood risks requires a watershed approach which allows holistic strategies that can also address "beneficial uses" as well as watershed functions. The goal is to provide the forum and guidelines to allow for improved regional flood management planning on a watershed basis, as well as defining the global strategies, to form the foundation in developing prospective projects for funding. The steps used in this planning study include the following:

1. **Watershed / Floodplain Managers Stakeholder Involvement -** The actual planning process involves the flood managers and stakeholders to assist shaping and defining the scope of the program as well as setting the goals/objectives. The stakeholders provide the local knowledge/information and identify the different flood risks, issues of concerns, opportunities, constraints, and propose different global management strategies that can be used to guide implementation of different projects in the future. Stakeholder workshops were held on June 26, 2012 and December 4, 2012 to provide the forum for developing an understanding of the existing problems and focusing on the critical issues.

2. **Understanding Problems / Flood Risks** – A key element in developing a management plan is first understanding the actual problems that require solutions, specifically defining the flood risks, level of risks, priorities, and the associated sources of flooding for those risks. These flood risk include the existing flooding risks as well as future risks in expected growth areas in the different watershed.

3. **Define Watershed Goals / Objectives** – It is important to develop the watershed goals and objectives of the plan since this defines the measure to assess the different potential management strategies.

4. **Identify Global Opportunities / Constraints** – The opportunities and constraints are the next step required in order to develop strategies. The opportunities will help define the types of potential strategies and areas where different water resources may be managed collectively. In addition, this allows effectively addressing the multiple functions within the watershed by specifically focusing on **"beneficial uses"** such as groundwater recharge, recreation, habitat, and water supply. Understanding the different constraints will also shape the management strategies in order to ensure success. This assessment can be performed at different levels or scales (i.e. global, regional, watershed, or even reach specific) corresponding to the scale of the different strategies.

5. **Identify Possible Global Management Strategies/Approaches** - The different general categories of management techniques can then be defined at a global level through the stakeholder workshop process that is either a structural or non-structural approach. These approaches can include watershed planning principles such as (1) landuse planning, (2) floodplain vegetation management, (3) regional runoff storage/infiltration, (4) sustainable systems, (5) drainage ordinances, and (6) risk management reduction.

6. **Planning Guidance Document –** This step involves building a cohesive guidance document to specifically define the regional watershed and flood management planning program and global strategies. The program will define the controls and communication measures to allow collaboration of the different regional and local agencies/flood managers as well as stakeholders. The plan will provide the basic framework with different categories for the types of global strategies and approaches, as well as the corresponding objectives. This step also involves documentation of the formalized watershed planning process and adopted global strategies that define the plan. This results in an adaptive plan which is flexible to respond to changes in the watershed and rapidly changing regulatory environment.

7. **Implementation Prioritization Evaluation Criteria** – Finally, a screening process is developed to evaluate different potential projects that are generated in the different management strategy categories. The screening will identify which projects should be prioritized for funding implementation. A specialized "analytical hierarchy process" can be used to objectively numerical rank the projects based on how well they achieve the watershed objectives.

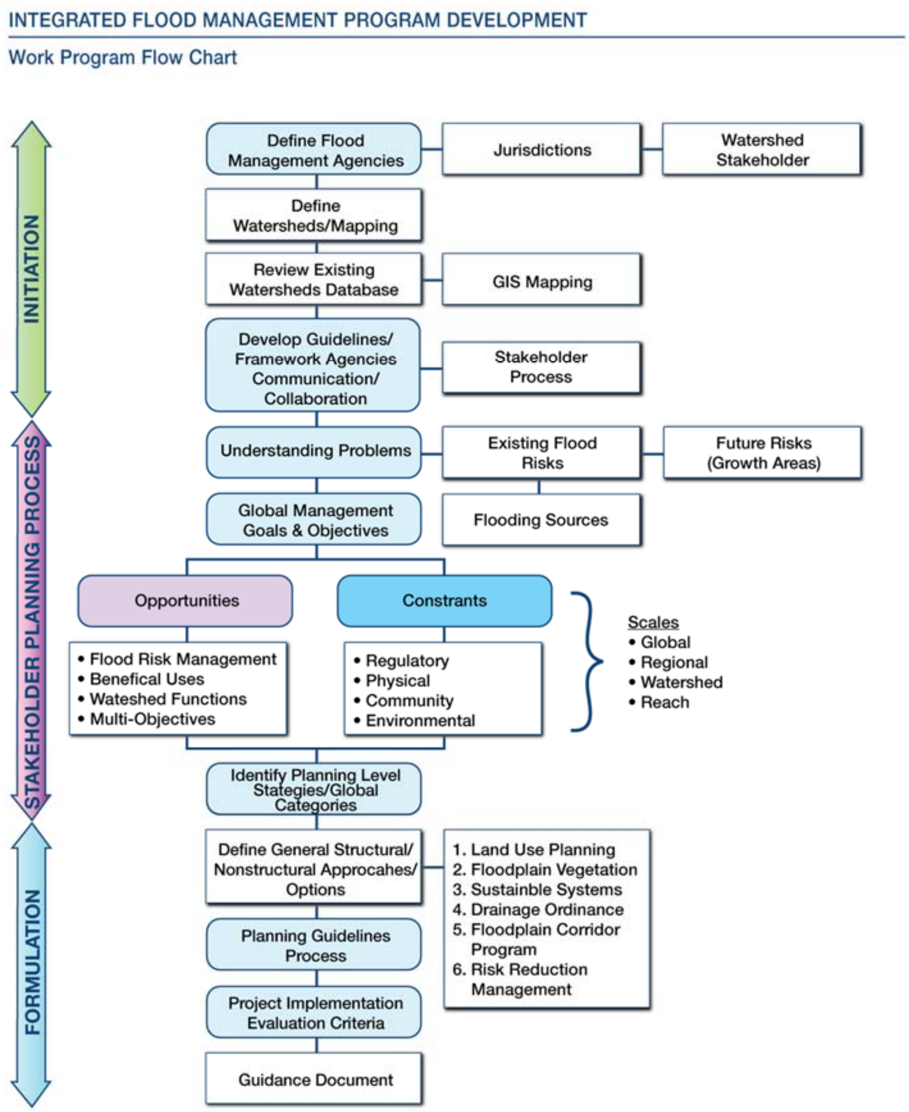


Figure 1-2: Overview of general work plan for the IRWM Integrated Flood Management Study

1.6 Watershed Stakeholder Involvement

Stakeholder outreach was performed as part of the study process in order to involve different agencies and community groups in the development of the floodplain management study. This included the development of the initial information and provided an opportunity to understand the current issues with implementation of floodplain management projects. Stakeholder participation was provided during study and plan formulation process at a general forum within the Workgroup meetings with all interested stakeholders that provided local input, project background, guidance, and specialized technical information. The effort is aimed at developing a strategic planning that will result in understanding watershed guidance needs and flood protection strategy that are compatible with both the physical, political, environmental, and regulatory constraints. The stakeholder meetings were divided into three different periods during the overall study process and included different objectives to solicit input from the stakeholders as well as provide information on the progress of the study: **Workshop No.1 – Background and Inventory of Watersheds**

- Topics – Discuss the overall objective of the program and how integrated flood management can be develop and work effectively for the stakeholders. Define the meaning of integrated flood management. Focus discussion will include developing an understanding of the existing flood programs, common issues in each of the different watersheds, obstacles and constraints encountered with flood management, priority flood hazards in the different watersheds, understanding how flood risks are evaluated.
- Feedback – Additional data sources and inventory from the stakeholders, defining lines of communication, understanding the needs within the different watershed for flood management, existing and future planned project for flood management, current flood management planning process.
- Deliverable – Watershed mapping worksheet with mapped flood hazards

Workshop No.2 – Define Opportunities / Goals / Strategies

- Topics – Defining the different underlying principles for integrated flood management and the guiding policies to set framework for the planning program.
- Feedback – Input on the development of regional types of opportunities, defining the goals of the integrated flood management, and development of the initial alternative strategies
- Deliverable – Updated watershed mapping identifying different levels of flood risks, matrix of existing management agencies and programs, summary matrix of common issues and flood risk.

Workshop No.3 – Review DRAFT Planning Guidance Document

- Topics – Present the DRAFT Guidance Document which will focus on the planning and the underlying principles and alternative strategies
- Feedback – Input and comments on the DRAFT document

2 Flood Management Database

2.1 Data Needs

A wide range of data was required to develop a minimum “baseline” database that would assist in developing background and understanding in order to characterize the existing watershed and flooding conditions. The general categories and types of data that were researched as part of the initial “baseline included the following:

- **Watershed** – Data related to characterizing the watershed conditions, including hydrologic parameters
- **Hydrology** – Studies and information related to estimates of the surface hydrology quantities and watershed response for different storm events
- **Meteorological** – Information related to the types of rainfall events characteristic of the region and the historical rainfall magnitudes including frequency as well as aerial distribution
- **Flood Control Facilities** – Existing regional flood control facilities within the watershed that have been constructed
- **Urban Drainage Facilities** – Existing local drainage facilities that have been installed
- **Drainage Facility Masterplans** – Watershed plans for proposed drainage facilities
- **Floodplain Mapping** – Studies delineating the existing floodplain boundaries, which define the limits of flood hazards
- **Historical Flooding** – Locations where existing flooding has historically occurred from storm events and locations chronic flood locations
- **Flood Damage Estimates** – Monetary estimates of the amount of flood damage associated with different storm events
- **Geomorphology** – Historical information on landform changes within the watershed and particularly trends for changes within the alluvial creeks of the floodplains
- **Erosion/Sedimentation** – Different erosion/sedimentation processes occurring within the watershed including historical trends related to locations of sedimentation and erosion hazards
- **Biological** – Existing biologic resources and habitat within the floodplain
- **Environmental / Regulatory** – Existing environmental permitting requirements related to restrictions for modifications within the active floodplains

Table 2-1 provides a detailed listing of the data and information collected as part of this planning study.

Table 2-1: Data and Information Collected

Flood Hazards / Floodplain Analysis
Historical Flooding Locations / Issues
Flood Maintenance Records
FEMA Floodplain Mapping / DFIRM
FEMA Technical Backup / Floodplain Models
Floodplain Hydraulic Models (other than FEMA)
Environmental Documentation
MSHCP / SAMP documentation
Biology / Wildlife
Plant Community Maps
Critical Habitat Maps
Animal Communities Maps
Riparian Habitat Maps
Prior Reports, Studies, or Data on Biological Resources, Species Occupation & Wildlife Movement
Water Quality
Point Sources
Non-Point Sources
Municipal NPDES Permit
Previous Watershed Hydrology / Hydraulic Studies
Municipal Drainage Masterplans
Development Drainage Masterplans / Hydrology Studies
Flood Control Deficiency Studies
Hydrology Studies – Proposed Developments
Development Drainage Masterplans / Hydrology Studies
Hydraulic Studies – Roadway Bridges / Culvert Crossings
USACE Regional Watershed Studies or Flood Control Planning Studies
Landuse
General Plan - landuse
Future Landuse Plans
Census Population Demographic data
Available GIS Mapping Data Layers
Soils
Geologic Features
Property Ownership / Property Boundaries / APN
Existing Landuse
Planned Development
Utilities
Roadways
Vegetation
Jurisdictional Boundaries (ACOE, CDFG, etc.)
Habitat / Wildlife / Endangered Species / Conservation Areas

Table 2-1: Data and Information Collected

FEMA Flood Hazard Zones
Existing Condition Floodplain Boundaries
Government / Civic Boundaries
Tract Maps
Parcel Maps
Right of Way Data
Plot Plans
Traffic Circulation Elements
Specific Plans
EIR
County / City Maintained Flood Control / Stormwater Facilities
Alquist - Priolo
Mapping / Right-of-Way
Topographic Mapping - Digital DTM
Aerial Photography – Rectified Digital Color
Property Ownership / Property Boundaries / APN

2.2 Data Sources

The information about watershed characteristics and existing flooding was gathered in order to establish a database of the baseline flood problem conditions in the region and was obtained in the following ways:

- **Existing flood documents** - A search was conducted for existing flood-related documents. This included flood control plans, stormwater/flood evaluation studies, surface flow studies, Federal Emergency Management Agency (FEMA) maps, drainage plans, master plans, general plans, flood assessments, and other documents related to climate change and wetlands.

- **Historical Flooding –** Locations of historical flooding, flood damage, and chronic flooding areas based on eye witness accounts, maintenance efforts, and newspaper articles. This information was obtained through phone calls, emails, outreach efforts, and periodical searches.

- **Data requests** - Specific data requests were made to participating municipalities and floodplain management agencies for records of current, ongoing flood problems in their respective municipal and unincorporated areas. A similar request for available data was also solicited to the “flood committee” members related to existing reference documentation, studies, and data related to watershed flood information. An attempt to maximize the initial information gathering effort by contacting multi-agency and/or multi-regional entities with known flood management responsibilities in the county. In addition, stakeholder outreach provided an opportunity to initiate relationship building between watershed stakeholders utilizing the floodplain managers’ forum. Once provided, this information was used to develop maps of flood hazards and watershed information

- **Existing GIS databases** – Available digital geographic information databases were consulted through a variety of agencies. In particular, the local database generated through the County of San Diego was utilized as the initial data source, SanGIS (San Diego Geographic Information Source), such as the existing landuse data.

2.3 Data Gaps

Available information was limited to fulfill the data needs, particularly in a geographic information format to facilitate regional planning. This is similar to the issues encountered by the contractor for the Flood Future Report. Flood infrastructure information is very limited and it is difficult to obtain digital mapping to inventory existing facilities on a regional basis or within local municipalities. No single agency in the county was familiar with all existing infrastructure across the county. In many cases, agencies did not have a complete inventory of infrastructure that they owned and/or maintained. In addition, it was difficult to find information related to locations of flood deficiencies, problem "hot spots," and recurring problem areas. Some of the issues in the development of a comprehensive database sufficient for watershed planning on a system wide basis include:

- Database utilized for the current study is limited to primarily to the available GIS data
- Data inventory conducted at a regional scale
- Existing flood hazards data limited to FEMA and DWR database
- Not sufficient information to identify locations of flood problem sources and deficiencies
- Insufficient information to generate a comprehensive inventory of existing flood protection infrastructure

3 Existing Flood Hazards and Management Programs

3.1 Definition of Flood and Nature of Hazard

A flood occurs when excess water from snowmelt, rainfall, or storm surge accumulates and overflows onto a river's bank or adjacent floodplains. Floodplains are lowlands adjacent to rivers, lakes, and oceans that are subject to recurring floods. Most injury and death from floods occur when people are swept away by flood currents, and property damage typically occurs as a result of inundation by sediment-filled water.

Several factors determine the severity of floods, including rainfall intensity and duration. A large amount of rainfall over a short time span can result in flash flood conditions. A sudden thunderstorm or heavy rain, dam failure, or sudden spills can cause flash flooding. The National Weather Service's definition of a flash flood is a flood occurring in a watershed where the time of travel of the peak of flow from one end of the watershed to the other is less than six hours. There are no watersheds in the County that have a longer response time than six hours. Flash floods in the County range from the stereotypical wall of water to a gradually rising stream. The central and eastern portions of the County of San Diego are most susceptible to flash floods where mountain canyons, dry creek beds, and high deserts are the prevailing terrain.

The County is also subject to shallow flooding. Shallow flooding occurs in areas where a lack of channels means water cannot drain away easily. Shallow flooding problems fall into three categories: sheet low, ponding, and urban drainage. Sheet low occurs where there are inadequate or no defined channels, floodwater spreads out over an area at a somewhat uniform depth. Sheet low flooding is common after intense or prolonged rainfall during which the rain cannot soak into the ground. In some flat areas, runoff collects in depressions and cannot drain out, creating a ponding effect. Ponding floodwaters do not move or low away. Floodwaters will remain in the temporary ponds until they can infiltrate, evaporate, or are pumped out.

An urban drainage system comprises the ditches, storm pipes, retention ponds and other facilities constructed to store runoff or carry it to a receiving stream, lake, or ocean. Other constructed features in such a system include swales that collect runoff and direct it to storm drains and ditches. Most systems are designed to handle the amount of water expected during a 10-year storm. Larger storms overload them and the resulting backed-up storm drains and ditches produce shallow flooding.

Dam failures can result in severe flood events. When a dam fails, a large quantity of water is suddenly released with a great potential to cause human casualties, economic loss, lifeline disruption, and environmental damage. A dam failure is usually the result of age, poor design, or structural damage caused by a major event such as an earthquake or flood.

The most common flooding types in the County of San Diego are riverine flooding and flash flood events.

Table 3-1: Characteristic Flooding Types within San Diego

Flood Hazard	Description Cause
Coastal Flooding	Winter and spring coastal storm, high winds and storm surges
Debris Flow Flooding	Heavy localized rainstorms on hillsides and high sediment producing or unstable areas subject to erosion or post-watershed fires
Slow Rise Flooding	Floodplain with limited hydraulic capacity and heavy precipitation generate runoff greater than capacity
Flash Flooding	High volume rainstorm, thunderstorms, or slow moving storms
Alluvial Fan Flooding	High volume rainstorm and thunderstorm displacing high volume of sediment to alluvial fan geographic features
Urban Drainage Flooding	Large rainstorms which exceed the capacity of the local urban drainage system resulting in flooding

Figure 3-1: Common flooding and flood hazard issues encountered throughout the County

3.1.1 Critical Flood Prone Facilities/Assets

Flood hazards and the potential damage or loss of "critical facilities" is an important consideration in watershed planning as well as for prioritization of flood management projects. A critical facility is a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response, and/or disaster recovery functions. These critical assets can also be "lifeline" type facilities which are essential for the public. Some of the common critical facilities identified hospitals and other health care facilities, emergency operations facilities, fire stations, and police stations, schools, hazardous material sites, airport facilities, bridges, bus facilities, rail facilities, and highways; utility systems that include electric power facilities, natural gas facilities, crude and refined oil facilities, potable and waste water facility, and communications facilities and utilities, government office/civic centers, jails, prisons, military facilities, religious facilities, and post offices.

3.2 Existing Floodplain Management Programs and Agencies

The San Diego County Flood Control District (SDFCD) is responsible for the floodplain management within the unincorporated areas of San Diego County, while the other 18 cities within the IRWM Region have similar responsibility within their respective municipality. In most counties there is usually a single agency which has the responsibility for coordinating all the different flood management activities regionally, however, in San Diego this does not exist. The different agencies responsible for floodplain management within the County region include:

Table 3-2: Jurisdictions Responsible for Floodplain Management in San Diego County

County of San Diego	City of El Cajon	City of Lemon Grove	City of San Marcos
City of Carlsbad	City of Encinitas	City of National City	City of Santee
City of Chula Vista	City of Escondido	City of Oceanside	City of Solana Beach
City of Coronado	City of Imperial Beach	City of Poway	City of Vista
City of Del Mar	City of La Mesa	City of San Diego	

The SDFCD's role is to provide for the control of the flood and storm waters within the District and of the flood and storm waters that flow into the District. It is to preserve such waters for beneficial use such as water supply, groundwater percolation, recreation, and environment. It is to protect the land, properties, facilities, and people within the District from damage caused by storm and flood waters. The SDFCD has an adopted *Floodplain Management Plan* (FMP) for the County's unincorporated areas which assesses the flood hazards, summarizes the current flood management program, describes mitigation strategies, and provides a future action plan.

In addition, the SDFCD based on the Act of the State Legislature in 1966 (see SBFCD website) has the legal authority to:

- Establish Flood Control policy
- Establish water quality policy
- Build and maintain recreational facilities within the watercourses of the County of San Diego.
- Purchase land, obtain easements, and build and maintain facilities for the conveyance of storm and flood waters.
- Provide flood warning services to the county.

- Repair and restore affected watersheds within and without the District. ·
- To regulate the discharge of pollutants into District Facilities.
- Provide a water supply to county residents without existing service.
- Operate outside of its jurisdiction to assist with watershed issues within the County of San Diego and in counties and nations with watersheds that drain into the District's jurisdiction.
- Make investigations within and without the District to study local watershed issues.

3.3 History of Flooding

From 1770 until 1952, 29 floods were recorded in the County of San Diego. Between 1950 and 2006, flooding prompted 12 Proclaimed States of Emergency in the County of San Diego. Several very large floods have caused significant damage in the County. The Hatfield Flood of 1916 destroyed the Sweetwater and Lower Otay Dams, and caused 22 deaths and $4.5 million in damages. Most of the deaths were attributed to the failure of Lower Otay Dam. The flood of 1927 caused $117,000 in damages and washed out the Old Town railroad bridge. The floods of 1937 and 1938 caused approximately $600,000 in damages.

Recent serious floods affecting the County occurred during tropical storms Kathleen (1977) and Doreen (1978) and during winter storms in 1980, 1987, 1998, 2005 and 2010. In the 1980 flood, approximately 16-20 inches of rain accumulated over a six week period. This slow moving storm, which was the most severe since the Hatfield Flood of 1916, lead to wide-spread small stream flooding and evacuations of residents in Mission Valley. The San Diego River at Mission Valley peaked at 27,000 cubic feet per second (cfs) and caused $120 million in damage. The following table displays a history of flooding in the County of San Diego, as well as the loss estimation associated with each flood event where available.

Table 3-3: Historical Records of Large Floods in San Diego County

Date	Loss Estimation	Source of Estimate	Comments
1862	Not available	County of San Diego Sanitation and Flood Control	6 weeks of rain
1891	Not available	County of San Diego Sanitation and Flood Control	33 inches in 60 hours
1916	$4.5 Million	County of San Diego Sanitation and Flood Control	Destroyed 2 dams, 22 deaths
1927	$117,000	County of San Diego Sanitation and Flood Control	Washed out railroad bridge Old Town
1937 & 1938	$600,000	County of San Diego Sanitation and Flood Control	n/a
1965	Not available	San Diego Union	6 killed
1969	Not available	San Diego Union	All of State declared disaster Area
1979	$2,766,268	County OES	Cities of La Mesa, Lemon Grove, National City, San Marcos, San Diego and unincorporated areas
1980	$120 million	County of San Diego Sanitation and Flood Control; Earth Times	San Diego river topped out in Mission Valley
Oct – 87	$640,500	State OES	NA
1995	$Tens of Millions	County OES	San Diego County Declared Disaster Area
Source: *Multi-Jurisdictional Hazard Mitigation Plan, San Diego County* (March 2004)			

3.4 Flood Hazard Identification

Regional mapping of the existing flood hazards for the San Diego region has been prepared by FEMA as part for the National Flood Insurance Program (NFIP), which requires each community to identify 100-year recurrence interval flood prone areas as part of adopting floodplain management regulations. The minimum federal flood protection goals and requirements are administered by FEMA as part of the NFIP. The NFIP originally established in 1968 provides low-cost federally subsidized flood insurance to those communities that participate in this program. Participation in the program requires that the community adopt floodplain regulations which meet the requirements of the NFIP defined in *44CFR Chapter 1 Part 59* which include mapping of existing flood hazards.

Hydrologic-hydraulic studies are required to analyze the delineation of the 100-year recurrence interval floodplain limits. The published FEMA flood hazard maps provide an approximation of the regional floodplain limits based on the standards for FMEA alluvial fan hazards. The mapped flood hazards focus on regional flood hazards and do not evaluate localized flooding, particularly in urbanized areas, so there can be areas which may flood in even small storm events but may not be within a mapped flood hazard zone.

FEMA is the federal entity responsible for producing Flood Insurance Rate Maps (FIRMs). The flood risk information presented on the FIRM is based on historic, meteorological, hydrologic, and hydraulic data, as well as open-space conditions, flood-control works, and development within the study area. The FEMA flood hazard zones represents the areas susceptible to the 1% annual chance flood (commonly referred to as the "100-year flood), and the 0.2% annual chance flood ("500-year flood"). The 1% annual chance flood has at least a 1% chance of occurring in any given year. FEMA designates this area as a Special Flood Hazard Area (SFHA) and requires flood insurance for properties in this area as a condition of a mortgage backed by federal funds.

Information found on a flood map includes:

- Common physical features, such as major highways, secondary roads, lakes, railroads, streams, and other waterways
- Special Flood Hazard Areas (SFHAs)
- Base (1% annual chance) Flood Elevation (BFE) depths
- Flood insurance risk zones
- Areas subject to inundation by the 0.2% annual chance (500-year) flood

FIRMs provide the information so that users can:

- Identify SFHAs
- Identify the location of a specific property in relation to the SFHA
- Identify the BFE at a specific site
- Identify the magnitude of flood hazards in a specific area
- Locate regulatory floodways

FIRMs are the mapped product of engineering studies, called Flood Insurance Studies (FISs). The effective date of the first FIS for the Unincorporated Areas of San Diego County was June 15, 1984. (Note: The County has only mapped floodplain in the unincorporated areas of the County of San Diego). Since that time, the FIS for the County has been updated multiple times, the most recent revision being May 16, 2012. The existing published FEMA flood hazard mapping illustrates general characteristics of the floodplain and provides an understanding of the extent of the existing flood potential. It is apparent that there are uncertainties and discrepancies in the flood hazard mapping, particularly where there are dramatic changes in the mapping at local government boundaries where there are not any hydraulic influences. The mapping should be used cautiously because of its approximate nature and it does not necessarily define the magnitude of flooding, but just the approximate extent of the floodplain.

In addition to the FEMA FIRMs, the County of San Diego has developed its own flood maps that account for additional areas of known risk. The County flood maps provide 1% annual chance (100-year) riverine flood elevations for areas beyond those studied by FEMA, and are used in addition to the FIRM in regulating development. The flood hazard information, including FEMA floodplain boundaries and flood zones as well as areas at risk of dam failure, are depicted on the website for SanGIS (http://www.sangis.org). SanGIS is a cooperative endeavor between the City and County of

San Diego. Its GIS data and map creation tools are available free of charge for online use or for purchase for download access and use with other applications.

3.5 Defining Flood Risk

Flood risk can be defined by three different components which include (1) “flood hazard” which is generally the probability of occurrence of a particular flood event, (2) the” exposure” of human activity to the flood which is equated to the flood damage potential, and (3) the specific “vulnerability” or the lack of resistance to damaging/destructive forces. Flood risk can be mathematically calculated as the product of hazard, exposure, and vulnerability. Understanding these definitions is an important foundation in flood management planning. A smaller flood that causes less damage occurs more frequently than a very severe flood that can cause much great damage. However, from a loss prevention standpoint, it may be more beneficial to protect for the more frequent events. The assessment of community vulnerabilities can be evaluated through review of existing codes, plans, policies, programs, and regulations used by local jurisdictions to determine whether existing provisions and requirements adequately address the flood hazards that pose the greatest risk to the community.

Flood Risk – likelihood of consequence from inundation. Identifies the cause and the frequency of the problem (how often)

Flood Exposure – relationship between the flood hazard on the effect on loss of property, life, and environmental resources.

Vulnerability – identifies level of exposure expected (how flooding adversely affects people and property)

Figure 3-2: Different types of flood risk/damage and exposure throughout the County

3.5.1 Flood Event-Specific Factors Influencing Flood Damage

Although there are many issue that effect flood damage, there are several key factors associated with the flood characteristics which influence the amount and severity of the flood damage. In addition, Figure 3-3 provides a general outline of the types of flood losses and the assessment of the type of damage. A description of the primary factors that influence on the severity of flood damage includes the following:

Flood depth: The height flood waters reach is an important consideration affecting flood losses. Structures are more susceptible to damage as flood depths increase. Generally, the coastal plains areas of the County are subject to lower flood depths and more mountainous regions where narrow floodplains and step terrain along the stream corridor prevails are subject to greater flood depths during flood events.

Flood duration: The longer flood waters are in contact with building components (such as structural members, interior finishes, and mechanical equipment), the greater the potential for damage. The duration of flooding is very specific to the nature of an event. However, the structures closest to a flooding source (such as a river, bay, or canal) are more likely to sustain longer durations of flooding and be more vulnerable to flood damage. As flood waters recede, these structures will remain flooded for longer durations than structures located along the edge of the floodplain, increasing the potential for damage.

Velocity: The velocity of flood waters is an important factor impacting potential flooding damage. Flowing water exerts forces on the structural members of a building, increasing the likelihood of significant damage. In addition, flowing waters can increase erosion and scour around the foundation of a structure, which can further increase the vulnerability of a building to flood damage.

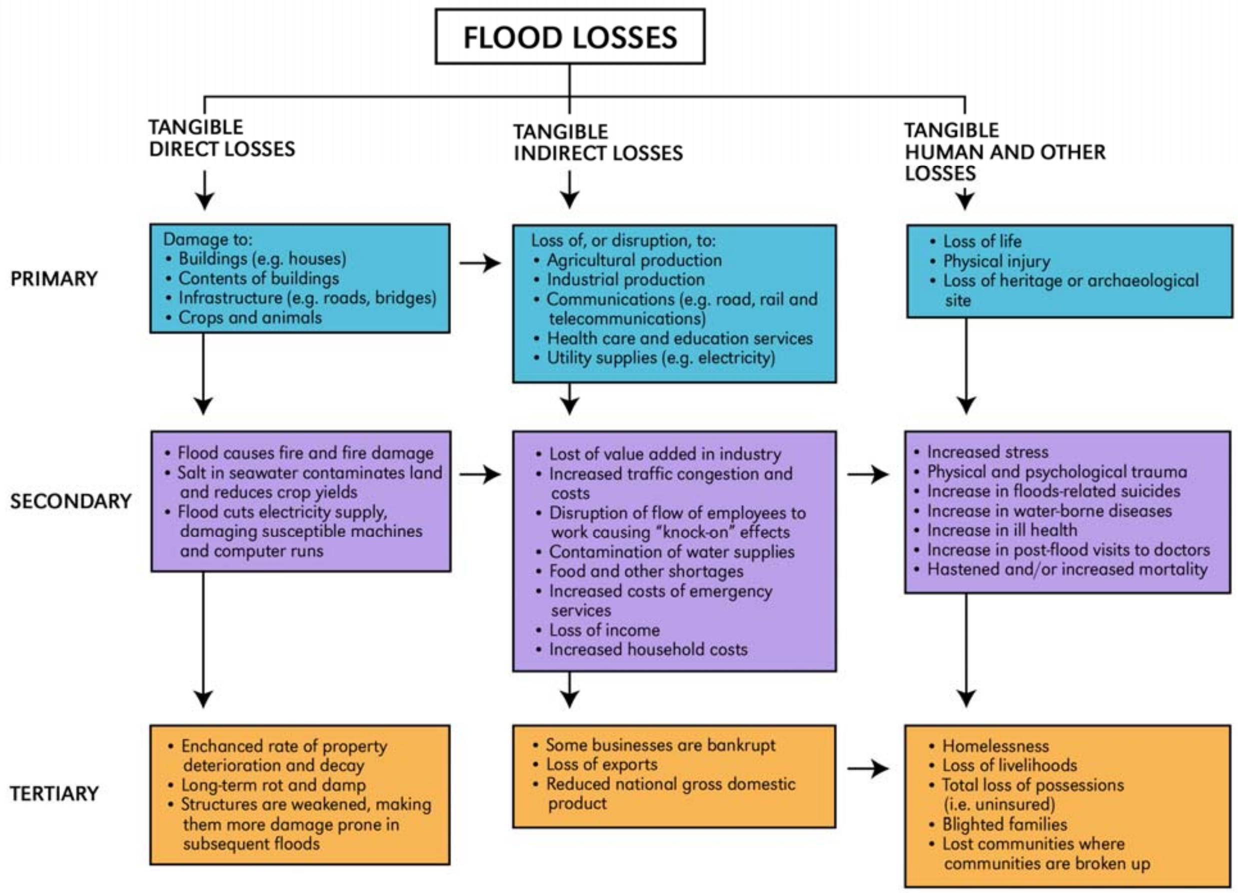


Figure 3-3: Illustration of different types of flood losses and the associated impacts

3.5.2 Repetitive Flood Damage Losses

A "repetitive loss property" is one for which two flood insurance claim payments of at least $1,000 have been paid by the NFIP within any 10-year period since 1978 (e.g., two claims during the periods 1978-1987, 1979-1988, etc.). These properties are important to the NFIP because they cost $200 million per year in flood insurance claim payments. Repetitive loss properties represent only one percent of all flood insurance policies, yet historically they account for nearly one-third of the claim payments (over $4.5 billion to date). Mitigation of the flood risk to these repetitive loss properties will reduce the overall costs to the NFIP as well as to individual homeowners. FEMA programs encourage communities to identify the causes of their repetitive losses and develop a plan to mitigate the losses. Repetitive flood damage loss illustrates areas of an existing recurring chronic flood hazard which should be targeted as a priority to be addressed. Repetitive loss areas and properties should be prioritized for attention and analysis. This "area analysis" should follow FEMA guidelines to determine whether acquisition, elevation, or other flood protection measures are appropriate and feasible for the repetitively flooded buildings. The County is vulnerable to specific "hot spot" areas that have experienced repeated flooding.

3.6 Assessment of Flood Risks

Assessment of the flood risk is a complex problem that can only be solved through interdisciplinary research. In general, a two-step approach is utilized. First it was needed to characterize the flood hazard using a selected set of indicator maps, like the spatial distribution of flow velocity, water height, speed of propagation, duration, etc. The second step was to estimate how the flood hazard indicators interfere with human activities in the flooded area. Agricultural activities will suffer damage in different ways than for instance an industrial zone or an urban area.

An initial assessment of the magnitude of the existing "flood risk" which correlates directly to the potential amount of flood damage can be developed through quantifying encroachment of different landuses within the floodplain. Any area located within 100-year floodplain flood hazard area is considered to be at high risk of flooding. An overlay the landuse plan with the mapped flood hazard zones can be generated. The FEMA flood hazard zone "A" is the 100-year floodplain designation, although there are different types of this flood hazard for insurance purposes. The mapping indicates that the majority of the areas have landuse zoning which is compatible with the floodplain being zoned primarily "open space." However, it is important to note the amounts of other general landuses within the floodplain, particularly the more urban type of uses which would result in more extensive flood damage. The magnitudes of the general landuse designations within the flood hazard zones have been developed utilizing the existing database available. This generalized mapping overlay can be utilized as an effective planning tool as part of the initial plan formulation. The landuse areas which have a high dollar value within flood hazard zones would indicate locations to target and prioritize projects. Other benefits of this mapping assessment include:

- Identification of flooding vulnerable structures based on flood inundation hazards
- Approximate magnitudes of potential flood losses
- Potential critical public lifeline facilities and infrastructure that could be impaired by flooding
- Identification of key transportation facilities, including roadways that could reduce public access and emergency response
- Identification of the different landuses encroaching within the 100-year flood hazard zones as well as quantifying the amount of these areas for different landuse

Figures 4-3, 4-5, 4-7, 4-9, 4-11, 4-13, 4-15, 4-17, 4-19, and 4-21 in Section 4 of this report illustrate the mapped floodplain risk and exposure assessment based on the amount of landuse within the published mapped flood hazard zones. The precise risks to the different landuses would require detailed analyses of different flooding depths for different flood frequencies to determine how risk varies within the floodplain, but this data was not available for this study.

3.6.1.1 Landuse Located within Flood Hazards – City Boundaries

The amount of the different landuses that are within the mapped flood hazard zones for the different major cities within San Diego were quantified and are presented in Table 3-4. This is a planning level assessment in order to provide an indication of the flood hazard risk based on the existing data for landuse within the mapped floodplain. The landuse mapping data is from the County of San Diego through their SanGIS.

Table 3-4: Landuse types located within mapped flood hazard zones based on City boundaries

Carlsbad	Area (acres)
Agriculture	36
Commercial and Services	258
Industrial	13
Open Space and Recreation	706
Residential	84
Transportation, Communications, and Utilities	92
Water	782
Grand Total	**1,970**

Chula Vista	Area (acres)
Commercial and Services	424
Industrial	319
Open Space and Recreation	1,544
Residential	329
Transportation, Communications, and Utilities	565
Water	1,314
Grand Total	**4,494**

Coronado	Area (acres)
Commercial and Services	175
Industrial	187
Open Space and Recreation	159
Residential	143
Transportation, Communications, and Utilities	112
Water	1,948
Grand Total	**2,724**

Del Mar	Area (acres)
Commercial and Services	214
Industrial	3
Open Space and Recreation	89
Residential	45
Transportation, Communications, and Utilities	69
Water	48
Grand Total	**470**

La Mesa	Area (acres)
Commercial and Services	0
Open Space and Recreation	2
Residential	10
Transportation, Communications, and Utilities	6
Grand Total	**18**

Santee	Area (acres)
Commercial and Services	210
Industrial	36
Open Space and Recreation	422
Residential	100
Transportation, Communications, and Utilities	62
Water	45
Grand Total	**874**

El Cajon	Area (acres)
Commercial and Services	304
Industrial	177
Open Space and Recreation	43
Residential	447
Transportation, Communications, and Utilities	430
Grand Total	**1,400**

Encinitas	Area (acres)
Agriculture	24
Commercial and Services	12
Open Space and Recreation	597
Residential	72
Transportation, Communications, and Utilities	62

Water	237
Grand Total	**1,004**

Escondido	**Area (acres)**
Agriculture	3
Commercial and Services	545
Industrial	63
Open Space and Recreation	220
Residential	987
Transportation, Communications, and Utilities	483
Water	76
Grand Total	**3,381**

Imperial Beach	**Area (acres)**
Commercial and Services	41
Industrial	2
Open Space and Recreation	978
Residential	29
Transportation, Communications, and Utilities	22
Water	36
Grand Total	**1,109**

Lemon Grove	**Area (acres)**
Commercial and Services	10
Industrial	24
Open Space and Recreation	2
Residential	1
Transportation, Communications, and Utilities	15
Grand Total	**52**

Solana Beach	**Area (acres)**
Commercial and Services	2
Open Space and Recreation	14
Residential	29
Transportation, Communications, and Utilities	11
Water	2
Grand Total	**57**

National City	Area (acres)
Commercial and Services	213
Industrial	277
Open Space and Recreation	168
Residential	70
Transportation, Communications, and Utilities	253
Water	520
Grand Total	**1,500**

Oceanside	Area (acres)
Agriculture	397
Commercial and Services	519
Industrial	261
Open Space and Recreation	1,760
Residential	1,340
Transportation, Communications, and Utilities	918
Water	95
Grand Total	**5,291**

Poway	Area (acres)
Agriculture	28
Commercial and Services	86
Industrial	14
Open Space and Recreation	344
Residential	379
Transportation, Communications, and Utilities	94
Water	53
Grand Total	**999**

San Diego	Area (acres)
Agriculture	1,653
Commercial and Services	2,318
Industrial	1,532
Open Space and Recreation	9,883
Residential	1,274
Transportation, Communications, and Utilities	2,061
Water	5,170
Grand Total	**23,892**

San Marcos	Area (acres)
Agriculture	13
Commercial and Services	157
Industrial	96
Open Space and Recreation	317
Residential	86
Transportation, Communications, and Utilities	125
Grand Total	**794**

Vista	Area (acres)
Agriculture	0
Commercial and Services	224
Industrial	18
Open Space and Recreation	136
Residential	161
Transportation, Communications, and Utilities	133
Grand Total	**672**

3.6.2 Planning Estimates of Flood Damage Loss Areas

The estimated loss for flood hazards throughout the County, in addition to exposure, was prepared at a planning level to provide guidance with the watershed planning. Loss is that portion of the exposure that is expected to be lost to a hazard. Loss is estimated by referencing frequency and severity of previous hazards. Hazard risk assessment methodologies were applied to flood hazards in the County of San Diego. The procedure adopted integrates GIS mapping data to provide estimates for the potential impact of flood hazards by using a common, systematic framework for evaluation. Average flood damage costs for different landuses based on FEMA guidelines and similar values embedded in to the HAZ-US (FEMA national hazard model). This data included economic and structural data on infrastructure and critical facilities, including replacement value to use in loss estimation assumptions. This approach provides estimates for the potential impact by using a common methodology and database. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (such as incomplete inventories, demographics, or economic parameters). However, the results provide a useful planning level tool to identify locations of high value assets within the watershed and prioritizing flood management projects around these locations in order to reduce the potential dollar damage losses.

The data developed for the different levels of flood exposures/risk based on landuses within the mapped flood hazard zones for each of the regional watersheds was used to develop planning level assessment of the potential economic losses or dollar damage. Studies on flood damage estimates illustrate that the dollar damage for residential and commercial structure increases with flood depth. However, this planning level assessment did not differentiate the variation of flood depths within the floodplain. A generalized dollar damage cost was applied to the different landuse categories based upon national information for flood damage. The results of this assessment are illustrated in Figure 3-4 and Figure 3-5. This illustrates some useful trends related to the locations and most susceptible types of flood damage when planning management activities.

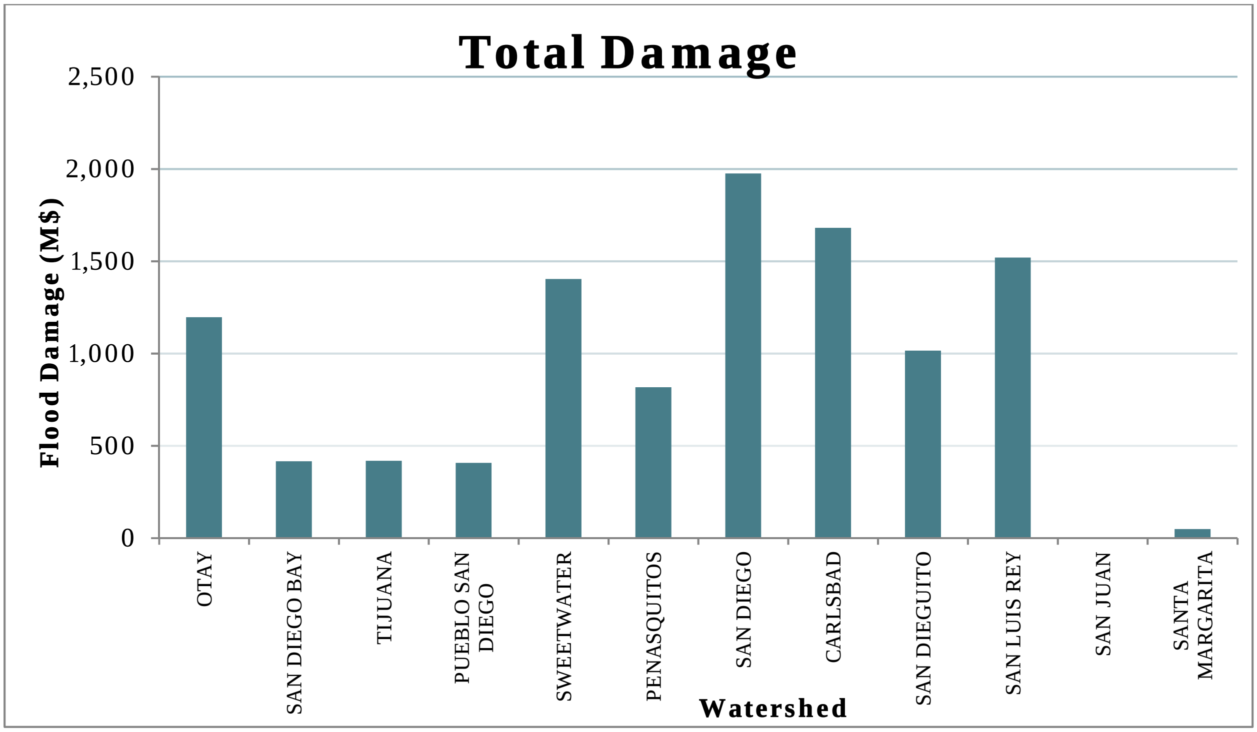


Figure 3-4: Total estimated 100-year approximate dollar flood damage by watershed

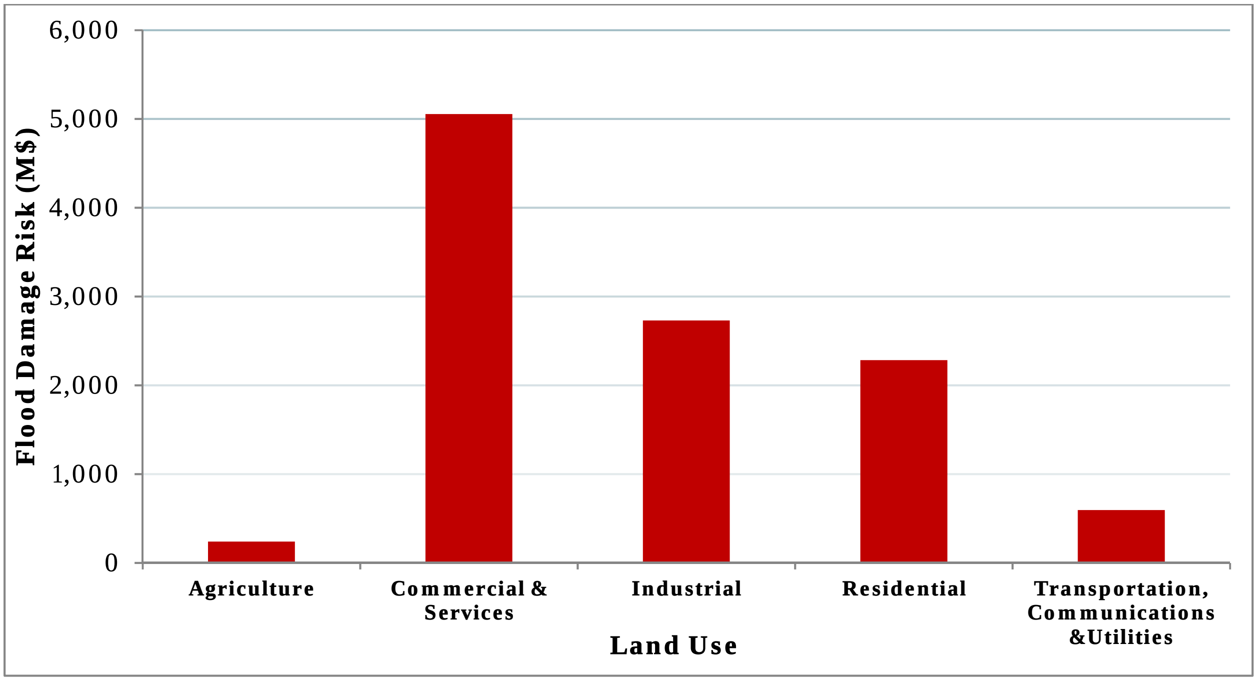


Figure 3-5: Total estimated 100-year flood damage to the different landuse types over all watersheds

3.7 Existing Community Watershed Programs

There are a variety of community-based watershed protection programs that provide a basis for community involvement for the preservation and management of the watershed resources. The community groups provide multiple benefits for the watershed through enhanced monitoring and performing volunteer watershed management projects. The community watershed programs should be an integral component of the watershed management program development and implementation. Table 3-5 provides a select few of the organizations who administer watershed protection programs.

Table 3-5: Examples of Community Watershed Programs

Watershed	Organization	Website
San Diego River	San Diego River Park Foundation	http://www.sandiegoriver.org/index.html
Carlsbad	Batiquitos Lagoon Foundation	http://www.batiquitosfoundation.org/
San Diego River	Friends of Famosa Slough	http://www.famosa-slough.org/
Carlsbad	The Escondido Creek Conservancy	http://www.escondidocreek.org/
Los Penasquitos Creek	Los Penasquitos Lagoon Foundation	http://lospenasuitos.org/
Sweetwater River	Sweetwater River Conservancy	http://www.sweetwaterriverconservancy.org/
Carlsbad	San Elijo Lagoon Conservancy	http://www.sanelijo.org/
Tijuana River	Tijuana River National Estuarine Research Reserve	http://www.trnerr.org/
Los Penasquitos Creek	Rose Creek Watershed Alliance	http://www.rosecreekwatershed.org/
Santa Margarita River	Santa Margarita River – Friends of the River	http://www.friendsofthe river.org/

4 Regional Watersheds Description

4.1 Regional Watersheds Hydrologic Characteristics

The San Diego IRWM Region is comprised of **11 watersheds** tributary to the Pacific Ocean and is illustrated on Figure 4-1. The Region's watersheds are located either completely within incorporated communities within the County or within undeveloped unmapped areas of the eastern part of the County. The major river systems affecting the unincorporated areas of the county include: Santa Margarita, Otay, San Luis Rey, Sweetwater, San Diego, San Dieguito, and Tijuana. The watersheds are the surface hydrology features or the tributary basin areas corresponding to the regional drainage systems and floodplains. The hydrologic response of these watershed units for rainfall events as well as the channel processes/geomorphology trends, which influence the flooding characteristics which are examined at a regional scale. In addition, different characteristics of the watersheds and floodplains that may limit potential flood management solutions are also explored. The "watershed units" provide a useful method to divide the region and basis for focusing on flood management planning utilizing a regional watershed basis.

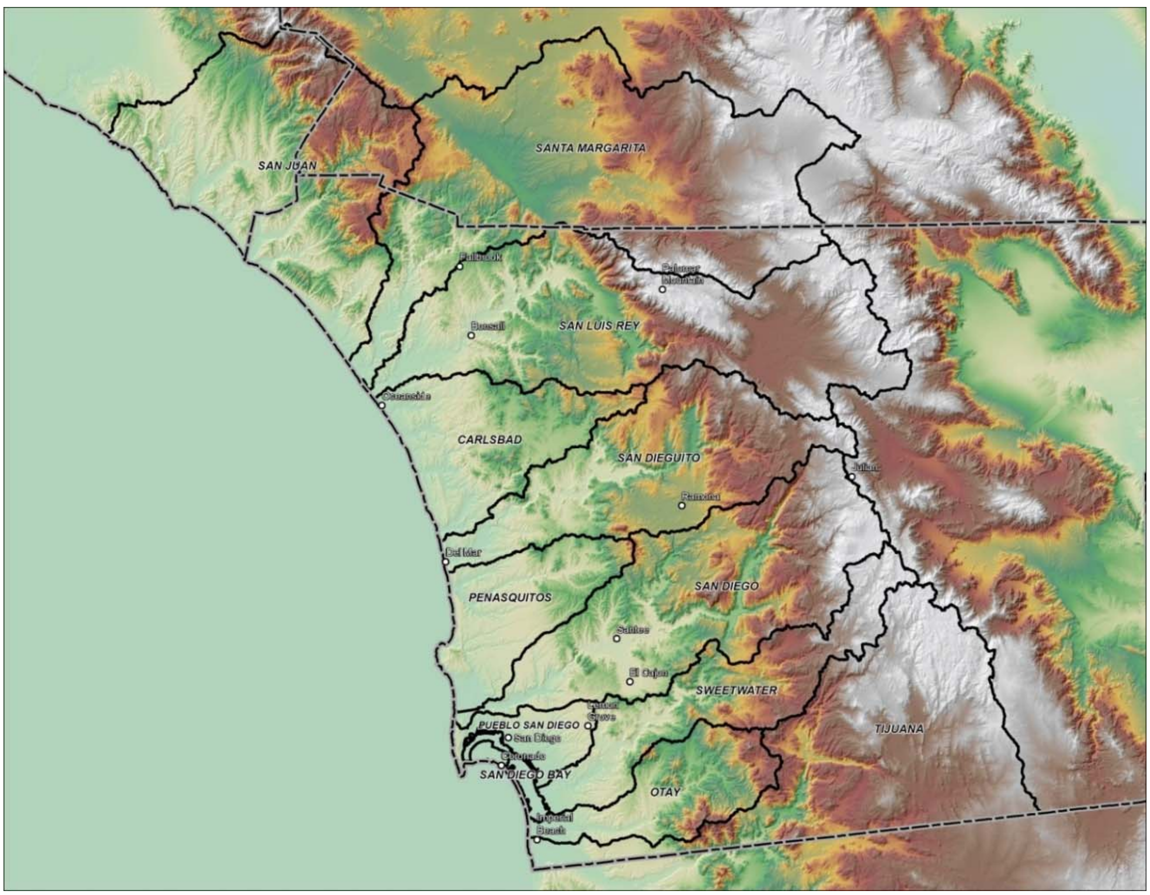


Figure 4-1: Regional delineation of major watershed units utilized for watershed planning

4.1.1 Tijuana River

Figure 4-2: Tijuana River watershed unit with population centers

The Tijuana River watershed encompasses a region of approximately 1,750 square miles on either side of the California – Baja California border. Twenty-seven percent of the watershed area is within California and the river discharges to the Tijuana Estuary and Pacific Ocean on the U.S. side of the international border. Although only 27% of the watershed area is within California, the river discharges to the Tijuana Estuary and Pacific Ocean on the U.S. side of the international border. On the U.S. side of the border, the cities of Imperial Beach and San Diego, and San Diego County have portions of their jurisdictions within the watershed. The cities of Tijuana and Tecate are the most important urban centers on the Mexican side. The current population of the entire watershed is approximately one million people. The cities of Tijuana and Tecate are the most important urban centers on the Mexican side. The major drainages include Cottonwood and Campo creeks in the US, and the Rio Las Palmas system in Mexico. Annual precipitation varies from less than 11 inches to 25 inches farther inland near the Laguna mountains. Runoff is captured by the Morena Reservoir and Barrett Lake on Cottonwood creek. There are 3 dams in the watershed controlling 78% of the area: Morena was built in 1912 and Barrett in 1922. In Mexico, Rodriguez dam was built in 1936. The watershed includes eight hydrological areas, including the Tijuana Valley, Potrero, Barrett Lake, Monument, Morena, Cottonwood, Cameron, and Campo areas.

Table 4-1: Tijuana River watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 467.4 square miles Naturally Occurring Waterways: 549.59 miles Percentage of Free Flowing River Miles: 93 % Percentage of River Miles in Protected Lands: 9 % Number of Dams: 5 Number of Stream Crossings: 407 Average Precipitation per Year: 19.08 inches Percentage Area above 15% Slope: 18.9 % Longest Watershed Flow Path Length: 348,500 feet Maximum Elevation: 5,075 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 5,075 feet Average Map Slope: 1.46%
Major Water Bodies	Tijuana Estuary, Tijuana River, Cottonwood Creek, Pine Valley, Campo Creek, Barrett Lake, Lake Moreno
Cities in Watershed	Imperial Beach, Tecate, Canyon City, Campo Potrero Rancho Del Campo Barrett Junction Hacienda Del Florasol Cameron Corners Lake Morena Village Live Oak Springs Boulder Oaks Laguna Junction Pine Valley Mt Laguna
River / Creeks Length (ft)	Agua Dulce Creek 7,454 Campo Creek 45,378 Cottonwood Creek 228,415 Dulzura Creek 481 Espinosa Creek 25,651 Grapevine Creek 17,601 Hauser Creek 22,673 Indian Creek 22,116 Kitchen Creek 47,192 La Posta Creek 105,445 Little Potrero Creek 12,213 Lucas Creek 10,205 Miller Creek 39,592 Morena Creek 29,686 Oak Valley Creek 14,214 Oneonta Slough 9,066 Pine Valley Creek 133,940 Potrero Creek 60,075 San Diego City Conduit 55,536 Tecate Creek 6,529 Tijuana River 40,362 Wilson Creek 28,655

4.1.1.1 Water Quality

The Tijuana River watershed is classified as a Category I (impaired) watershed by the State Water Resources Control Board due to a wide variety of water quality problems. These problems are largely a result of non-point agricultural sources on the U.S. side of the border and a large variety of point and nonpoint sources on the Mexican side. The Tijuana Estuary, a National Estuarine Sanctuary that supports a variety of threatened and endangered plants and animals, is threatened by inflows from the Tijuana River containing high concentrations of coliform bacteria, sediment, trace metals (copper, lead, zinc, chromium, nickel, and cadmium), PCBs, and other urban, agricultural, and industrial pollutants. The major problem in the watershed is poor water quality. Although discharges from the Tijuana River account for only a small percentage of total gauged runoff to the Southern California coastal ocean, it contains the highest concentrations of suspended solids and cadmium (Cd), copper (Cu), nickel (Ni), lead (Pb), and zinc (Zn) among the eight largest creeks and rivers in Southern California. Surface water quality has been affected by runoff from Mexico while ground water contamination has occurred as a result of seawater intrusion and waste discharges.

4.1.1.2 Biological / Habitat Natural Resources

The Tijuana estuary is one of the largest and most studied wetlands in the South Coast, and is part of the National Estuarine Research Reserve and National Wildlife Refuge programs. The reserve is home to eight threatened and endangered species, including the Light-footed clapper rail, California least tern, Least Bell's vireo, salt marsh bird's beak, white and brown pelicans, and numerous shorebirds.

4.1.1.3 Watershed Floodplain Hydrology – Major Drainages

Table 4-2: Tijuana River watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Tijuana River				
At Mouth	1,700	17,000	50,000	75,000

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.1.4 Flood Risk and Exposure Mapping

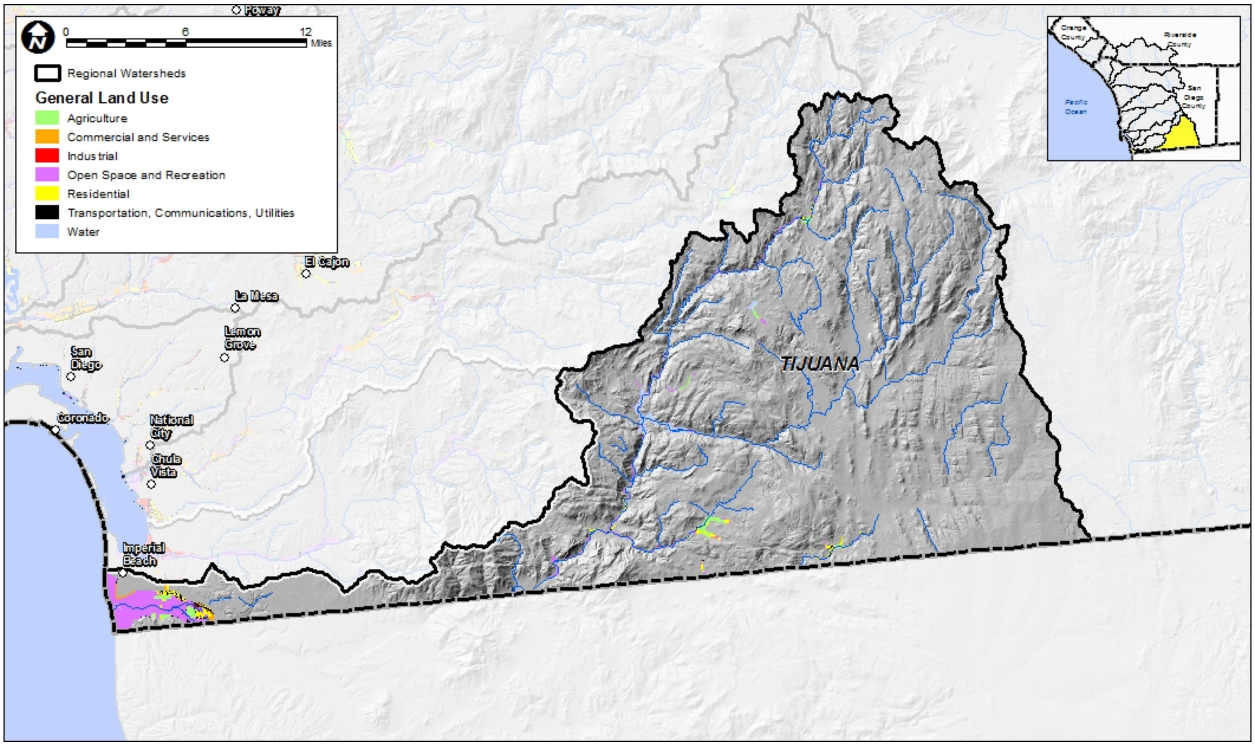


Figure 4-3: Floodplain risks and exposure assessment – landuses within 100-year floodplain for Tijuana watershed unit

Table 4-3: Landuse types located within mapped flood hazard zones for Tijuana watershed unit

TIJUANA	Area (acres)
Agriculture	800
Commercial and Services	188
Industrial	23
Open Space and Recreation	4,758
Residential	852
Transportation, Communications, and Utilities	319
Water	821
Grand Total	**7,761**

4.1.2 Otay River

Figure 4-4: Otay River watershed unit with population centers

The Otay River watershed encompasses approximately 160 square miles in southwest San Diego County and is one of the three county watersheds that discharge to San Diego Bay. The watershed consists largely of unincorporated area, but also includes portions of the cities of Chula Vista, Imperial Beach, Coronado, National City, and San Diego. The predominant land uses in the watershed are open space (67%) and urban/ residential (20%). The major inland hydrologic features, Upper and Lower Otay Lakes, are two water supply reservoirs that also provide important habitat and recreational opportunities.

The current population in the Otay River watershed is approximately 150,000 people. The expected population increase of 88% from 1998 – 2015 is anticipated to substantially increase the volume of urban runoff in the watershed.

Table 4-4: Otay watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 153.7 square miles Longest Watershed Flow Path Length: 148,300 feet Maximum Elevation: 1,888 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 1,888 feet Average Map Slope: 1.27%
Major Water Bodies	Upper and Lower Otay Reservoirs, Otay River, San Diego Bay
Cities in Watershed	Nestor, Otay Mesa, Palm City, Castle Park, Engineer Springs, Dulzura,
Rivers/Creeks Length (ft)	Dulzura Creek 52,802 Jamul Creek 59,736 Otay River 86,405 Salt Creek 33,431

4.1.2.1 *Water Quality*

The current population in the Otay River watershed is approximately 150,000 people. At the present time, serious water quality problems are limited to the presence of elevated coliform bacteria in the Pacific Ocean receiving waters near Coronado. However, an expected population increase of 88% from 1998 – 2015 will substantially increase the volume of urban runoff in the watershed, and could significantly alter the present water quality status. In the absence of effective watershed-based management, the natural resources of the Otay River watershed may be significantly degraded.

4.1.2.2 *Biological / Habitat Natural Resources*

Approximately 36 square miles of the watershed is part of the Multiple Species Conservation Plan effort that provides habitat for a wide range of endangered plant and animal species. Other important conservation areas within the watershed include the San Diego National Wildlife Refuge, the Rancho Jamul Ecological Reserve, and the vernal pool lands in the region.

4.1.2.3 *Watershed Floodplain Hydrology – Major Drainages*

Table 4-5: Otay watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Otay River				
At Otay Valley Rd.	122.7	1,200	12,000	22,000
Telegraph Canyon Creek				
At Int. Hwy. 5	7.3	900	2,100	2,800

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.2.4 Flood Risk and Exposure Mapping

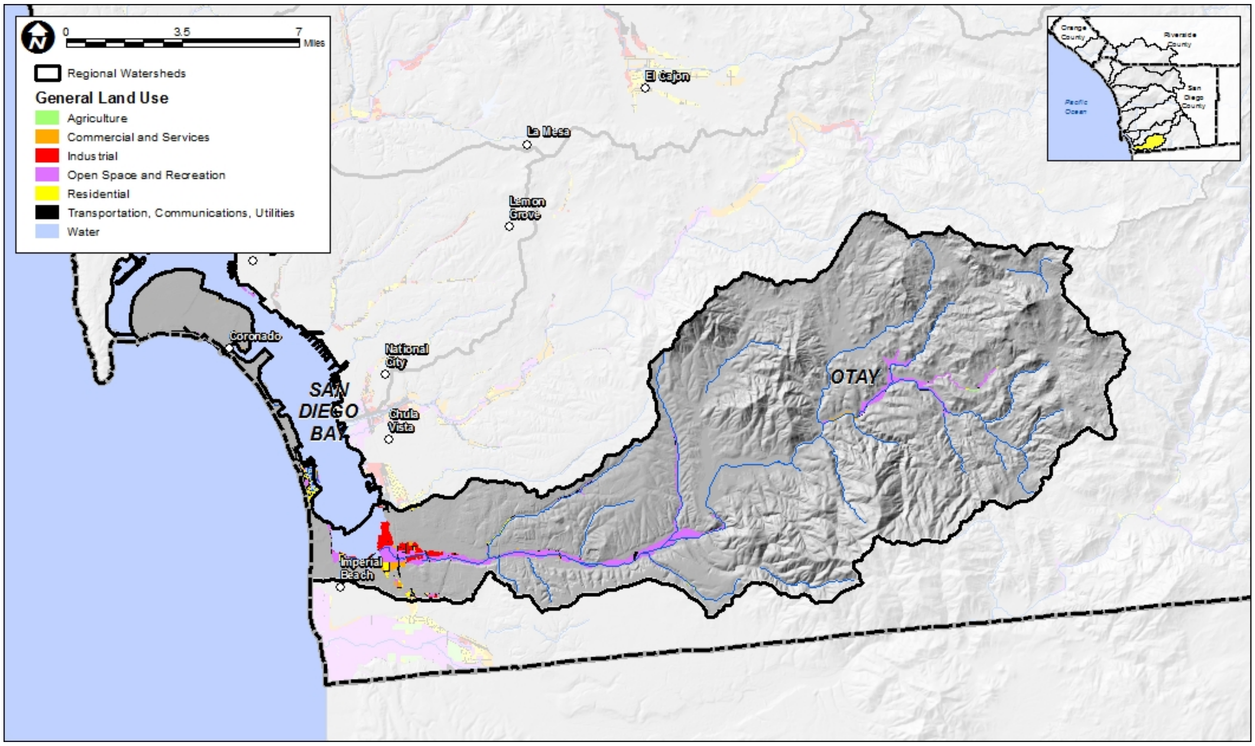


Figure 4-5: Floodplain risks and exposure assessment – landuses within 100-year floodplain for Otay watershed unit

Table 4-6: Landuse types located within mapped flood hazard zones for Otay watershed unit

OTAY	Area (acres)
Agriculture	18
Commercial and Services	170
Industrial	1,238
Open Space and Recreation	2,318
Residential	267
Transportation, Communications, and Utilities	317
Water	61
Grand Total	**4,389**

4.1.3 Sweetwater River

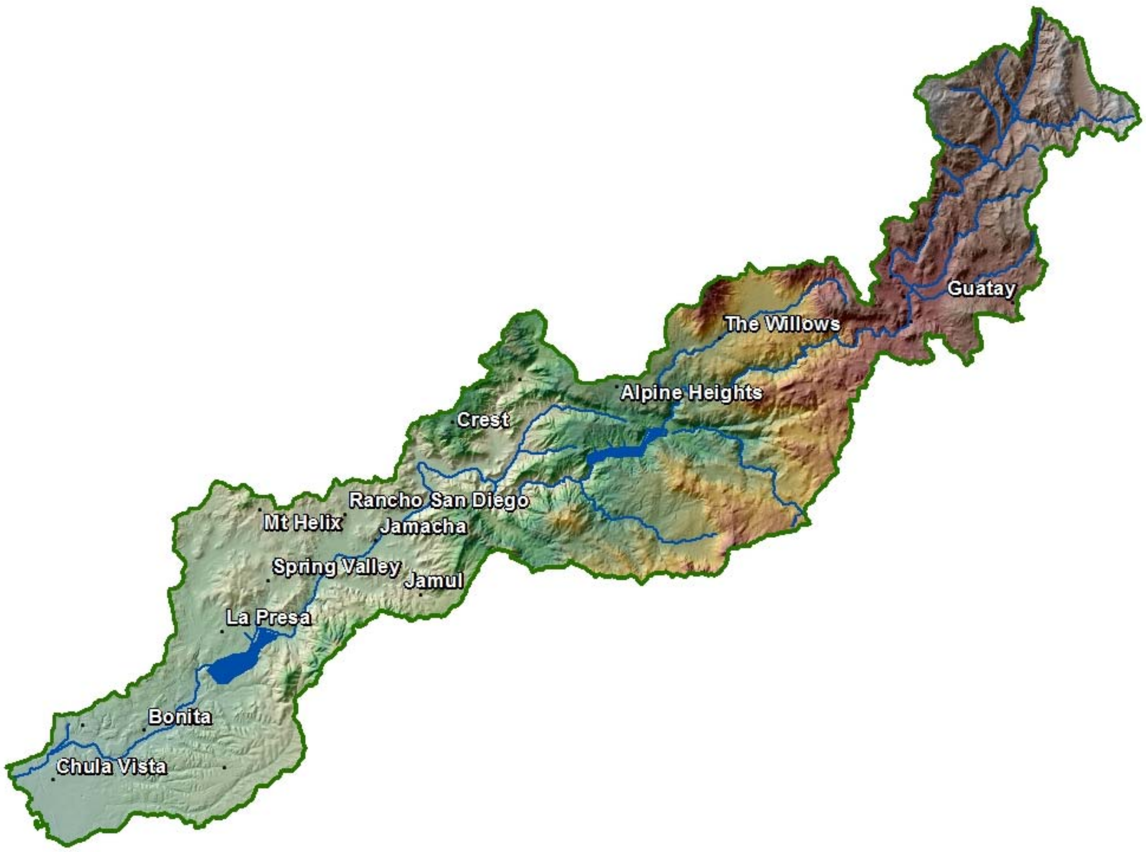


Figure 4-6: Sweetwater River watershed unit with population centers

The Sweetwater River watershed along with the Otay and Pueblo San Diego watersheds combine to form the major watershed tributary to the San Diego Bay area. The Sweetwater River watershed is the largest of the three encompassing 230 of the approximately 415 square mile total. Over 86% of the watershed is within unincorporated jurisdictions. The dominant land uses in the Sweetwater River watershed are urban (29%), open space/ agriculture (22%), and undeveloped (49%). Approximately two-thirds of the land area categorized as urban is composed of residential communities. Approximately 300,000 people currently reside within the Sweetwater River watershed, and this amount is projected to increase to 365,000 by 2015. The most important watershed issues are related to the protection of municipal water supplies, and the protection and restoration of sensitive wetland and wildlife habitats.

The upper watershed includes Cuyamaca Rancho State Park, the unincorporated communities of Pine Valley, Descanso, and Alpine, and the Viejas Indian Reservation. Unincorporated rural and suburban communities characterize the central part of the watershed. The urbanized lower portion of the

Sweetwater watershed contains portions of several cities including San Diego, National City, Chula Vista, La Mesa, and Lemon Grove. Of the cities within the watershed, Chula Vista is the most important in terms of land area.

Table 4-7: Sweetwater River watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 229.4 square miles Longest Watershed Flow Path Length: 313,600 feet Maximum Elevation:4,833 Minimum Elevation: 0 (se level) Watershed Elevation Difference: 4,833 feet Average Map Slope: 1.54%
Major Water Bodies	Sweetwater River, Sweetwater Reservoir, Loveland Reservoir, and San Diego Bay
Cities/Population Centers in Watershed	Chula Vista, Rancho Del Ray, Bonita, Lincoln Acres, La Presa, Jamul, North Jamul, Spring Valley, Jamacha Rancho San Diego Mt Helix Crest Alpine Heights Harbison Canyon The Willows Descanso Junction Guatay Descanso Hulburd Grove Morettis Junction Valley Center Ranchita Hidden Meadows Camp Pendleton South San Luis Rey Lake Henshaw San Ysidro La Jolla Amago Bonsall Warner Springs Los Tules Eagles Nest Rincon Birch Hill Pauma Valley San Luis Rey Heights Camp Pendleton North Pala Mesa Village Winterwarm Palomar Mountain Sunshine Summit Pala Fallbrook Rainbow
Rivers / Creek Length (ft)	Arroyo Seco 4,051 Cold Stream 15,642 Descanso Creek 34,725 Harper Creek 28,950 Japacha Creek 10,552

	Juaquapin Creek	13,141
	Lawson Creek	32,326
	North Fork Sweetwater River	31,539
	Paradise Creek	15,399
	Samagatuma Creek	29,426
	Stonewall Canyon	14,259
	Sweetwater River	311,152
	Sycuan Creek	10,893
	Taylor Creek	38,827
	Viejas Creek	49,445

4.1.3.1 Biological / Habitat Natural Resources

Between the headwaters and the outlet to San Diego Bay, the watershed contains a variety of habitat types including oak and pine woodlands, riparian forest, chaparral, coastal sage scrub, and coastal salt marsh. The upper watershed contains large undeveloped areas within the Cleveland National Forest and

4.1.3.2 Watershed Floodplain Hydrology – Major Drainages

Table 4-8: Sweetwater watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Spring Valley Creek				
Below Confluence w/ Casa de Oro Creek	7.1	1,300	2,600	3,600
Sweetwater River				
Above Sweetwater Reservoir	174	5,600	21,500	29,500
Sweetwater River (At National City)				
At Broadway	219	1,200	21,000	35,000
Sweetwater River (Near Descanso)				
At Japatul Valley Rd. Bridge	41	3,800	14,800	20,300

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.3.3 Flood Risk and Exposure Mapping

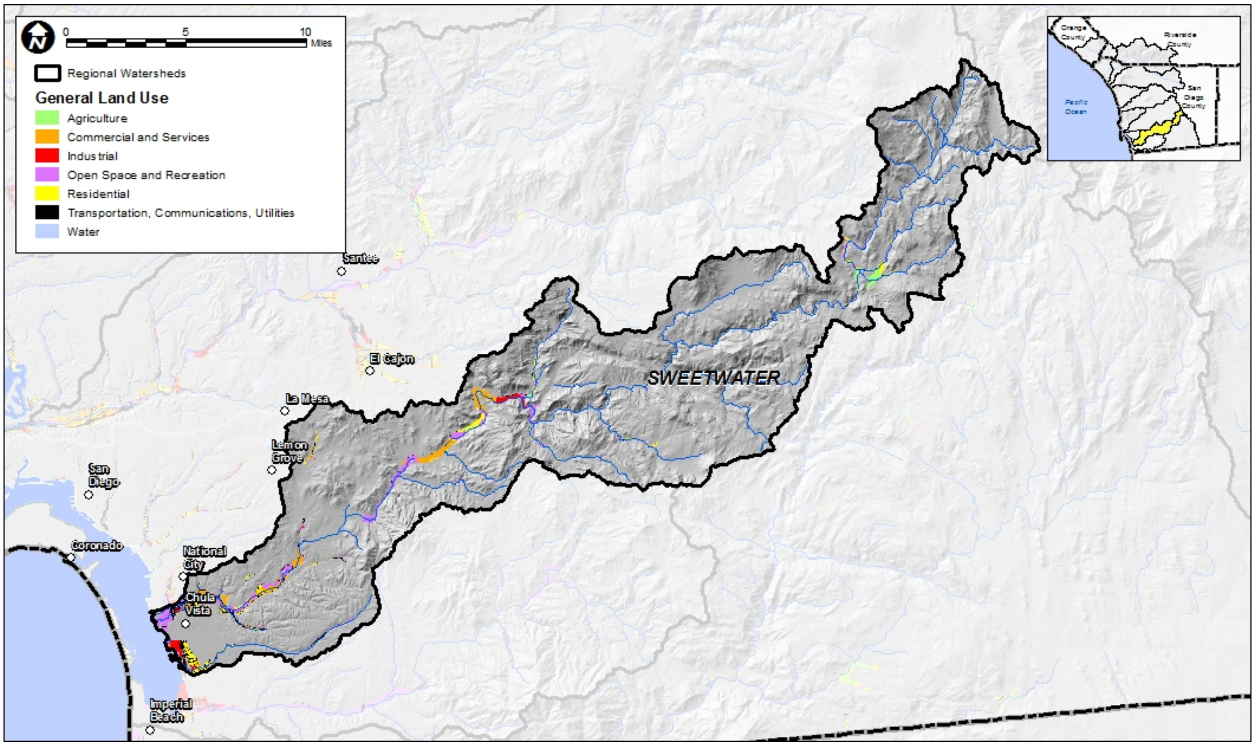


Figure 4-7: Floodplain risks and exposure assessment – landuses within 100-year floodplain for Sweetwater watershed unit

Table 4-9: Landuse types located within mapped flood hazard zones for Sweetwater watershed unit

SWEETWATER	Area (acres)
Agriculture	273
Commercial and Services	1,204
Industrial	371
Open Space and Recreation	1,815
Residential	825
Transportation, Communications, and Utilities	751
Water	97
Grand Total	**5,336**

4.1.4 Pueblo San Diego

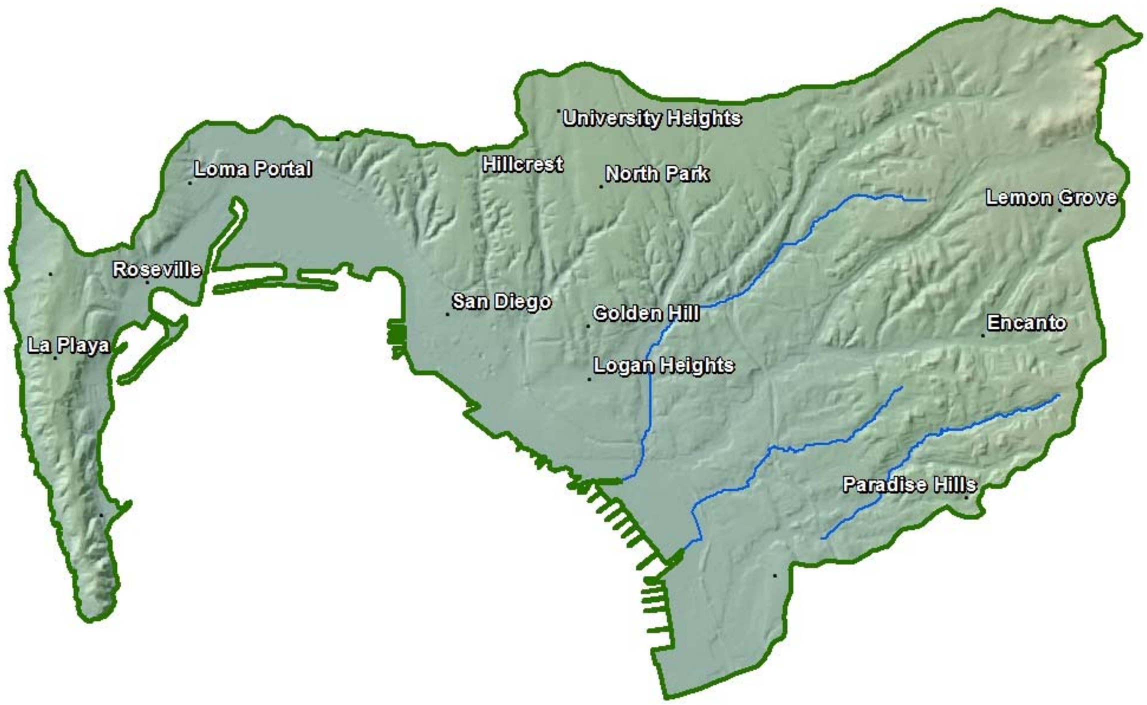


Figure 4-8: Pueblo San Diego watershed unit with population centers

The Pueblo San Diego is the smallest regional watershed unit in San Diego County, encompassing approximately 60 square miles of predominantly urban landscape in the cities of San Diego, La Mesa, Lemon Grove, and National City. The watershed contains the smallest proportion of unincorporated area (0.3%) of the watershed units within the county. The population of the Pueblo San Diego watershed is approximately 500,000 residents, making it the county's most densely populated watershed. Approximately 75% of the watershed is developed. Residential, retail/ office, and industrial land uses account for 45%, 11%, and 10% of the total, respectively. In addition, there are relatively large percentages of land used for transportation corridors and highways. Due to the high level of existing urbanization in the watershed, only small amounts of additional land is projected for development over the next 15 years.

The watershed drainage consists of a group of relatively small local creeks and pipe conveyances, many of which are concrete-lined and drain directly into San Diego Bay.

Table 4-10: Pueblo San Diego watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 58.6 square miles Longest Watershed Flow Path Length: 33,053 feet Maximum Elevation:431 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 431 feet Average Map Slope: 1.30%
Major Water Bodies	Las Chollas Creek, Switzer Creek, Paleta Creek, and San Diego Bay
Cities in Watershed	National City Paradise Hills Point Loma Logan Heights Encanto La Playa Golden Hill San Diego Roseville Fleetridge Lemon Grove North Park Loma Portal Hillcrest Mission Hills University Heights
Rivers / Creek Length (ft)	Chollas Creek 33,054 Paradise Creek 21,478 Seventh Street Channel 22,300

4.1.4.1 Water Quality

The beneficial uses of the inland surface waters in the Pueblo San Diego watershed are limited to contact (potential use) and non-contact recreation, warm freshwater habitat, and wildlife habitat. The San Diego Bay receiving water supports an extensive array of beneficial uses. The creeks in the watershed are highly impacted by urban runoff, and Chollas Creek and the mouth of the creek in San Diego Bay are listed as 303(d)-impaired water bodies for various trace metals parameters and aquatic toxicity. Five sites in San Diego Bay that are impacted by runoff from the Pueblo San Diego watershed have been identified as hot spots by California's Bay Protection Toxic Cleanup Program.

4.1.4.2 Watershed Floodplain Hydrology – Major Drainages

Table 4-11: Pueblo San Diego watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Las Chollas Creek				
At Main St.	26.4	4,200	8,000	10,000
Above Confluence w/ South Las Chollas Creek	15.3	3,000	6,000	7,900
At Market St.	12.7	2,700	5,400	7,100
Las Puleta Creek				

At San Diego and AZ Eastern Railroad	2.8	550	1,200	1,400
South Las Chollas Creek				
Above Confluence w/ Las Chollas Creek	10.9	2,000	3,900	5,300
Switzer Creek				
At Harbor Dr.	4.3	830	2,200	2,600

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.4.3 Flood Risk and Exposure Mapping

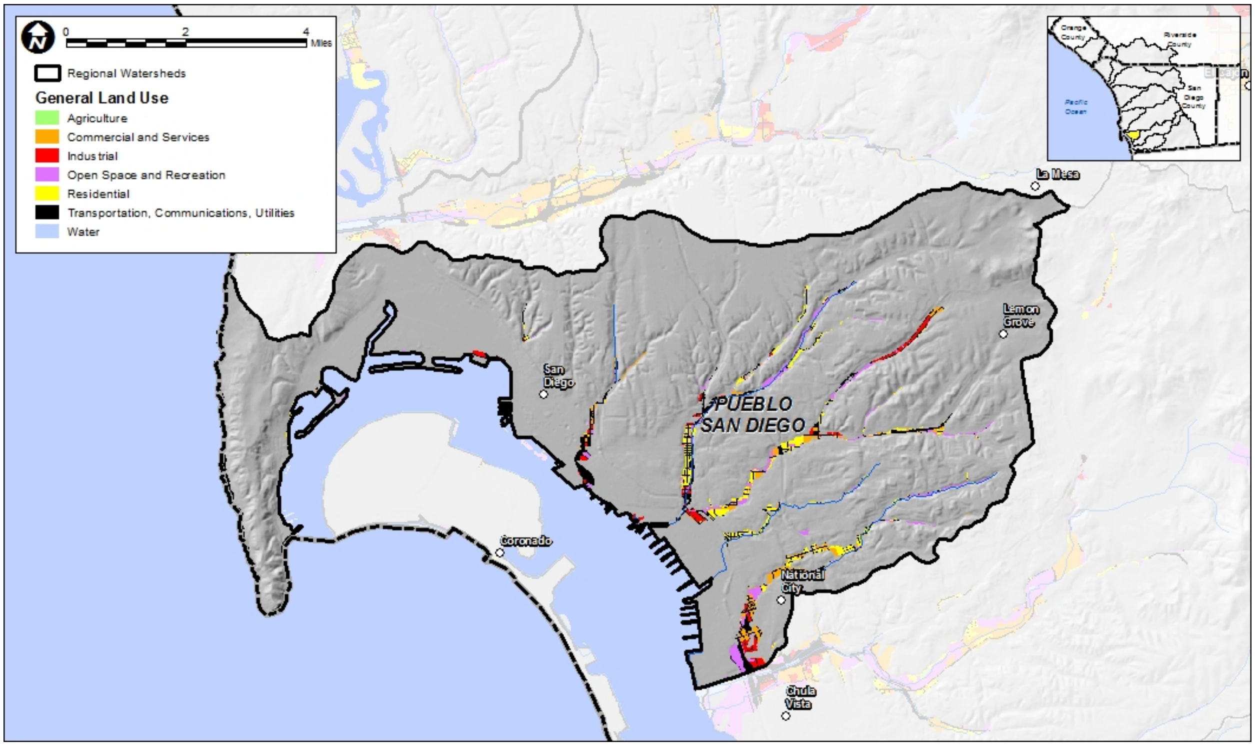


Figure 4-9: - Floodplain risks and exposure assessment – landuses within 100-year floodplain for Pueblo San Diego watershed unit

Table 4-12: Landuse types located within mapped flood hazard zones for Pueblo San Diego watershed unit

PUEBLO SAN DIEGO	Area (acres)
Commercial and Services	217
Industrial	165
Open Space and Recreation	330
Residential	306
Transportation, Communications, and Utilities	555
Water	22
Grand Total	**1,594**

4.1.5 San Diego River

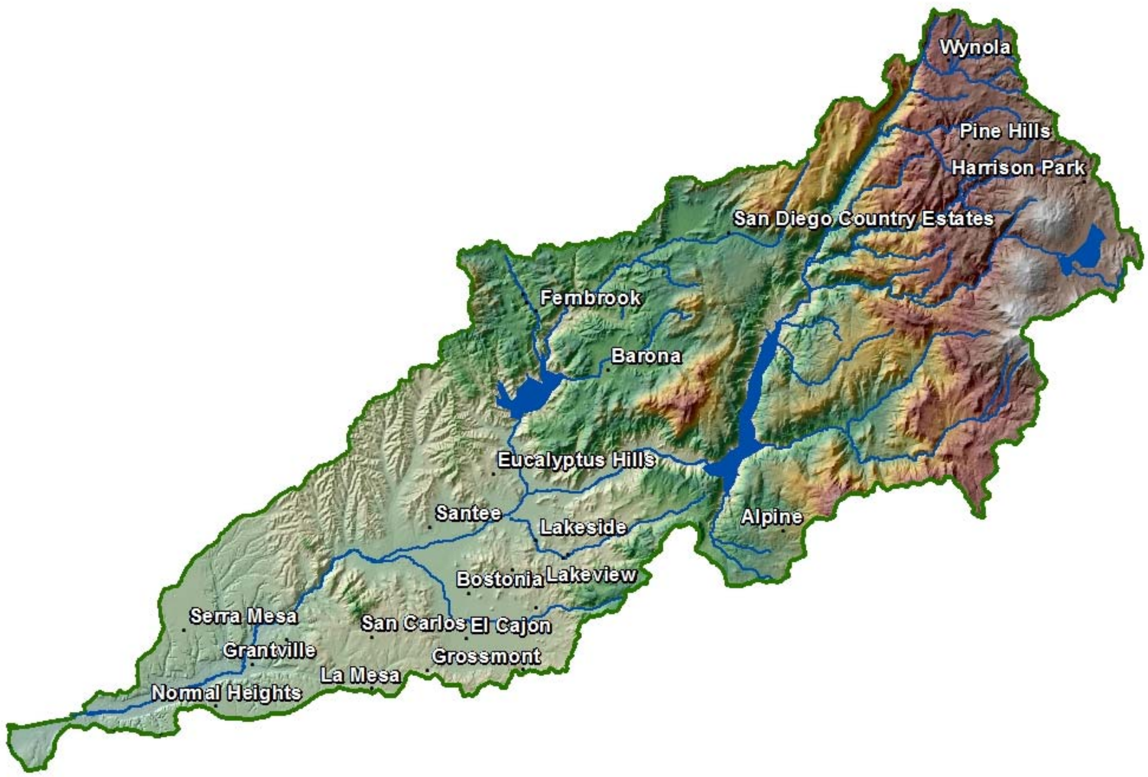


Figure 4-10: San Diego River watershed unit with population centers

With a land area of approximately 440 square miles, the San Diego River watershed is the second largest in San Diego County. It also has the highest population (~475,000) of the County's watersheds and contains portions of the cities of San Diego, El Cajon, La Mesa, Poway, and Santee and several unincorporated jurisdictions. Important hydrologic resources in the watershed include five water storage reservoirs, a large groundwater aquifer, extensive riparian habitat, coastal wetlands, and tidepools. Approximately 58.4% of the San Diego River watershed is currently undeveloped. The majority of this undeveloped land is in the upper, eastern portion of the watershed, while the lower reaches are more highly urbanized with residential (14.9%), freeways and roads (5.5%), and commercial/ industrial (4.2%) land uses predominating.

There are 4 major dams within the San Diego River watershed: El Capitan on the main river; San Vicente, Lake Jennings, and Cuyamaca on tributaries. The reservoirs along the river are major water storage facilities for the San Diego metropolitan area. These reservoirs store water that is primarily from the Colorado River. El Capitan stores local water while Cuyamaca Reservoir stores only local runoff. The annual precipitation ranges from less than II inches along the coast to 35 inches around Cuyamaca and El Capitan reservoir. Other areas including the Cleveland National Forest, Mission Trails Regional Park, and the river flood plain near Lakeside represent three important undeveloped areas that host a wide variety of intact habitats and endangered species. In addition, Famosa Slough, near the mouth of the San Diego River contains extremely productive wetlands habitat. The Famosa Slough is a tidal salt water marsh, located on West Point Loma Boulevard between Nimitz and Sports Arena Boulevards. It receives water via the San Diego River Flood Control Channel.

Table 4-13: San Diego River watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 435.9 square miles Naturally Occurring Waterways: 1736.44 miles Percentage of Free Flowing River Miles: 82 % Number of Dams: 28 Number of Stream Crossings: 2312 Percentage Area above 15% Slope: 14.59 % Longest Watershed Flow Path Length: 260,762 feet Maximum Elevation: 3,668 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 3,668 feet Average Map Slope: 1.41%	
Major Water Bodies	San Diego River, El Capitan Reservoir, San Vicente Reservoir, Lake Murray, Boulder Creek, Santee Lakes	
Cities in Watershed	Ocean Beach Normal Heights La Mesa Casa De Oro-Mount Helix Grossmont Grantville El Cajon Allied Gardens San Carlos Serra Mesa Granite Hills Bostonia Winter Gardens Lakeview Johnstown Lakeside Alpine Santee Eucalyptus Hills Barona Fernbrook Shady Dell Irvings Crest San Diego Country Estates Harrison Park Pine Hills Wynola	
Rivers / Creek Length	Alpine Creek	12,030
	Azalea Creek	10,799
	Bailey Creek	11,949
	Boring Creek	6,200

	Boulder Creek	71,041
	Cedar Creek	70,558
	Chocolate Creek	24,606
	Coleman Creek	25,867
	Conejos Creek	58,339
	Daly Creek	3,404
	Dehr Creek	27,621
	Eastwood Creek	7,462
	Forester Creek	62,064
	Isham Creek	17,110
	Jim Green Creek	15,641
	Johnson Creek	14,553
	Kelly Creek	21,973
	King Creek	57,233
	Klondike Creek	16,131
	Little Stonewall Creek	17,513
	Los Coches Creek	48,884
	Mariette Creek	7,305
	Orinoco Creek	27,368
	Padre Barona Creek	34,739
	Ritchie Creek	30,885
	San Diego River	248,403
	San Vicente Creek	141,148
	Sand Creek	35,260
	Sandy Creek	11,533
	Sentenac Creek	12,955
	Sheep Camp Creek	9,916
	Temescal Creek	20,663
	West Branch San Vicente Creek	23,949
	West Fork King Creek	14,942

4.1.5.1 Water Quality

The mouth of the river discharges into the Pacific Ocean at the community of Ocean Beach. Beach postings and closures from elevated levels of coliform bacteria more than doubled between 1996 and 1999 due to urban runoff and sewage spills. Discharge from the San Diego River outlet may also influence water quality in other nearby coastal areas including Sunset Cliffs, Pacific Beach, and Mission Beach. The extensive groundwater resources beneath the San Diego River provide a cost effective and reliable water supply to four local water districts and the City of San Diego. Excessive extraction, increasing total dissolved solids, and MTBE contamination now threatens this resource.

4.1.5.2 Watershed Floodplain Hydrology – Major Drainages

Table 4-14: San Diego River watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Forester Creek				
At Prospect Ave.	22.7	6,000	11,000	12,450
Murphy Canyon				
Upstream of Friars Rd.	12.1	1,500	2,700	3,500
San Diego River				
At Confluence w/ Murphy Canyon Creek	420	3,100	17,000	36,000
Just Downstream of Confluence of San Vicente Creek	290	2,500	--	31,000
San Vicente Creek				
At Mouth	83	1,400	10,500	16,000

-- Data Not Available

Note: Hydrology Data is based on *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.5.3 Flood Risk and Exposure Mapping

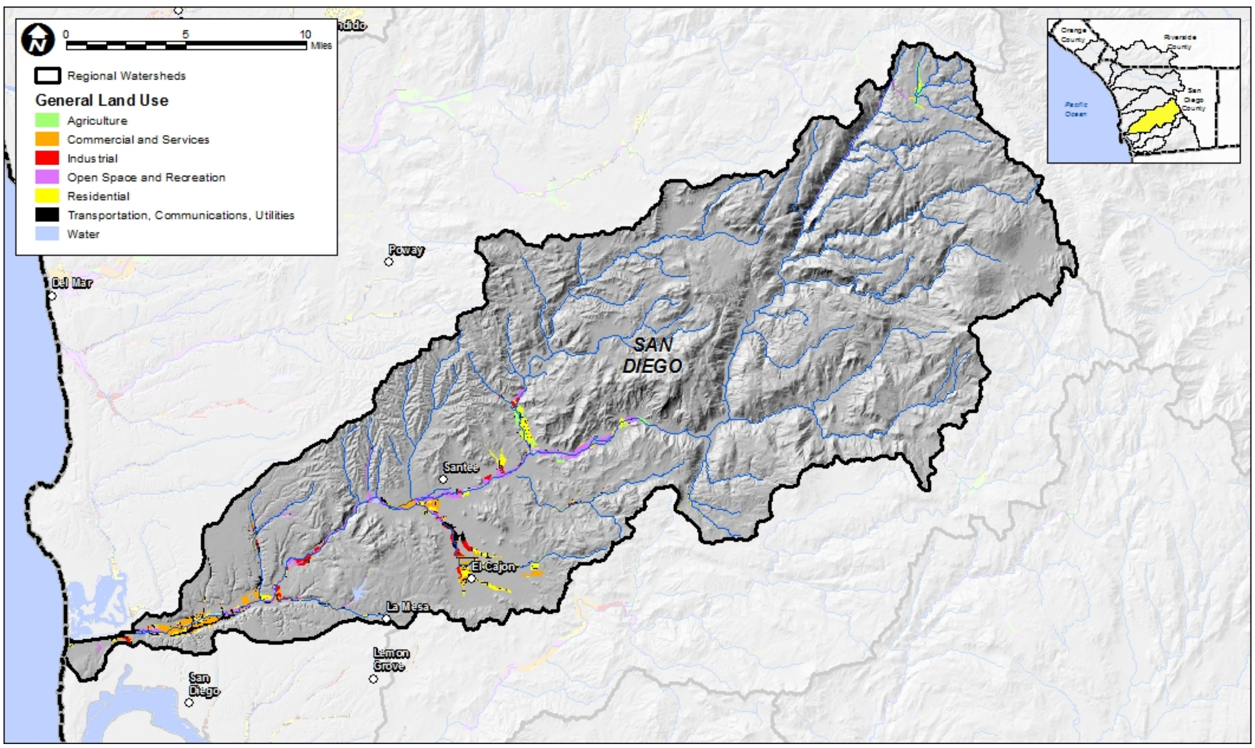


Figure 4-11: Floodplain risks and exposure assessment – landuses within 100-year floodplain for San Diego River watershed unit

Table 4-15: Landuse types located within mapped flood hazard zones for San Diego River watershed unit

SAN DIEGO RIVER	Area (acres)
Agriculture	508
Commercial and Services	1,414
Industrial	600
Open Space and Recreation	2,576
Residential	1,577
Transportation, Communications, and Utilities	1,272
Water	420
Grand Total	**8,367**

4.1.6 Los Peñasquitos Creek

Figure 4-12: Los Peñasquitos watershed unit with population centers

The Los Peñasquitos regional watershed unit is comprised of the Los Peñasquitos Creek watershed, several coastal tributaries, and the Mission Bay watershed. These watersheds drain a highly urbanized region located almost entirely west of Interstate 15 in coastal San Diego County. Collectively and individually, they support a variety of water supply, economic, recreational, and habitat-related beneficial uses. The major receiving waters, Los Peñasquitos Lagoon and Mission Bay, are both fragile systems that support diverse native fauna and flora. Both water bodies are especially sensitive to the effects of pollutants due to restricted or intermittent tidal flushing. The Los Peñasquitos Creek watershed encompasses a land area of approximately 100 square miles including portions of the cities San Diego, Poway, and Del Mar. The watershed is highly urbanized with a population of approximately 400,000 residents. The creek discharges to a 0.6 square mile lagoon that is identified as an impaired water body on the California 303(d) list for sedimentation.

The watershed encompasses 170 square miles, and extends from Poway (inland) to La Jolla. The tributaries of the watershed, Los Peñasquitos Creek and Carmel Creek, low year-round due to development in the watershed. Miramar Reservoir is the major water storage facility within the watershed, and contains Colorado River water. Annual precipitation ranges from less than 8 inches along the coast to 18 inches inland.

Table 4-16: Los Peñasquitos watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 162.1 square miles Longest Watershed Flow Path Length: 111,466 feet Maximum Elevation: 1,684 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 1,684 feet Average Map Slope: 1.51%	
Major Water Bodies	Los Peñasquitos Creek, Los Peñasquitos Lagoon, Rose Creek, Tecolote Creek, Mission Bay, Miramar Reservoir	
Cities / Population Centers in Watershed	Crown Point, Bay Park, Mission Beach, Linda Vista, Clairemont, Pacific Beach, Bird Rock, La Jolla, University City, Miramar, Mira Mesa, Poway	
Rivers / Creek Length (ft)	Beeler Creek	31,232
	Chicarita Creek	13,095
	Los Peñasquitos Creek	61,229
	Poway Creek	39,098
	Rattlesnake Creek	26,910
	Tecolote Creek	35,928

4.1.6.1 Watershed Floodplain Hydrology – Major Drainages

Table 4-17: Los Peñasquitos watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Carmel Valley Creek				
Above Confluence w/ Soledad Canyon	15.7	2,100	6,500	9,800

Los Peñasquitos Creek				
Above Confluence w/ Soledad Canyon	58.3	3,700	11,300	16,800
At US Hwy 395	42.7	3,100	10,000	15,400
Poway Creek				
USGS Gage at Cobblestone Creek Rd.	31.2	2,500	8,700	14,000
Rose Canyon Creek				
At Mouth	37	2,700	8,100	12,000
San Clemente Canyon Creek				
Upstream of Confluence w/ Rose Canyon Creek	18.4	1,400	4,200	6,900
Soledad Canyon				
At Mouth	95.5	5,000	15,400	23,000
Tecolote Creek				
At Interstate Hwy. 5	9.29	2,100	3,800	4,900

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.6.2 Flood Risk and Exposure Mapping

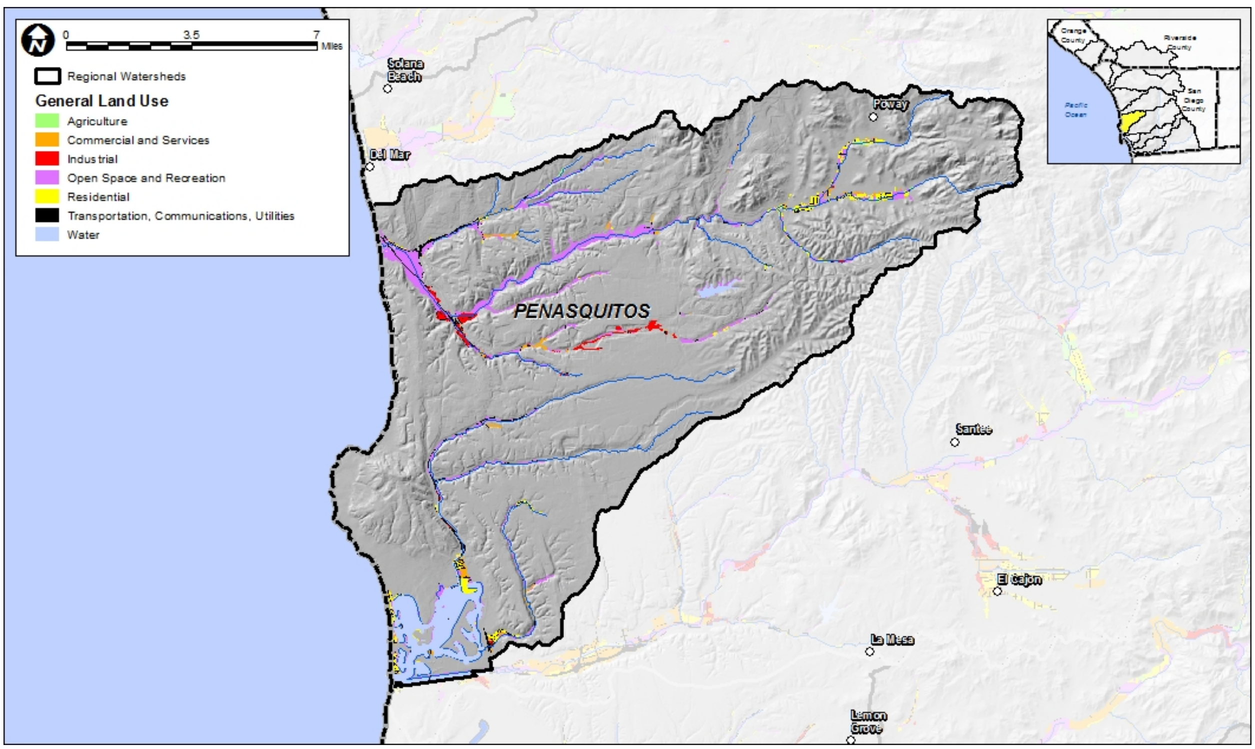


Figure 4-13: Floodplain risks and exposure assessment – landuses within 100-year floodplain for Los Penasquitos watershed unit

Table 4-18: Landuse types located within mapped flood hazard zones for Los Penasquitos watershed unit

LOS PEÑASQUITOS	Area (acres)
Agriculture	38
Commercial and Services	461
Industrial	356
Open Space and Recreation	2,953
Residential	637
Transportation, Communications, and Utilities	629
Water	2,309
Grand Total	**7,382**

4.1.7 San Dieguito River

Figure 4-14: San Dieguito watershed unit with population centers

The San Dieguito River watershed is a drainage area of approximately 346 square miles in west-central San Diego County, 302 of which are behind dams. Lake Hodges (completed in 1919) and Lake Sutherland (completed in 1954) are the two major dams that block the river. Three tributaries join the San Dieguito River below the dam while 2 other small drainages empty directly into the lagoon basin. San Dieguito River flow is intermittent and the riverbed upstream of tidal influence is often dry. The channel is substantially unarmored except for a concrete block revetment along the upper bank. The watershed includes portions of the cities of Del Mar, Escondido, Poway, San Diego, and Solana Beach, and unincorporated San Diego County. In terms of land area, the majority of the watershed (79.8%) is within the unincorporated jurisdiction. The San Dieguito River watershed is presently divided into vacant/undeveloped (54%), parks/open space (29 %), and urban (18%) land uses. Nearly half of the vacant land area is open to future development, most of which is zoned for residential usage. The current watershed population is approximately 125,000 however; this level is projected to increase to over 210,000 residents by 2015.

Table 4-19: San Dieguito watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 346.2 square miles Longest Watershed Flow Path Length: 304,600 feet Maximum Elevation:5,234 Minimum Elevation: 0 Watershed Elevation Difference: 5,234 feet Average Map Slope: 1.72%
Major Water Bodies	San Dieguito River, San Dieguito Lagoon, and Lake Hodges
Cities / Population Centers in Watershed	Rancho Santa Fe Cardiff By The Sea Olivenhain Encinitas Leucadia Escondido Carlsbad Lake San Marcos San Marcos Jesmond Dene South Oceanside Oceanside Twin Oaks Vista
Rivers / Creek Length (ft)	Bear Creek 19,849 Bloomdale Creek 30,505 Dan Price Creek 10,920 Guejito Creek 57,975 Hatfield Creek 54,845 Lusardi Creek 22,472 San Diego Aqueduct 5,848 San Dieguito River 121,820 Santa Maria Creek 92,231 Santa Ysabel Creek 206,095

	Scholder Creek	13,741
	Temescal Creek	53,688
	Wash Hollow Creek	22,135
	Witch Creek	26,994

4.1.7.1 *Water Quality*

The Pacific Ocean at the mouth of the San Dieguito River is listed as a 303(d)-impaired water body for elevated coliform bacteria. In the absence of a comprehensive watershed planning effort, large-scale future development may exasperate current water quality problems and create additional beneficial use impairments. The San Dieguito Lagoon is especially sensitive to the effects of pollutants and oxygen depletion due to restricted or intermittent tidal flushing.

4.1.7.2 *Biological / Habitat Natural Resources*

The watershed extends through a diverse array of habitats from its eastern headwaters in the Volcan Mountains to the outlet at the San Dieguito Lagoon and the Pacific Ocean. There are several important natural areas within the watershed that sustain a number of threatened and endangered species. Among these are the 55-mile long, 80,000 acre San Dieguito River Park, the 150 acre San Dieguito Lagoon, and five water storage reservoirs including Lake Hodges, Lake Sutherland, and Lake Poway.

4.1.7.3 *Watershed Floodplain Hydrology – Major Drainages*

Table 4-20: San Dieguito watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Hatfield Creek				
At Mouth	20.8	1,700	7,900	13,700
San Dieguito River				
Upstream of Camino Del Mar Bridge	--	5,700	31,400	41,800
Santa Maria Creek (San Pasqual Valley Area)				
At Confluence w/ Santa Ysabel Creek	60	3,200	14,700	19,000
Santa Ysabel Creek				
Lake Hodges at Hodges Dam	290	10,000	48,000	62,000

-- Data Not Available

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.7.4 Flood Risk and Exposure Mapping

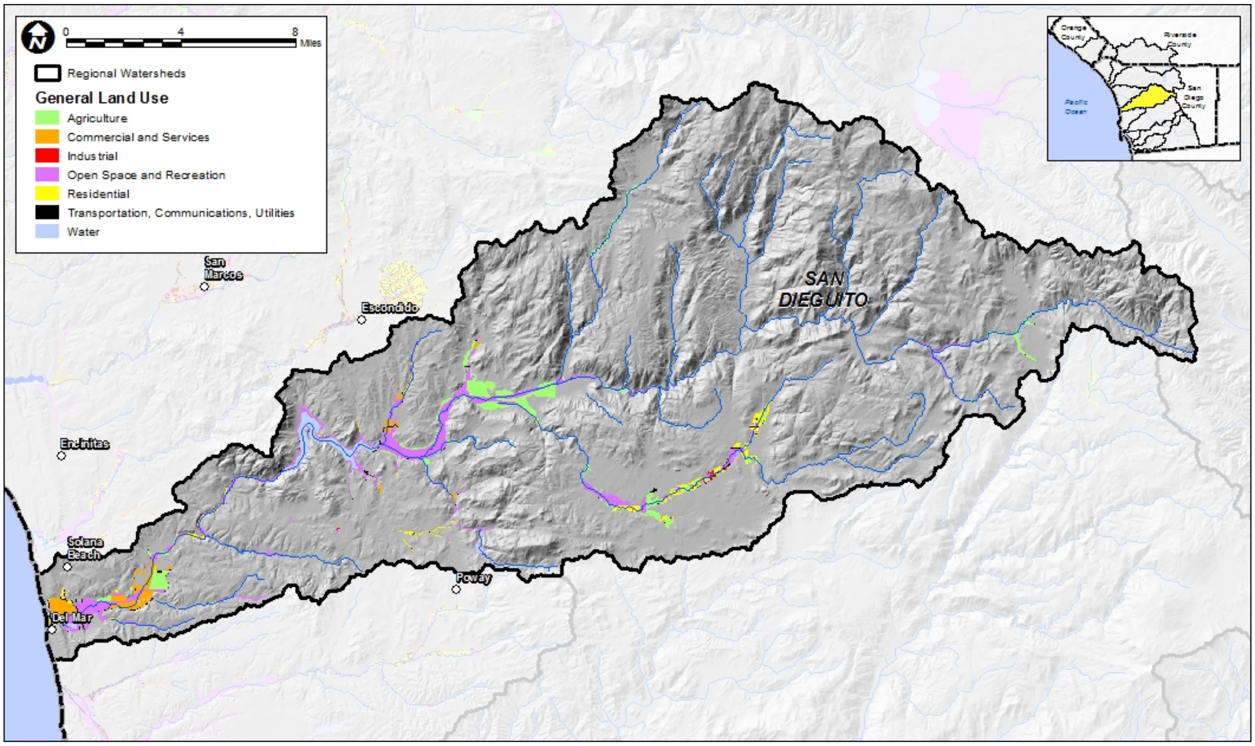


Figure 4-15: Floodplain risks and exposure assessment – landuses within 100-year floodplain for San Dieguito watershed unit

Table 4-21: Landuse types located within mapped flood hazard zones for San Dieguito watershed unit

SAN DIEGUITO	Area (acres)
Agriculture	2,352
Commercial and Services	953
Industrial	44
Open Space and Recreation	4,326
Residential	853
Transportation, Communications, and Utilities	344
Water	993
Grand Total	**9,864**

4.1.8 Carlsbad

Figure 4-16: Carlsbad watershed unit with population centers

The watershed encompasses 210 square miles, and extends from Lake Wohlford to the ocean. The watershed is drained by Buena Vista, Agua Hedionda, San Marcos, and Escondido creeks. The watershed includes the Encinas and Loma Alta hydrological areas. The Buena Vista watershed encompasses 19 square miles while the Escondido creek watershed encompasses 77 square miles and includes the major tributaries of Escondido and La Orilla creeks. The Agua Hedionda creek watershed encompasses 29 square miles. The Loma Alta creek watershed encompasses 20 square miles. The San Marcos creek watershed encompasses 52 square miles. and San Marcos Dam, constructed in 1952, controls approximately 53% of the watershed. The cities of Carlsbad, San Marcos, and Encinitas are entirely within this regional watershed unit. The population of the Carlsbad regional watershed unit is approximately 500,000 residents making it the third most densely populated in San Diego County behind the Pueblo San Diego and the Peñasquitos watershed units. A high percentage of the undeveloped land is in private ownership and the population of the Carlsbad watershed unit is projected to increase to over 700,000 residents by 2015.

The watershed includes four major coastal lagoons: Buena Vista, Agua Hedionda, Batiquitos (at the mouth of San Marcos creek), and San Elijo (at the mouth of Escondido Creek).

Table 4-22: Carlsbad watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 212.1 square miles Longest Watershed Flow Path Length: 141,900 feet Maximum Elevation: 1,841 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 1,841 feet Average Map Slope: 1.30%
Major Water Bodies	Loma Alta Creek, Buena Vista Creek, Buena Vista Lagoon, Agua Hedionda Creek, Agua Hedionda Lagoon, San Marcos Creek, Batiquitos Lagoon, Escondido Creek, San Elijo Lagoon, and Lake Wolhford
Cities / Population Centers in Watershed	Rancho Santa Fe Cardiff By The Sea Olivenhain Encinitas Leucadia Escondido Carlsbad Lake San Marcos San Marcos Jesmond Dene South Oceanside Oceanside Twin Oaks Vista
Rivers / Creek Length (ft)	Agua Hedionda Creek 68,121 Arroyo Poco 4,657 Buena Creek 25,547 Buena Vista Creek 58,093 Encinitas Creek 24,395 Escondido Canal 6,981 Escondido Creek 138,013 Loma Alta Creek 34,838 San Marcos Creek 64,065 Vista Canal 68,690

4.1.8.1 Water Quality

The Agua Hedionda, Buena Vista, and San Elijo lagoons are experiencing impairments to beneficial uses due to excessive coliform bacteria and sediment loading from upstream sources. These coastal lagoons represent critical regional resources that provide freshwater and estuarine habitats for numerous plant and animal species. Other water bodies in the Carlsbad HU have been identified as impaired on the California 303(d) list for elevated coliform bacteria including several locations in the Pacific Ocean near creek and lagoon outlets.

4.1.8.2 Biological / Habitat Natural Resources

Urban development (and associated flood control activities), sedimentation from agriculture, erosion, eutrophication of lagoon systems, the presence of exotic species in the watershed, water pollution, and general habitat degradation are major threats to the area.

4.1.8.3 Watershed Floodplain Hydrology – Major Drainages

Table 4-23: Carlsbad watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Agua Hedionda Creek				
At El Camino Real	23.8	--	--	9,850
Buena Vista Creek				
Upstream of Interstate Hwy. 5	20.8	2,000	5,600	8,500
Escondido Creek				
At Interstate Hwy. 5	77.7	3,400	15,500	22,000
San Marcos Creek				
Upstream of San Marcos Dam (Lake San Marcos)	28.1	--	--	15,700

-- Data Not Available

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.8.4 Flood Risk and Exposure Mapping

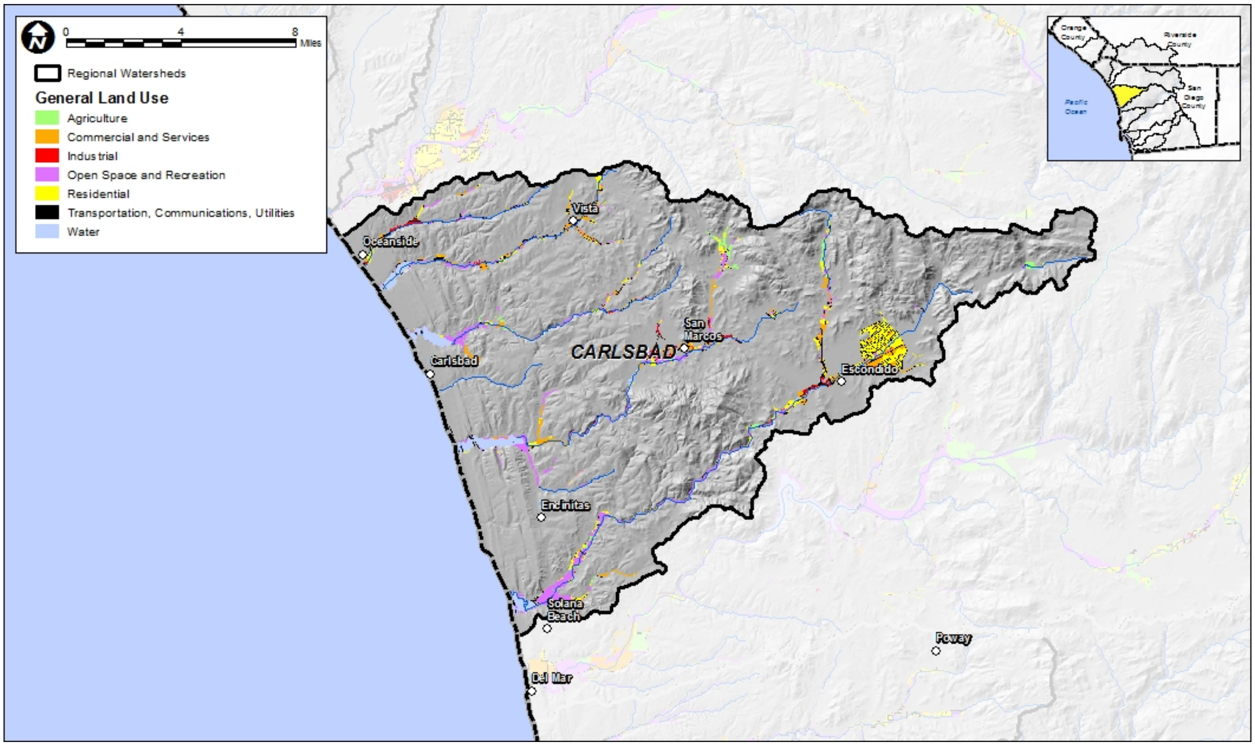


Figure 4-17: Floodplain risks and exposure assessment – landuses within 100-year floodplain for Carlsbad watershed unit

Table 4-24: Landuse types located within mapped flood hazard zones for Carlsbad watershed unit

CARLSBAD	Area (acres)
Agriculture	354
Commercial and Services	1,345
Industrial	271
Open Space and Recreation	2,474
Residential	1,721
Transportation, Communications, and Utilities	1,082
Water	1,217
Grand Total	**8,464**

4.1.9 San Luis Rey River

Figure 4-18: San Luis Rey River watershed unit with population centers

The San Luis Rey River watershed is located east of the City of Oceanside in the northwestern portion of San Diego County. The 558 square mile drainage is the largest watershed affecting the San Diego region. It is bordered to the north by the Santa Margarita River Watershed and to the south by the Carlsbad and San Dieguito River Watersheds. The San Luis Rey River originates in the Palomar and Hot Springs Mountains, both over 6,000 feet above mean sea level, as well as several other mountain ranges along the western border of the Anza Borrego Desert Park. The river extends over 55 miles across northern San Diego County. The river ultimately discharges to the Pacific Ocean near the City of Oceanside. Of the nine major watersheds in the San Diego region, the San Luis Rey is the third largest.

The watershed drains to the Pacific Ocean to the west and is bounded by the Moserate Mountains to the north, the Cleveland National Forest and Camp Pendleton to the northwest, and Escondido, San Diego, and other cities to the south. The basin is roughly 50 miles long by 16 miles wide, and is divided into two drainage areas by Henshaw Dam. The areas above and below the dam encompass 206 and

354 square miles, respectively (USACOE, 1977). Annual precipitation ranges from 12 inches near the coast to approximately 45 inches near the headwaters on Palomar mountain. The watershed is comprised of three hydrological areas: the Lower San Luis, Monserate and Warner Valley areas. Henshaw Dam, built in 1922, controls 36% of the watershed and three small reservoirs. The mouth of the San Luis Rey River is not listed as an impaired water body.

Approximately 92.5% of the San Luis Rey River watershed is located in unincorporated areas of San Diego County. Roughly one-fourth of the land area in the watershed is located west of Interstate 15 including portions of the cities of Oceanside and Vista, the communities of Fallbrook and Bonsall, and the southwestern portion of Camp Pendleton. The land west of I-15 has multiple uses including open space/ undeveloped, residential, commercial/ industrial, and agricultural. East of Interstate 15, most of the land is owned and managed by government agencies (county, state, and federal), special districts, and Native American bands. The predominant land uses are open space/ undeveloped and agricultural. About half (49%) of the land in the watershed is privately owned, 37% is publicly owned, and the remaining 14% consists of six federally recognized Tribal Indian Reservations. In the western half of the watershed, private ownership dominates. Population centers include the City of Oceanside and the unincorporated communities of Fallbrook, Bonsall, and Valley Center. Moving east through the watershed, public lands become increasingly dominant. Over 54% of the land in the watershed is vacant or undeveloped. The next largest land uses in the watershed are residential (15%) and agriculture (14%). Principal agricultural uses include cattle grazing, nurseries, citrus groves, and avocado groves.

Unlike most major rivers in Southern California, the San Luis Rey River has undergone relatively little channelization. The only significant segment of the river that has been channelized is within the City of Oceanside. However, the cumulative impacts of various land use practices in the basin appear to be degrading the river's environmental value. For example, an increased rate of bed erosion attributable to sand mining operations has been observed in the upper reaches of the river.

Table 4-25: San Luis Rey watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 560.0 square miles Area: 495650.48 acres Naturally Occurring Waterways: 961.86 miles Number of Dams: 18 Number of Stream Crossings: 1311 Average Precipitation per Year: 18.82 inches Percentage Area above 15% Slope: 14.64 % Longest Watershed Flow Path Length: 368,400 feet Maximum Elevation:5,593 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 5,593 feet Average Map Slope: 1.52%
Major Water Bodies	San Luis Rey River and Lake Henshaw
Cities / Population	Morettis Junction Valley Center Ranchita Hidden Meadows

Table 4-25: San Luis Rey watershed unit characteristics and background information

Centers in Watershed	Camp Pendleton South San Luis Rey Lake Henshaw San Ysidro La Jolla Amago Bonsall Warner Springs Los Tules Eagles Nest Rincon Birch Hill Pauma Valley San Luis Rey Heights Camp Pendleton North Pala Mesa Village Winterwarm Palomar Mountain Sunshine Summit Pala Fallbrook Rainbow
Rivers / Creek Length (ft)	Agua Caliente Creek 82,870 Agua Tibia Creek 30,543 Bubble-up Creek 17,923 Buena Vista Creek 43,407 Canada Verruga 13,745 Carrista Creek 34,066 Carrizo Creek 32,895 Cedar Creek 20,057 Doane Creek 12,095 Escondido Canal 66,926 French Creek 17,166 Frey Creek 25,479 Fry Creek 10,298 Gomez Creek 27,805 Hell Creek 24,256 Iron Springs Creek 10,090 Jaybird Creek 11,022 Keys Creek 71,709 Kumpohui Creek 8,556 Lion Creek 13,292 Magee Creek 22,199 Matagual Creek 44,435 Pala Creek 47,683 Paradise Creek 33,155 Pauma Creek 38,597 Pilgrim Creek 52,130

Table 4-25: San Luis Rey watershed unit characteristics and background information

	Plaisted Creek	13,936
	Potrero Creek	30,039
	Prisoner Creek	15,234
	San Diego Aqueduct	74,437
	San Felipe Creek	9
	San Luis Rey River	390,453
	San Ysidro Creek	54,466
	Trujillo Creek	30,379
	West Fork San Luis Rey River	60,762
	Wigham Creek	8,676
	Yuima Creek	29,130

4.1.9.1 Watershed Floodplain Hydrology – Major Drainages

Table 4-26: San Luis Rey watershed floodplain mapping hydrology – major drainages

Flooding Source / Location	Drainage Area (square miles)	Peak Discharge (cfs)		
		10-year (10% chance)	50-year (2% chance)	100-year (1% chance)
Keys Canyon Creek				
Just Downstream of Keys Canyon Creek Tributary (1)	31.58	--	--	22,911
Moosa Canyon Creek				
Near Junction of Moosa Rd. and US Hwy. 395	34.7	2,600[1]	9,000[1]	13,000[1]
Pilgrim Creek				
At Mouth	19	--	--	1,925
San Luis Rey River				
At Mouth	560	6,600	31,000	51,000
Downstream of Confluence w/ Moosa Canyon	355.6	6,200	30,000	48,000
Downstream of Confluence w/ Keys Canyon	252.3	5,000	25,000	41,000

-- Data Not Available

- Note (1) – Flows partially controlled by Turner Dam

Note: Hydrology Data is based on the FEMA *Flood Insurance Study San Diego County, CA;* May 16, 2012

4.1.9.2 Flood Risk and Exposure Mapping

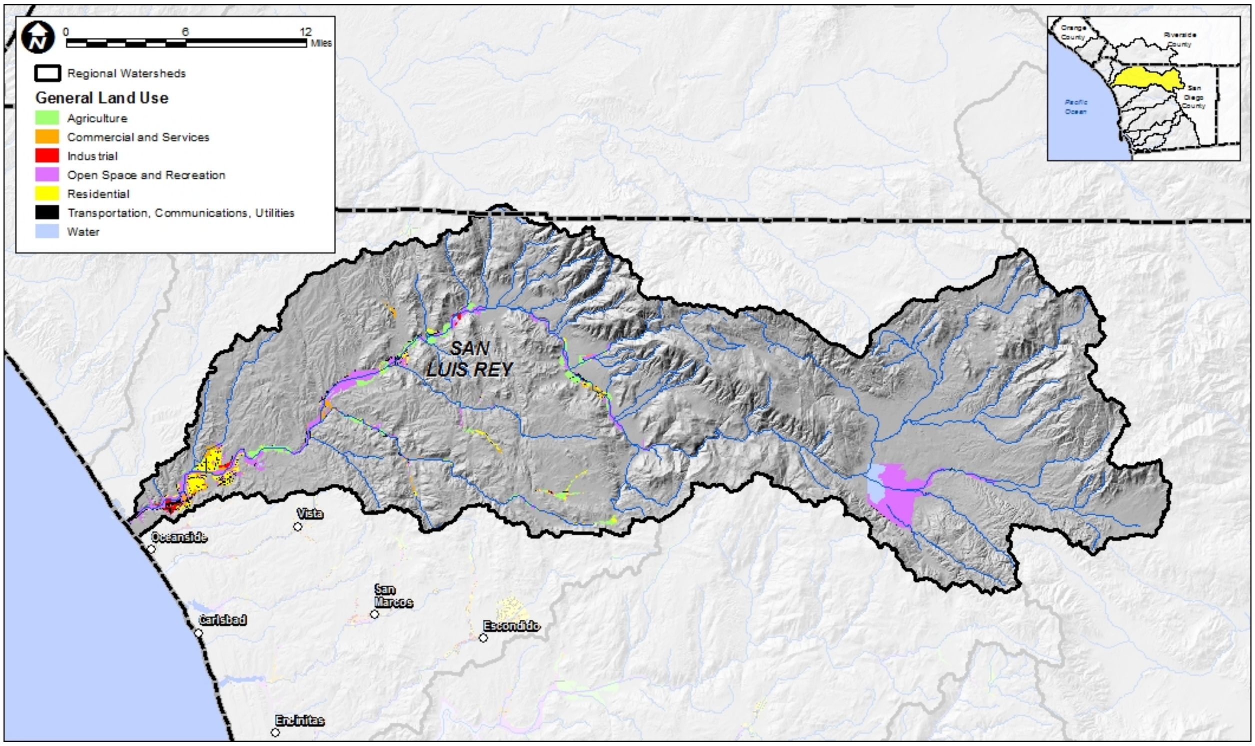


Figure 4-19: Floodplain risks and exposure assessment – landuses within 100-year floodplain for San Luis Rey watershed unit

Table 4-27: Landuse types located within mapped flood hazard zones for San Luis Rey watershed unit

SAN LUIS REY	Area (acres)
Agriculture	2,382
Commercial and Services	917
Industrial	264
Open Space and Recreation	8,262
Residential	1,953
Transportation, Communications, and Utilities	1,159
Water	1,012
Grand Total	**15,950**

4.1.10 Santa Margarita River

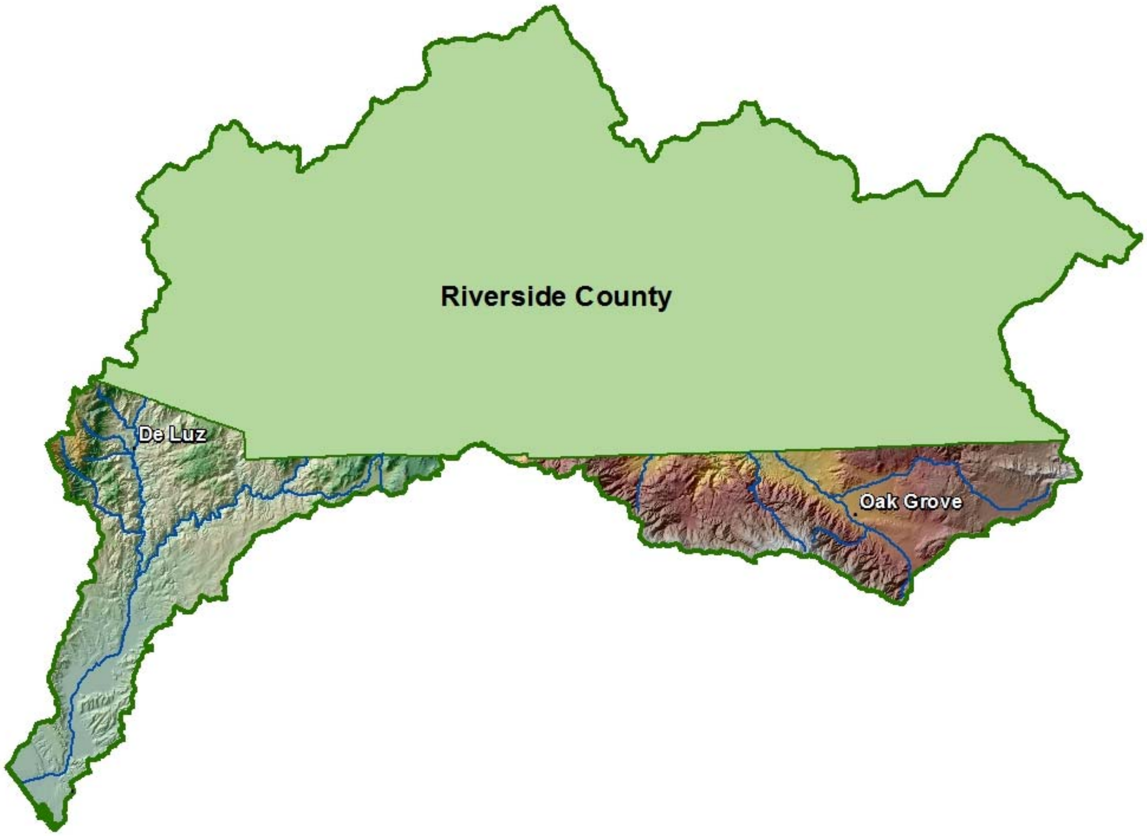


Figure 4-20: Santa Margarita River watershed unit with population centers

The Santa Margarita River watershed encompasses approximately 750 square miles in northern San Diego and southwestern Riverside counties. It is the longest free flowing river in coastal southern California; the channel is braided and supports the most extensive riparian corridor in the county. The watershed is comprised of the following nine hydrologic areas: the Ysidora, Deluz, Murrieta, Auld, Pechanga, Wilson, Cave Rocks, Aguanga, and Oak Groves. This watershed is drained largely by the Santa Margarita River, Murrieta Creek and Temecula River. The precipitation within the watershed ranges from 12 inches on the coast to 45 inches at the headwaters on Palomar Mountain. Twenty-seven miles of free-flowing river exist. Lake O'Neill is out of the River channel but receives much of its water from seasonal river diversions. Two dams are located in the upper watershed along the two streams that join to form the Santa Margarita River. The river is included in the list of impaired water bodies. The watershed contains a variety of nearly intact habitats including chaparral-covered hillsides, riparian woodlands, and coastal marshes. Of the total watershed area, approximately 27% is within San Diego County. The Santa Margarita River is formed near the City of Temecula in Riverside County at the confluence of the Temecula and Murrieta creek systems. Once formed, the majority of the Santa Margarita River main stem flows within San Diego County through unincorporated areas, the community of Fallbrook, and the Marine Corps Base Camp Pendleton. The lower river and estuary have largely escaped the development typical of other regions of coastal Southern California, and are therefore able to support a relative abundance of functional habitats and wildlife.

The upper watershed basin lies in Riverside County, one of the fastest growing areas in California. In the absence of effective planning measures, this rapid development will likely lead to serious water quality and environmental concerns in the watershed including excessive sedimentation from development and agricultural areas, groundwater degradation and contamination with nitrates and other salts, habitat loss, channelization, flooding and scour (San Diego County Basin Plan).

Table 4-28: Santa Margarita River watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 197.8 square miles (Total 750 sq. mi.) Naturally Occurring Waterways: 1033.46 miles Percentage of Free Flowing River Miles: 92 % Number of Dams: 9 Number of Stream Crossings: 1488 Average Precipitation per Year: 16.07 inches Percentage Area above 15% Slope: 9.38 % Longest Watershed Flow Path Length: 362,900 feet Maximum Elevation: 5,798 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 5,798 feet Average Map Slope: 1.60%
Major Water Bodies	Santa Margarita River, Temecula Creek, Murrieta Creek, Santa Margarita Lagoon, Vail Lake, Skinner Reservoir, and Diamond Valley Lake Reservoir
Cites / Population Centers in Watershed	De Luz, Oak Grove
Rivers / Creek Length (ft)	Arroyo Seco Creek 51,074 Cahuilla Creek 98,568 Camps Creek 15,809 Chihuahua Creek 66,485 Cottonwood Creek 64,014 De Luz Creek 72,850 Elder Creek 31,991 Fern Creek 12,724 Gomez Creek 304 Hamilton Creek 39,414 Kolb Creek 17,856 Murrieta Creek 72,608 Pechanga Creek 44,567 Rainbow Creek 30,936

	Rattlesnake Creek	19,357
	Roblar Creek	36,000
	San Diego Aqueduct	18,989
	Santa Gertrudis Creek	66,681
	Santa Margarita River	161,422
	Spring Creek	25,920
	Temecula Creek	180,809
	Tucalota Creek	141,746
	Tule Creek	64,077
	Warm Springs Creek	80,254
	Wilson Creek	86,758

4.1.10.1 Water Quality

Water quality issues focus on sediment, nutrients (especially nitrates), and salts. The Santa Margarita estuary is listed as impaired by the Regional Water Quality Control Board because of being eutrophic. The upper Santa Margarita River is impaired because of phosphorus (San Diego Regional Water Quality Control Board, 2005a).

4.1.10.2 Biological / Habitat Natural Resources

San Margarita River provides diversity of vegetative and aquatic habitats are home to numerous plants and animals, including 500 plant species, 236 bird species, 52 mammal species, 43 reptile species, 26 fish species and 24 species of aquatic invertebrates. The riparian corridor contains the highest density and overall diversity of bird species of any natural area in the south coastal river basin. The Santa Margarita's lush riparian growth supports a substantial percentage of the nation's entire population of the endangered Least Bell's Vireo. This small migratory song bird has been extirpated from 95 percent of its historic breeding range, but has found a home in the Santa Margarita River canyon. The lower portion of the river supports extensive coastal wetlands which provide important habitat for other sensitive and endangered bird species, including the Light-footed Clapper Rail, Belding's Savannah Sparrow and California Least Tern. The Santa Margarita River also supports the largest remaining native population of Arroyo Chub, a small fish which was formerly abundant throughout Southern California. Large runs of coastal steelhead trout have been extirpated from the Santa Margarita, but the river remains one of the few nearly pristine coastal watersheds in which to reintroduce this biologically unique species.

4.1.10.3 Flood Risk and Exposure Mapping

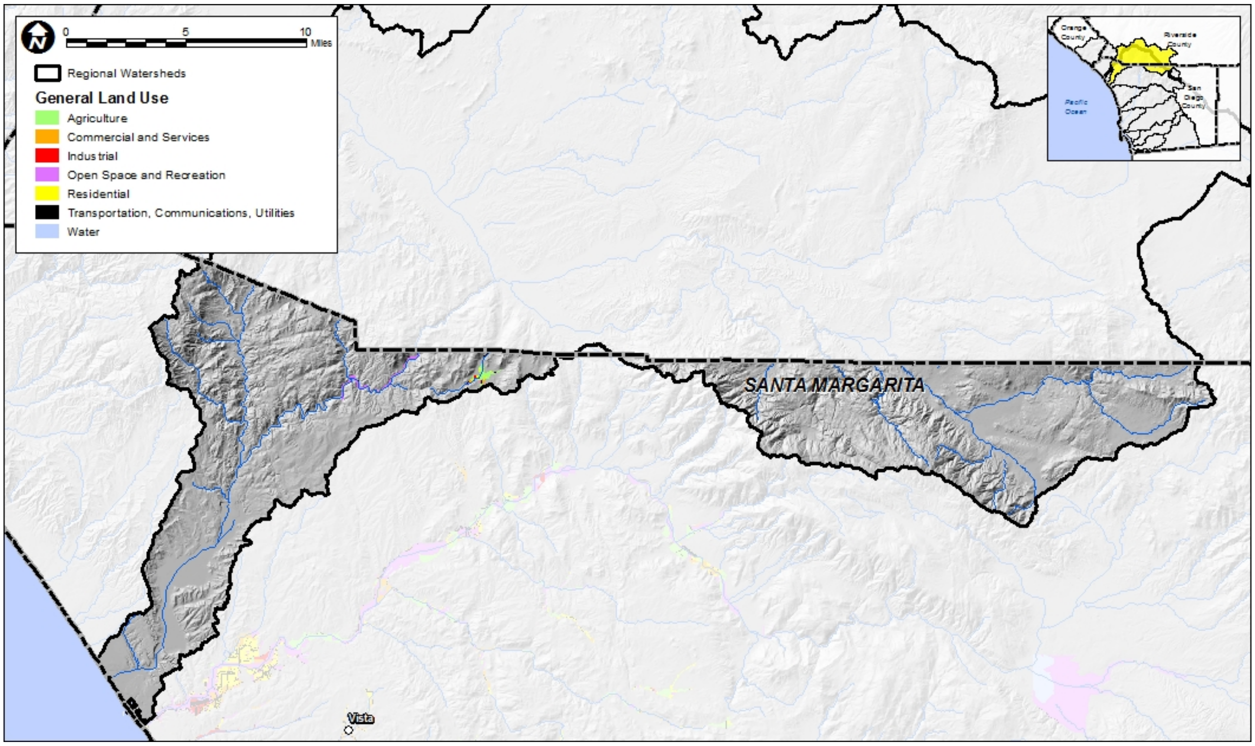


Figure 4-21: Floodplain risks and exposure assessment – landuses within 100-year floodplain for Santa Margarita watershed unit

Table 4-29: Landuse types located within mapped flood hazard zones for Santa Margarita watershed unit

SANTA MARGARITA	Area (acres)
Agriculture	146
Commercial and Services	38
Industrial	4
Open Space and Recreation	273
Residential	42
Transportation, Communications, and Utilities	40
Grand Total	**544**

4.1.11 San Mateo / San Juan

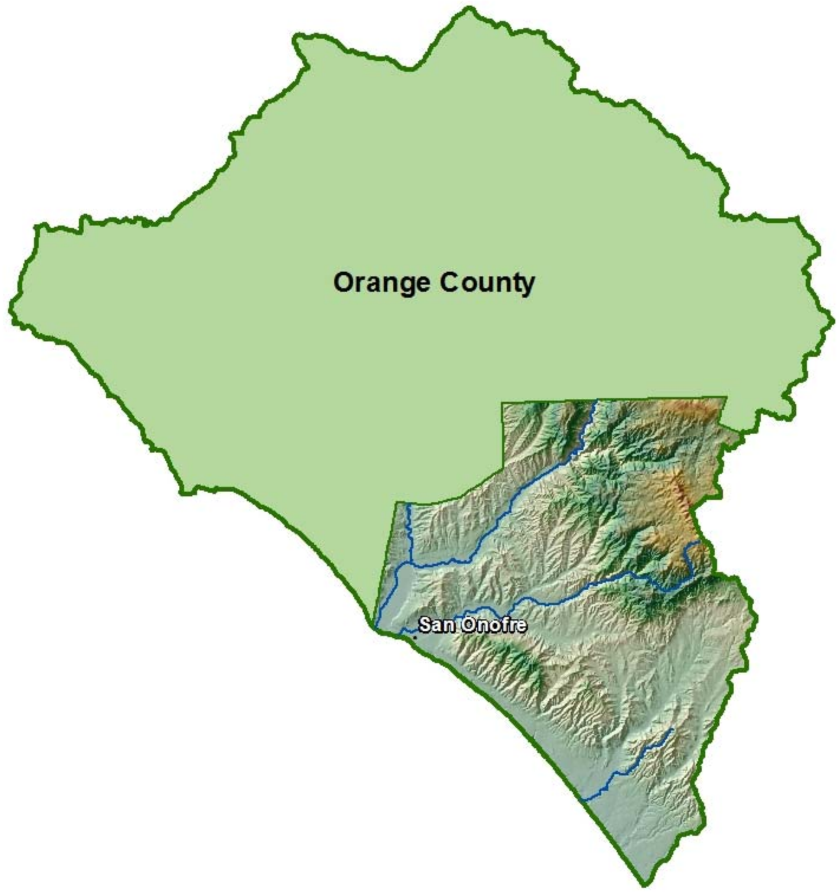


Figure 4-22: San Mateo/San Juan Creeks watershed unit with population centers

The San Mateo watershed unit is located primarily within northern San Diego County and includes the San Onofre watershed, but a portion of the watershed is within the southern portion of Orange County and western portion of Riverside County. San Mateo Creek (133.2 square miles drainage area) flow 22 miles from its headwaters within the Cleveland National Forest to the ocean just south of the City of San Clemente. The watershed lies mostly in undeveloped area of the Cleveland National Forest, the northern portion of Marine Corps Base Camp Pendleton, and ranch lands. The largest tributary of San Mateo Creek is Cristianitos Creek. The confluence is located 3 miles northeast of the San Mateo Creek outlet, near the residence of the largest Marine Corps development within the San Mateo Valley. The Special Area Management Plan (SAMP) for San Juan Creek includes only the portion of San Mateo Creek within Orange County. The watershed is primarily composed of hydrologic soil types C (49%) and D (40%) which indicates that overall the infiltration in the San Mateo watershed is relatively low due to the prominence of poorly infiltrating soils. The estimated 100-year peak discharge for San Mateo Creek at the ocean outlet is approximately 47,530 cfs (PWA, 2001).

Table 4-30: San Mateo/San Juan watershed unit characteristics and background information

Watershed Characteristics Information	Watershed Unit Area (within County): 151.0 square miles Longest Watershed Flow Path Length: 138,508feet Maximum Elevation: 3,340 Minimum Elevation: 0 (sea level) Watershed Elevation Difference: 3,340 feet Average Map Slope: 2.40 %
Major Cities / Population Centers in Watershed	San Onofre
Rivers / Creek Length (ft)	Cristianitos Creek 40,939 San Mateo Creek 138,508

4.1.11.1 Biological / Habitat Natural Resources

Trestles Natural Wetlands Preserve lies between the mouth of the creek and the I-5 Freeway and is wholly within the boundaries of San Onofre State Park. The 160 acre Preserve includes a freshwater lagoon, marshlands and several distinct plant communities including Coastal Sage Scrub, Willow Woodland, Sycamore/Cottonwood and Marsh Wetland. These plant communities are populated with over 219 plant species and provide one of the most diverse habitats in coastal Southern California. Cristianitos and Talega Creeks are known to have the largest population of the endangered Arroyo Toad and provide habitat for other listed species, including the Least Bell's Vireo, California Gnatcatcher, Southwestern Willow Flycatcher and Pacific Pocket Mouse.

4.1.11.2 Flood Risk and Exposure Mapping

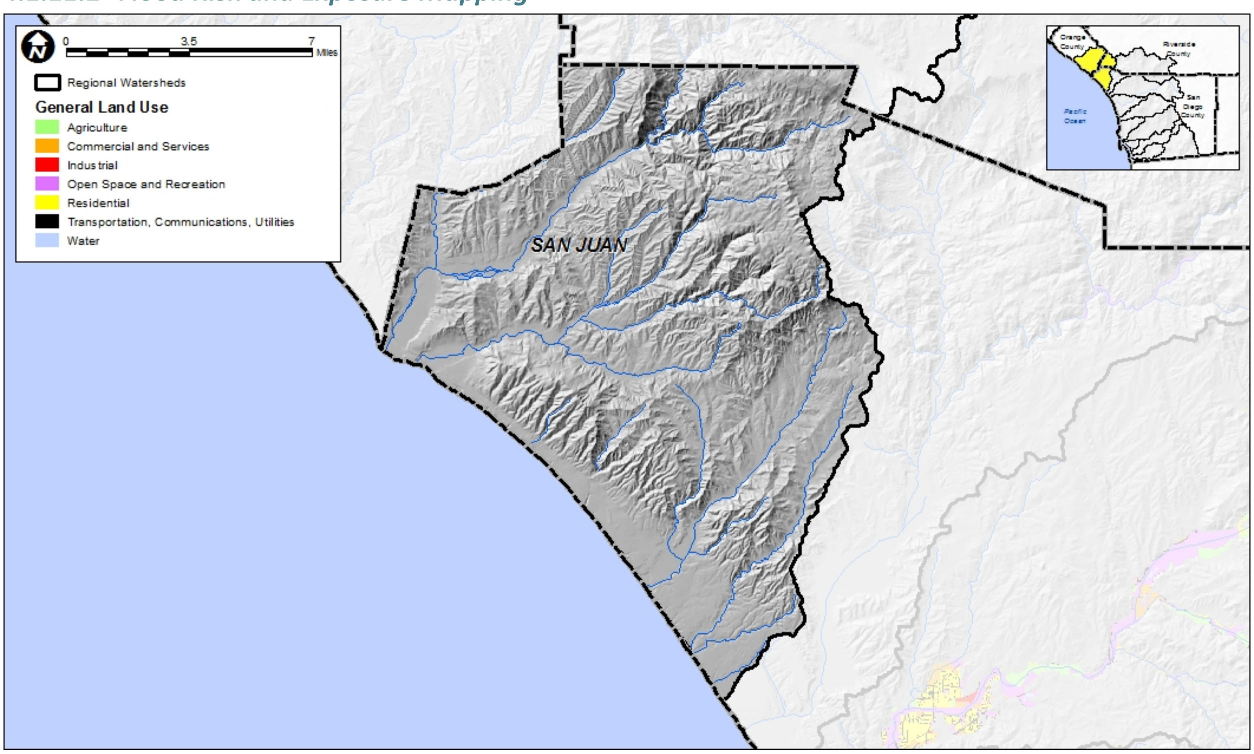


Figure 4-23: Floodplain risks and exposure assessment – landuses within 100-year floodplain for San Juan watershed unit

4.2 Metrologic Conditions / Historic Precipitation

The San Diego IRWM Region climate is classified as subtropical Mediterranean and is a semi-arid environment based on the amount of precipitation. The County of San Diego is an area of great climatic variation with the major rivers and the divide that separates the western- and eastern-draining watersheds. This divide follows the mountain ridgeline and elevations that vary from 3000 to 5000 feet above sea level. Precipitation that falls east of the divide flows down the eastern slope to the Salton Sea Basin, while runoff from precipitation west of the divide flows down the western slope to the Pacific Ocean. Most storms come from the Pacific Ocean toward the mountain ridge. The higher altitude and lower temperature cause the moisture to condense and form rain as it is forced up and over the divide. The north/south lines of equal average annual precipitation vary from west to east which is illustrated on the regional map of the county for the average annual rainfall isopluvials on Figure 3-13. The coast receives an average 10 inches in a year, the mountains over 30 inches, and the eastern valley floor about 3 inches. The major precipitation during the average year (see Figure 3-15) occurs from December to March and in the summer the rainless periods may extend for as long as four months. The historical variation of the total annual rainfall is illustrated on Figure 3-14 which identifies the wet-years, but this does not necessarily correlate directly to flood events since flooding is general associated with large amount of rainfall in a short period of time.

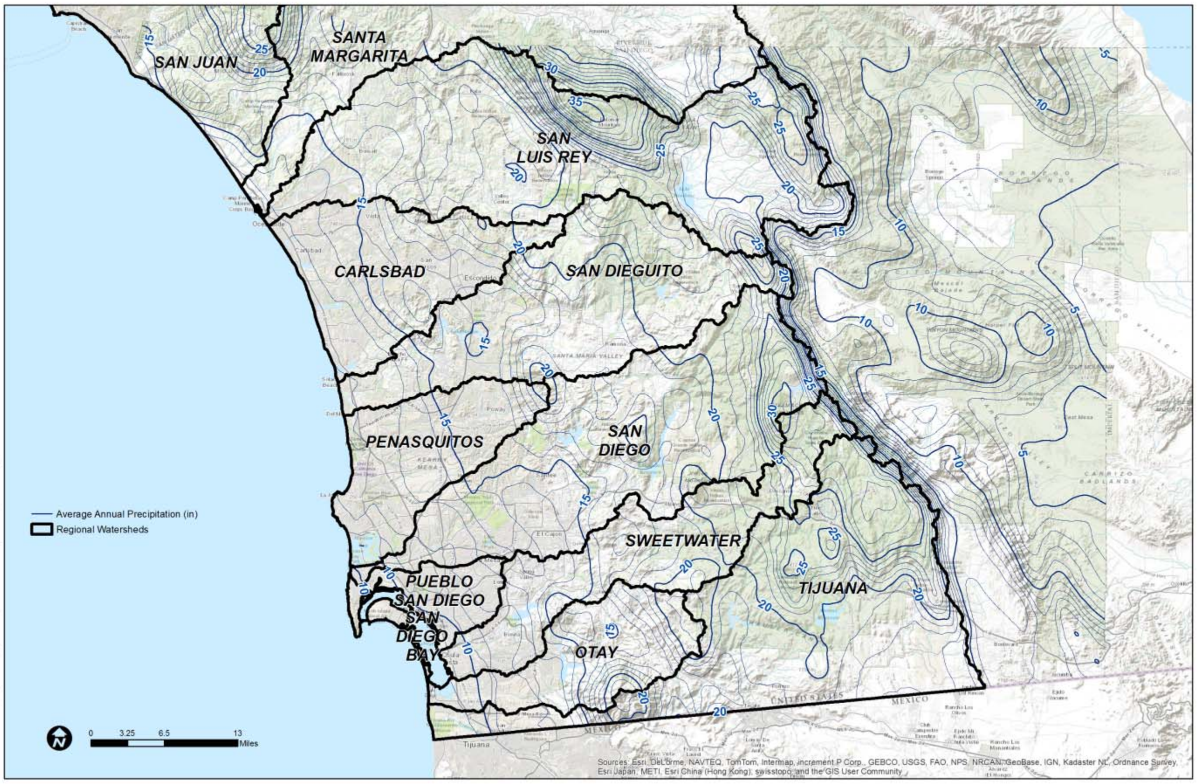


Figure 4-24: San Diego mean annual total precipitation in inches variation across the County illustrating lines of constant rainfall (isopluvials)

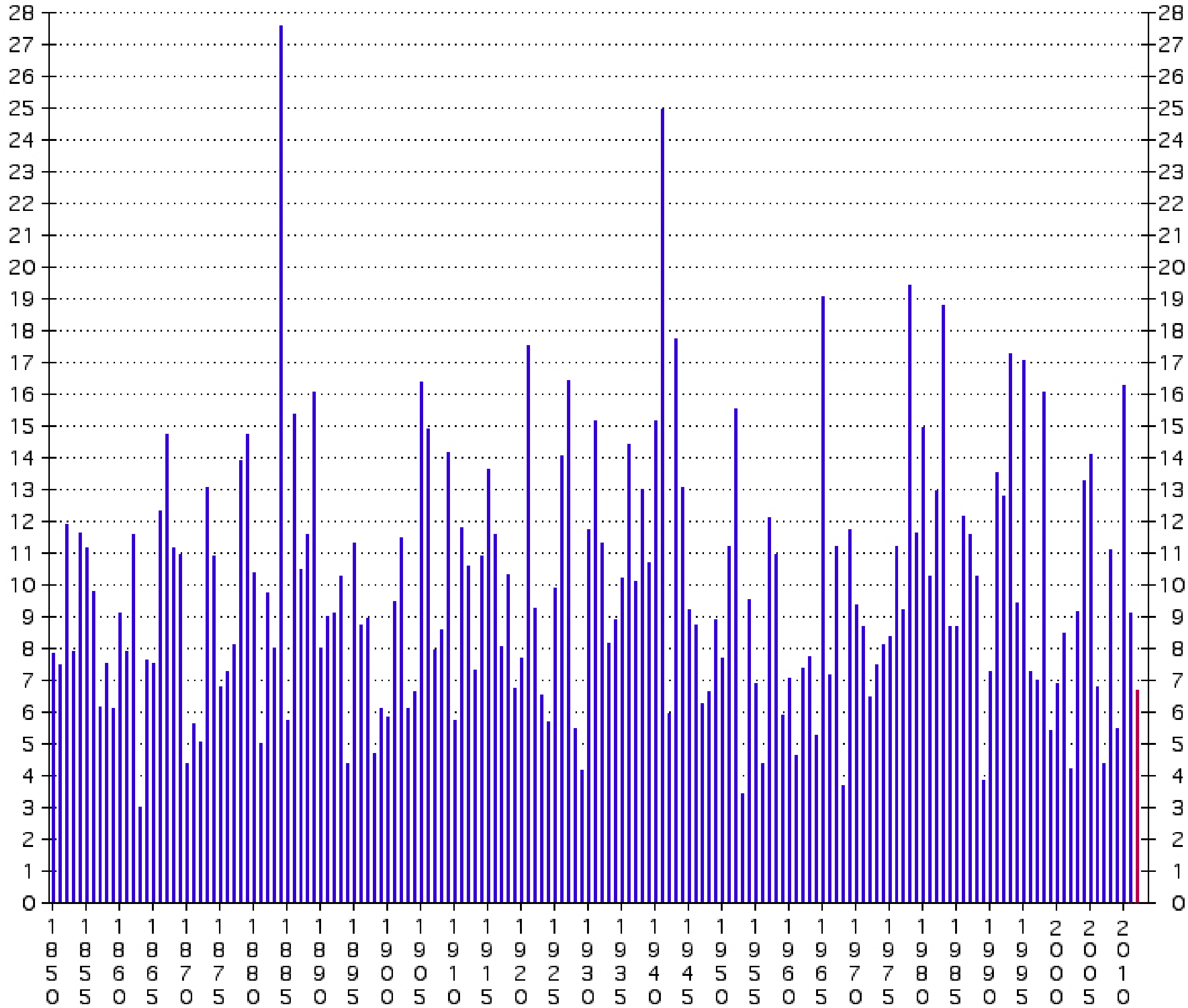


Figure 4-25: Variation of annual rainfall totals in San Diego (Lindbergh Field) from the mid-1800's

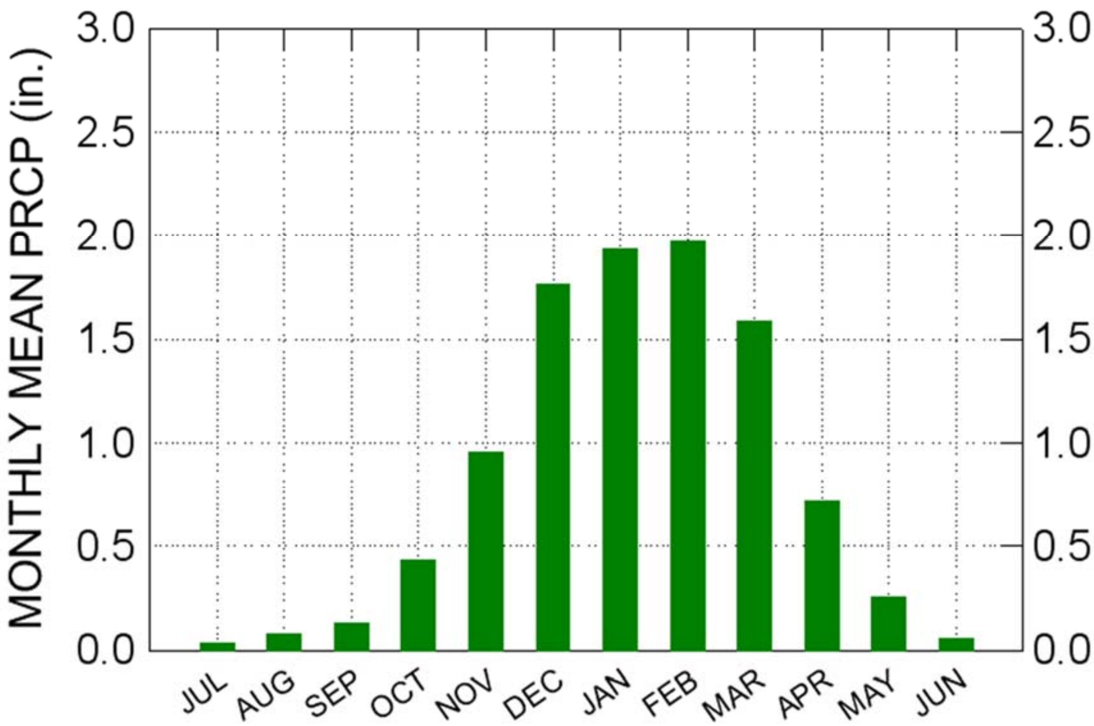


Figure 4-26: Typical month variation of rainfall over the year, noting the months of highest rainfall (Period of record from 1850 to 2010)

4.3 Floodplain Hydrology – Major Regional Flood Sources

The flood hazard mapping generated by FEMA and utilized for the risk/exposure assessment in this study were generated as part of the original FEMA FIS utilized engineering hydrologic analyses methods. A summary of the select larger drainages are provided with each of the regional watershed sections in order to get an understanding of the watershed characteristics and the magnitude of the hydrologic response as part of the watershed planning effort.

5 Integrated Flood Management (IFM) Planning Guiding Principles

5.1 Overview of IFM and Basic Planning Principles

Integrated Flood Management (IFM) is a different approach that deviates from traditional flood protection approaches since IFM combines land and water resources development within a watershed, within the context of IRWM, and with a focus on maximizing the efficient use/net benefit of floodplain while promoting public safety. IFM is a process that promotes an integrated rather than fragmented approach to flood management and recognizes the connection of flood management actions to water resources management, land use planning, environmental stewardship, and sustainability. Flood risk management requires the holistic development of a long-term strategy balancing current needs with future sustainability. Incorporating sustainability means looking for way of working towards identifying opportunities to enhance the performance of the watershed system as a whole. Traditional flood management practices focus on reducing the chance of flooding and flood damages through physical measures intended to store and convey floodwaters away from areas to be protected. Although this approach can reduce the intensity and frequency of flooding, it can also limit the floodplain's natural function and have other unintended consequences. In addition, the traditional approach has typically been reactive or piecemeal in addressing the negative aspects of flooding without looking at the larger watershed processes and riverine ecosystem.

IFM uses various techniques to manage flooding, including structural projects (such as levees), nonstructural measures (such as land use practices), and natural watershed functions. Depending on the characteristics of individual watersheds, various resource management strategies may be used, such as: agricultural land stewardship, conjunctive water management, conveyance, ecosystem restoration, forest management, land use planning and management, surface storage, system reoperations, urban runoff management and watershed management. In recent years, flood managers have recognized the potential for natural watershed features to reduce the intensity or duration of flooding. Natural watershed features include: undeveloped floodplains that can store and slowly release floodwaters and wetlands acting as sponges, soaking up floodwaters, filtering runoff, and providing opportunities for infiltration to groundwater. Natural watershed features also include healthy forests, meadows, and other open spaces that can slow runoff during smaller flood events, reducing peak lows, mudslides, and sediment loads in streams.

5.1.1 Basic Planning Principles of IFM

The following provides basic guiding principles that provide the foundation in planning integrated flood management:

Table 5-1: Basic guiding principles of integrated flood management planning

1. Every flood risk scenario is different: there is no flood management blueprint.
Understanding the type, source and probability of flooding, the exposed assets and their vulnerability are all essential if the appropriate urban flood risk management measures are to be identified. The suitability of measures to context and conditions is crucial: a flood barrier in the wrong place can make flooding worse by stopping rainfall from draining into the river or by pushing water to more vulnerable areas downstream, and early warning systems can have limited impact on reducing the risk from flash flooding.

2. Designs for flood management must be able to cope with a changing and uncertain future.
The impact of urbanization on flood management is currently and will continue to be significant. But it will not be wholly predictable into the future. In addition, in the present day and into the longer term, even the best flood models and climate predictions result in a large measure of uncertainty. This is because the future climate is dependent on the actions of unpredictable humans on the climate – and because the climate is approaching scenarios never before seen. Flood risk managers need therefore to consider measures that are robust to uncertainty and to different flooding scenarios under conditions of climate change.

3. Rapid urbanization requires the integration of flood risk management into regular urban planning and governance.
Urban planning and management which integrates flood risk management is a key requirement, incorporating land use, shelter, infrastructure and services. The rapid expansion of urban built up areas also provides an opportunity to develop new settlements that incorporate integrated flood management at the outset. Adequate operation and maintenance of flood management assets is also an urban management issue.

4. An integrated strategy requires the use of both structural and non-structural measures and good metrics for "getting the balance right".
The two types of measure should not be thought of as distinct from each other. Rather, they are complementary. Each measure makes a contribution to flood risk reduction but the most effective strategies will usually combine several measures – which may be of both types. It is important to identify different ways to reduce risk in order to select those that best meet the desired objectives now – and in the future.

5. Heavily engineered structural measures can transfer risk upstream and downstream.
Well-designed structural measures can be highly effective when used appropriately. However, they characteristically reduce flood risk in one location while increasing it in another. Urban flood managers have to consider whether or not such measures are in the interests of the wider catchment area.

6. It is impossible to entirely eliminate the risk from flooding. Hard-engineered measures are designed to defend to a pre-determined level.
They may fail. Other non-structural measures are usually designed to minimize rather than prevent risk. There will always remain a residual risk which should be planned for. Measures should also be designed to fail gracefully rather than, if they do fail, causing more damage than would have occurred without the measure.

7. Many flood management measures have multiple co-benefits over and above their flood management role.
The linkages between flood management, urban design, planning and management, and climate change initiatives are beneficial. For example, the greening of urban spaces has amenity value, enhances biodiversity, protects against urban heat island and can provide fire breaks, urban food production and evacuation space. Improved waste management has health benefits as well as maintaining drainage system capacity and reducing flood risk.

8. It is important to consider the wider social and ecological consequences of flood management spending.
While costs and benefits can be defined in purely economic terms, decisions are rarely based on economics alone. Some social and ecological consequences such as loss of community cohesion and biodiversity are not readily measureable in economic terms. Qualitative judgments must therefore be made by city managers, communities at risk, urban planners and flood risk professionals on these broader issues.

9. Clarity of responsibility for constructing and running flood risk programs is critical.
Integrated urban flood risk management is often set within and can fall between the dynamics and differing incentives of decision-making at national, regional, municipal and community levels. Empowerment and mutual ownership of the flood problem by relevant bodies and individuals will lead to positive actions to reduce risk.

10. Implementing flood risk management measures requires multi-stakeholder cooperation.

Table 5-1: Basic guiding principles of integrated flood management planning

Effective engagement with the people at risk at all stages is a key success factor. Engagement increases compliance, generates increased capacity and reduces conflict. This needs to be combined with strong, decisive leadership and commitment from national and local governments.
11. Continuous communication to raise awareness and reinforce preparedness is necessary. Ongoing communication counters the tendency of people to forget about flood risk. Even a major disaster has a half-life of memory of less than two generations and other more immediate threats often seem more urgent. Less severe events can be forgotten in less than three years.
12. Plan to recover quickly after flooding and use the recovery to build capacity. As flood events will continue to devastate communities despite the best flood risk management practices, it is important to plan for a speedy recovery. This includes planning for the right human and financial resources to be available. The best recovery plans use the opportunity of reconstruction to build safer and stronger communities which have the capacity to withstand flooding better in the future.

5.1.2 General Elements of IFM

An integrated strategy usually requires the use of both structural and non-structural solutions. It is important to recognize the level and characteristics of existing risk and likely future changes in risk. Integrated flood management also includes the recognition that flood risk can never be entirely eliminated and that resilience to flood risk can include enhancing the capacity of people and communities to adapt to and cope with flooding.

The defining characteristic of IFM is integration simultaneously occurring in different forms such as: mix of different strategies, types of mitigation (structural and non-structural), short-term or long-term, and a participatory approach by multiple agency stakeholders within the watershed to decision making. Key elements of IFM would include:

Enhanced Level of Watershed Stakeholder Communication

- Open communication and participation by stakeholders, planners, and decision makes at all levels.
- Public consultation and involvement of watershed stakeholders for decision-making
- Promote coordination/communication across jurisdiction boundaries within the watershed including information management and exchange

Integrate Land and Water Management

- Land use planning and water management combined through coordination authorities to obtain consistency in planning
- Main elements of watershed management (water quantity, water quality, and processes of erosion/sedimentation) should be linked in planning
- Effect of land use changes on the hydrologic cycles should be evaluated and considered

Manage the Water Cycle as a Whole

- Flood management linked with drought management in the effective use of flood water
- Promote multi-benefit solutions that achieve multiple water resource benefits simultaneously

Adopt a Best-Mix of Strategies

- Flood management strategies should involve a combination of complementary strategies
- Formulate a layered strategy based on economic and watershed characteristics that is adaptable to changing conditions
- Appropriate combination of structural and non-structural measures should be evaluated recognizing the different advantage and disadvantages for the most effective plan

Adopt Integrated Hazard Management Approaches

- Flood management should be integrated into the risk management process

5.2 Risk Assessment and Management

Identifying flood risks is an important element in reducing flood damage and prioritizing flood management infrastructure needs. Appropriate assessment of flood risks can help local community government make informed decisions about priorities. The balancing of development needs and risks is essential. Uncertainty and risk management are defining characteristics of choice, and risk management is a necessary component of the development process, essential for achieving sustainable development. The application of a risk management approach provides measures for preventing a hazard from becoming a disaster. Flood risk management consists of systematic actions in a cycle of preparedness, response and recovery. Risk management calls for identification, assessment, minimization of risk, or the elimination of unacceptable risks through appropriate policies and practices. Flood risk management also includes the efforts to reduce the residual risks through such measures as flood-sensitive land-use and spatial planning, early warning systems, evacuation plans, the preparations for disaster relief and flood proofing and, as a last resort, insurance and other risk sharing mechanisms.

5.3 Resource Management Using an Ecosystem Approach

Riverine aquatic ecosystems, including rivers, wetlands and estuaries, provide many benefits to people such as clean drinking water, food, materials, water purification, flood mitigation and recreational opportunities. Variability in flow quantity, quality, timing and duration are often critical for the maintenance of river ecosystems. For example, flooding events serve to maintain fish spawning areas, help fish migration and flush debris, sediment and salt. This is particularly so for regions with dry climates that experience seasonal flooding followed by a period of drought. Different flood management measures have varying impacts on the ecosystem and at the same time changes in the ecosystem have consequential impacts on the flood situation, flood characteristics and river behavior.

Some flood management interventions adversely impact riverine ecosystems by reducing the frequency of flooding of wetlands that develop around flood plains, which are subject to frequent flooding and owe the large variety of wildlife to this phenomenon. In these situations it is desirable to avoid changes in high frequency floods since to do so would damage the ecosystems that have developed around the existing flood regime. What is desirable is to reduce extreme floods. Thus a tradeoff between competing interests in the river basin is required to determine the magnitude and variability of the flow regime needed within a basin in order to maximize the benefits to society and maintain a healthy riverine ecosystem.

5.4 General Flood Management Opportunities / Constraints

The characteristics of the region provide background into understanding the both potential opportunities as well as constraints for developing potential IFM solutions for the existing flood hazards. Flood management projects are planned and implemented to solve problems reducing risk to public safety and property, meet challenges, and seize opportunities. A problem can be thought of as an undesirable condition, while an opportunity offers a chance for improvement, and constraints limit the ability for implementation. The San Diego IRWM Region includes a wide variety of terrain conditions, as well as geographic features which can generate a range of different types of watershed response. These features include urban development surrounded by rainfall-collecting steep terrain and at the other extreme coastal flooding. The geography, as well meteorological conditions, are conducive to sudden flooding. The semi-arid climate, where the total rainfall is typically concentrated in a few short months, adds to the uncertainty of flood prediction. In addition, the unique issues associated with the watershed conditions also limit the application of even conventional flood management solutions. It is important to identify and recognize the areas within the watershed which have specific unique properties as part of the planning process to assist in the formulation of alternative solutions. This study is utilizing a watershed scale assessment as part of an IFM approach that allows examination of flood hazards and their management in combination with other water resources and environmental restoration on a broad scale.

Based on the characteristics discussed above, the Region's flood management opportunity/constraints may be divided into four major categories which include: (1) physical conditions, (2) regulatory, (3) landuse, and (4) environmental/biological.

Physical

Different physical features define the types of flooding issues since the topographic features greatly influence the response of the watershed. The nature of the flooding created by the topography also results in different constraints and limits the ability to apply different conventional solutions for the flood hazard mitigation. Table 5-2 illustrates the opportunity and constraints with floodplain management that are associated with "physical features" within the watershed.

Table 5-2: Opportunity / Constraints for regional floodplain management – Physical features

Physical	
Opportunity / Constraint	**Reference**
Hydraulic conveyance limitations of existing roadway and utility crossings	• Identification of hydraulic limitations as potential target areas for fixes that may reduce areas of flooding and sedimentation
Existing facilities and structures located with the floodplain	• Define existing flood risk from existing facilities/uses within the floodplain
Sediment delivery with flood flows from foothill areas	• Excessive sediment delivery causes deposition and will ultimately be deposited at a downstream location with flatter slope • High sediment yields bulk the flood waters and increase depth of flooding
Limited topographic relief/slope that limits hydraulic conveyance in valley areas	• Facility sizes will increase further downstream within the watershed because of the reduced slope
Soils/geology primarily alluvial deposits that are highly erodible	• Channel migration routinely occurs • Erosion hazards for development adjacent to channels
Specialized geographic/geomorphic features which include alluvial fans and coastal plains	• Hydraulic conditions are unique and conventional flood management solutions are not applicable
Topographic features result in steep slopes in the mountains/foothills and extremely flat slopes on the valley floors	• Changes in hydraulic conveyance and sediment delivery because of the change in slopes

Regulatory

The existing regulations related to floodplain management/flood control influence the existing level of flood protection provided to the community. Table 5-3 illustrates the opportunity and constraints with floodplain management that are associated with "regulatory" items within the watershed.

Table 5-3: Opportunity / Constraints for regional floodplain management – Regulatory Elements

Regulatory	
Opportunity / Constraint	**Reference**
No centralized regional flood agency for the entire San Diego region. San Diego County Flood Control District is only responsible for the unincorporated County areas and all other municipalities manage floodplains individually	• Flooding problems within the County area are extremely varied and associated with the different individual watersheds • Comprehensive planning required that reflects the current though process for flood management and the environmental considerations for each of the regional watersheds that will cross over political boundaries
FEMA/NFIP requirements for community floodplain regulations	• NFIP requirements have the most influence on floodplain restrictions
Water quality limitations and restrictions based on the Basin Plan and identified TMDLs	• Water quality restrictions should be implemented as part of the regional planning solution

Landuse

Existing land use and future proposed development should be closely coordinated with the existing mapped flood hazards. Land use restrictions are one of the primary tools for floodplain management in order to reduce flood risks. Table 5-4 illustrates the opportunity and constraints with floodplain management that are associated with "landuse features" within the watershed.

Table 5-4: Opportunity / Constraints for regional floodplain management – Landuse features

Landuse	
Opportunity/Constraints	**Reference**
Various urban/commercial landuse and additional manmade encroachments within the floodplain	• Cost/benefit assessments should be performed to evaluate cost effectiveness of flood control facilities or removing these uses from the floodplain
Limitations of development and landuse restrictions within active flood hazard zones	• Modifications to current General Plan modifying landuses so that they are compatible with the floodplain overlay since many locations have development zoned for floodplain areas

Environmental/Biological

Existing biological resources within the floodplain corridor are an important opportunity to integrate into the regional planning as part of the preservation of these resources. However, in addition to an opportunity these resources can represent constraints in the different types of solutions that can be applied for flood mitigation and may result in additional costs. Table 5-5 illustrates the opportunity and constraints with floodplain management that are associated with "environmental/biological" elements within the watershed.

Table 5-5: Opportunity / Constraints for regional floodplain management – Environmental / Biological

Opportunity/Constraints	Reference
Environmental permitting limitations for activities/structures within the floodplain (i.e. endangered species, etc.)	• Additional costs or limitations on the potential solutions available because of environmental regulatory restrictions
Many existing floodplain corridors have special defined ecological preserve or similar designations because of habitat for sensitive species	• Existing floodplains and streams are valuable biological resources for preservation

6 Formulation Integrated Flood Management Strategies

6.1 Global IFM Management Strategies

IFM includes a broad range of management strategies and can be grouped into four general approaches— (1) Nonstructural Approaches, (2) Restoration of Natural Floodplain Functions, (3) Structural Approaches, and (4) Emergency Management. These approaches and the management actions within them serve as a toolkit of potential actions that local agencies can use to address flood-related issues, and advance IFM throughout the Region's watersheds. These actions range from policy or institutional changes to operational and physical changes to flood infrastructure. Such actions are not specific recommendations for implementation; rather, they serve as a suite of generic management tools that can be used individually or combined for specific application situations. A variety of management actions can be bundled together as part of a single flood management project to provide a multiple benefit outcome related to water resources.

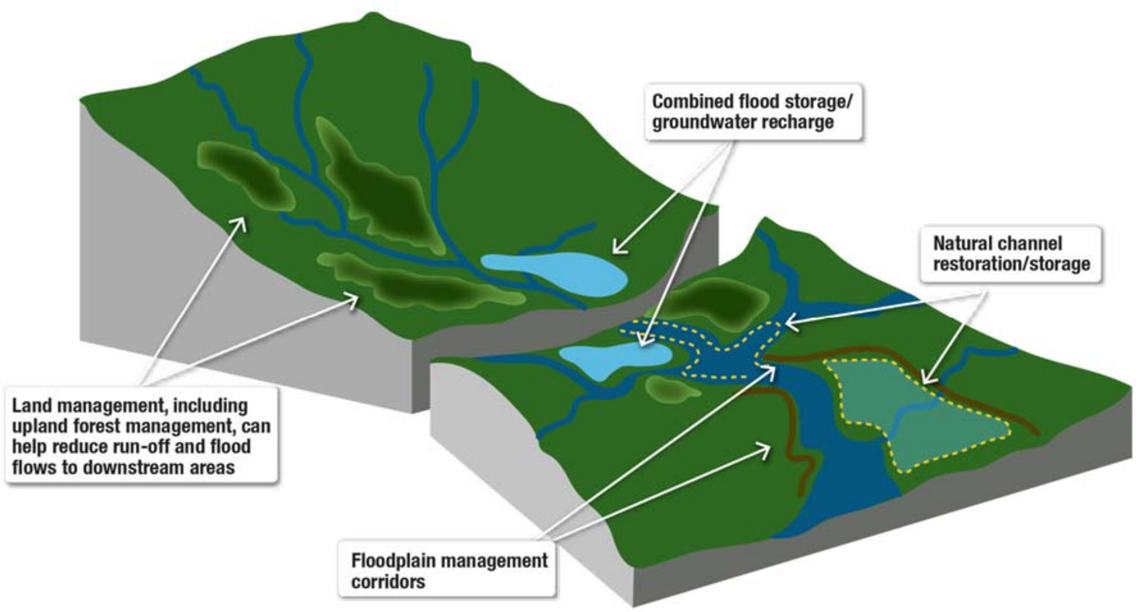


Figure 6-1: Example of IFM strategies applied at different locations on a watershed basis to achieve multiple water resources benefits

6.2 Nonstructural Approaches

6.2.1 Land Use Planning – Floodplain Basis

Land use planning employs policies, ordinances, and regulations to limit development in flood-prone areas and encourages land uses that are compatible with floodplain functions. This can include policies and regulations that restrict or prohibit development within floodplains, restrict size and placement of structures, prevent new development from providing adverse flood impacts to existing structures, encourage reduction of impervious areas, require flood-proofing of buildings, and encourage long-term restoration of streams and floodplains.

6.2.2 Land Use Planning – Watershed Basis

Landuse controls on a watershed basis provide the opportunity to assist in controlling the response of the watershed and influence or correct potential problems through non-structural means. In addition, land use planning and regional water management can be coordinated between land management and water management authorities to achieve consistency and maximum benefits. Landuse impacts different elements of the watershed including water quantity, water quality, and the processes of erosion/deposition. It is important to understand these linkages between landuse and the watershed functions in order to develop collaboration to improve the watershed performance on a regional basis.

6.2.3 Floodplain Management

Floodplain management generally refers to nonstructural actions in floodplains to reduce flood damages and losses. Floodplain management actions include:

- **Floodplain Mapping and Risk Assessment –** Floodplain mapping and risk assessment serve a crucial role in identifying properties that are at a high risk to flooding. Accurate, detailed maps are required to prepare risk assessments, guide development, prepare plans for community economic growth and infrastructure, utilize the natural and beneficial function of floodplains, and protect private and public investments. Development of needed technical information includes topographic data, hydrology, and hydraulics of streams and rivers, delineation of areas subject to inundation, assessment of properties at risk, and calculation of probabilities of various levels of loss from floods.
- **Land Acquisitions and Easements** – Land acquisitions and easements can be used to restore or preserve natural floodplain lands and to reduce the damages from flooding by preventing urban development. Land acquisition involves acquiring full-fee title ownership of lands from a willing buyer and seller. Easements provide limited-use rights to property owned by others. Flood easements, for example, are purchased from a landowner in exchange for perpetual rights to periodically flood the property when necessary or to prohibit planting certain crops that would impede flood flows. Conservation easements can be used to protect agricultural or wildlife habitat lands from urban development. Both land acquisitions and easements generally involve cooperation with willing landowners. Although acquisition of lands or easements can be expensive, they can reduce the need for structural

flood improvements that would otherwise be needed to reduce flood risk. Maintaining agricultural uses and/or adding recreational opportunities where appropriate provide long-term economic benefits to communities and the State.

- **Building Codes and Flood-proofing** – Building codes and flood-proofing include specific measures that reduce flood damage and preserve egress routes during high- water events. Building codes are not uniform; they vary across the state based on a variety of factors. Example codes could require flood-proofing measures that increase the resilience of buildings through structural changes, elevation, or relocation and the use of flood resistant materials.
- **Retreat** – Retreat is the permanent relocation, abandonment, or demolition of buildings and other structures. Retreat can be used in a variety of settings from floodplains to coastal areas. In coastal regions, this action would allow the shoreline to advance inward, unimpeded in areas subject to high coastal flooding risks, high erosion rates, or future sea level rise. Integrating recreation uses into retreat areas along the shoreline provides economic uses for these buffer lands.
- **Flood Risk Awareness (Information and Education)** – Flood risk awareness is critical because it encourages prudent floodplain management. Flood hazard information is a prerequisite for sound education in understanding potential flood risks. If the public and decision makers understand the potential risks, they can make decisions to reduce risk, increase personal safety, and expedite recovery after floods. Effective risk awareness programs are critical to building support for funding initiatives and to building a connection to the watershed.
- **Flood Insurance** – Flood insurance is provided by the Federal government via the NFIP to communities that adopt and enforce an approved floodplain management ordinance to reduce future flood risk. The NFIP enables property owners in participating communities to purchase subsidized insurance as a protection against flood losses. If a community participates in the voluntary Community Rating System and implements certain floodplain management activities, the flood insurance premium rates are discounted to reflect the reduced flood risks

6.2.4 Restoration of Natural Floodplain Functions

This strategy recognizes that periodic flooding of undeveloped lands adjacent to rivers and streams is a natural function and can be a preferred alternative to restricting flood flows to an existing channel. The intent of natural floodplain function restoration is to preserve and/or restore the natural ability of undeveloped floodplains to absorb, hold, and slowly release floodwaters, to enhance ecosystem, and to protect flora and fauna communities. Natural floodplain conservation and restoration actions can include both structural and nonstructural measures. To permit seasonal inundation of undeveloped floodplains, some structural improvements (e.g., weirs) might be needed to constrain flooding within a defined area along with nonstructural measures to limit development and permitted uses within those areas subject to periodic inundation. Actions that support natural floodplain and ecosystem functions include:

- **Promoting Natural Hydrologic, Geomorphic, and Ecological Processes –** Natural hydrologic, geomorphic, and ecological processes are key components of promoting natural floodplain and ecosystem functions**.** Human activities (including infrastructure such as dams, levees, channel stabilization, and bank protection) have modified natural hydrological processes by changing the extent, frequency, and duration of natural floodplain inundation. These changes disrupt natural geomorphic processes such as sediment erosion, transport, and deposition, which normally cause channels to migrate, split, and rejoin downstream. These natural geomorphic processes are important drivers in creating diverse riverine, riparian, and floodplain habitat to support fish and wildlife, and in providing natural storage during flood events. Restoration of these processes might be achieved through setting back levees, restoring channel alignment, removing unnatural hard points within channels, or purchasing lands or easements that are subject to inundation.
- **Protecting and Restoring Quantity, Quality, and Connectivity of Native Floodplain Habitats –** Quantity, quality, and connectivity of native floodplain habitats are critical to promote natural floodplain and ecosystem functions**.** In some areas, native habitat types and their associated floodplain have been lost, fragmented, and degraded. Lack of linear continuity of riverine, riparian habitats, or wildlife corridors, impacts the movement of wildlife species among habitat patches and results in a lack of diversity, population complexity, and viability. This can lead to native fish and wildlife becoming rare, threatened, or endangered. Creation or enhancement of floodplain habitats can be accomplished through setting back levees and expanding channels or bypasses, or through removal of infrastructure that prevents flood flows from entering floodplains. Coastal wetlands have been severely reduced, resulting in a loss of habitat for freshwater, terrestrial, and marine plant species. Restoration of these habitats could provide a buffer against storm surges and sea level rise.
- **Invasive Species Reduction –** Minimizing invasive species can help address problems for both flood management and ecosystems. Invasive species can reduce the effectiveness of flood management facilities by decreasing channel capacity, increasing rate of sedimentation, and increasing maintenance costs. Nonnative, invasive plant species often can out-compete native plants for light, space, and nutrients, further degrading habitat quality for native fish and wildlife. These changes can supersede natural plant cover, eliminate, or reduce the quality of food sources and shelter for indigenous animal species, and disrupt the food chain. Reductions in the incidence of invasive species can be achieved by defining and prioritizing invasive species of concern, mapping their occurrence, using BMPs for control of invasive species, and using native species for restoration projects.

6.3 Structural Approaches

Structural approaches to flood management include flood infrastructure, reservoir and floodplain storage and operations, and operations and maintenance (O&M).

6.3.1 Flood Infrastructure

Flood infrastructure varies significantly based on the type of flooding. There are many alternative components that can be applied to correct flood control deficiencies. These components can be used individually or in different combinations with other available alternative components. The alternative structural flood control infrastructure solutions that are available to select from for any type of flood control problem are limited to three major categories of solutions from which the individual components will generally fall within one of these categories and include (1) conveyance oriented, (2) storage, and (3) diversion. The major categories of structural solutions can be further expanded to define additional classifications of the primary components which include: (1) flow redirection, (2) structural rigid revetments, (3) other structural techniques, (4) biotechnical techniques, (5) channel geometry, (6) channel alignment, (7) diversion, (8) storage, and (9) other techniques. Flood infrastructure can include:

- **Levees and Floodwalls –** Levees and floodwalls are designed to confine flood flows by containing waters of a stream or lake. Levees are an earthen or rock berm constructed parallel to a stream or shore (or around a lake) to reduce risk from all types of flooding. Levees could be placed close to stream edges, or farther back (e.g., a setback levee). Ring levees could be constructed around a protected area, isolating the area from potential floodwaters. A floodwall is a structural reinforced-concrete wall designed and constructed to hold back floodwaters. Floodwalls have shallow foundations or deep foundations, depending on flood heights and soil conditions. Although Levees and Floodwalls are structural flood management approaches, they are not recommended. Due to strict FEMA regulations and intensive maintenance requirements, other alternatives are preferred within the County of San Diego.
- **Channels and Bypasses –** Channels and bypasses convey floodwaters to reduce the risk of slow rise, flash, and debris- flow flooding. Channels can be modified by deepening and excavating the channel to increase its capacity, or lining the streambed and/or banks with concrete, riprap, or other materials, to increase drainage efficiency. Channel modifications can result in increased erosion downstream and degradation of adjacent wildlife habitat, and often the modifications require extensive permitting. Bypasses are structural features that divert a portion of flood flows onto adjacent lands (or into underground culverts) to provide additional flow-through capacity and/or to store the flows temporarily and slowly release the stored water.
- **Retention and Detention Basins** – Retention and detention basins are used to collect stormwater runoff and slowly release it at a controlled rate so that downstream areas are not flooded or eroded. A detention basin eventually drains all of its water and remains dry between storms. Retention basins have a permanent pool of water and can improve water quality by settling sediments and attached pollutants.
- **Culverts and Pipes** – Culverts and pipes are closed conduits used to drain stormwater runoff. Culverts are used to convey stream-flow through a road embankment or some other type of flow obstruction. Culverts and pipes allow stormwater to drain underground instead of through open channels and bypasses.
- **Shoreline Stabilization, and Streambank Stabilization** – Shoreline stabilization reduces risk to low-lying coastal areas from flooding. Coastal armoring structures are typically massive concrete or earthen structures that keep elevated water levels from flooding interior lowlands and prevent soil from sliding seaward. Shoreline stabilization reduces the amount

of wave energy reaching a shore or restricts the loss of beach material to reduce shoreline erosion rates. Types of shoreline stabilization include breakwaters, groins, and natural or artificial reefs. Streambank stabilization protects the banks of streams from erosion by installing riprap, matting, vegetation or other materials to reduce erosion.

- **Debris Mitigation Structures** – For debris and alluvial flooding, debris fences and debris basins separate large debris material from debris flows, or the structures contain debris flows above a protected area. These structures require regular maintenance to periodically remove and dispose of debris after a flood. Deflection berms (or training berms) can be used to deflect a debris flow or debris flood away from a development area, allowing debris to be deposited in an area where it would cause minimal damage.

6.3.2 Reservoir and Floodplain Storage and Operations

Reservoir and floodplain storage provide an opportunity to regulate flood flows by reducing the magnitude of flood peaks occurring downstream. Many reservoirs are multipurpose and serve a variety of functions, including water supply, irrigation, habitat, and flood control. Reservoirs collect and store water behind a dam and release it after the storm event. Floodplain storage occurs when peak flows in a river are diverted to adjacent off-stream areas. Floodplain storage can occur naturally when floodwaters overtop a bank and flow into adjacent lands, or storage can be engineered using weirs, berms, or bypasses to direct flows onto adjacent lands.

- **Storage Operations –** Storage operations can reduce downstream flooding by optimizing the magnitude or timing of reservoir releases, or through greater coordination of storage operations. Coordination can take the form of formal agreements among separate jurisdictions to revise reservoir release operations based on advanced weather and hydrology forecasts, or it can simply involve participation in coordination meetings during flood emergencies.
- **Groundwater Recharge** – In some areas, opportunities may exist to provide recharge to the aquifer in order to capture surface water sources which would normally discharge to the ocean can enhance the water supplies. In addition, the opportunities for flood storage should be coordinated with recharge opportunities to ensure that these are located where optimum benefits occur, including recharge capabilities.

6.3.3 Operations and Maintenance

Operation and maintenance (O&M) is a crucial component of flood management. O&M activities can include inspection, vegetation management, sediment removal, management of encroachments and penetrations, repair or rehabilitation of structures, or erosion repairs. Because significant flood infrastructure constructed in the early to mid-twentieth century are near or have exceeded the end of their expected service lives, adequate maintenance is critical for this flood infrastructure to continue functioning properly.

6.4 Flood Emergency Management

Flood emergency management includes the following preparedness, response, and recovery activities:

- **Flood Preparedness** – Flood preparedness consists of the development of plans and procedures on how to respond to a flood in advance of a flood emergency, including preparing emergency response plans, training local response personnel, designating evacuation procedures, conducting exercises to assess readiness, and developing emergency response agreements that address issues of liability and responsibility.
- **Emergency Response** – Emergency response is the aggregate of all those actions taken by responsible parties at the time of a flood emergency. Early warning of flood events through flood forecasting allows timely notification of responsible authorities so that plans for evacuation of people and protection of property can be implemented. Emergency response includes flood fighting, emergency evacuation, and sheltering. Response begins with, and might be confined to, affected local agencies or operational areas (counties). Depending upon the intensity of the event and the resources of the responders, response from regional, State, and Federal agencies might be required.
- **Post-Flood Recovery** – Recovery programs and actions include restoring utility services and public facilities, repairing flood facilities, draining flooded areas, removing debris, and assisting individuals, businesses, and communities to protect lives and property. Recovery planning could include development of long- term floodplain reconstruction strategies to determine if reconstruction would be allowed in flood-prone areas, or if any existing structures could be removed feasibly. Such planning should review what building standards would be required, how the permit process for planned reconstruction could be improved, funding sources to remove existing structures, natural habitat restoration, and how natural floodplains and ecosystem functions could be incorporated.

6.5 Application of Common IFM Strategies

The value of using an IFM approach within the watershed is in the results—improved public safety, enhanced environmental stewardship, and statewide economic stability. Localized, narrowly focused projects are not the best use of public resources and might have negative unintended consequences in nearby regions. The IFM approach can help deliver more benefits at a faster pace using fewer resources than what is possible from single-benefit projects. Table 6-1 provides examples of different recommended IFM strategies to assist in formulating alternatives within the different watersheds in order to produce high-value multi-benefit projects.

Table 6-1: Examples of applications of different IFM strategies and approaches

1. Increase hydraulic conveyance capacities and remove flow restrictions
2. Provide flood relief structures or bypass system to reduce downstream flows
3. Construct setback levees to preserve natural floodplain vegetation corridor
4. Preservation of natural active washes and floodplain corridors
5. Clearing of debris and snags within channel systems

Table 6-1: Examples of applications of different IFM strategies and approaches

6. Watershed and floodplain vegetation management plan including current levee requirements
7. Streambank stabilization to reduce sedimentation downstream
8. Update O&M procedures and methods to reflect other functions in the flood management system including ecosystem functions
9. Acquire floodplain areas to reduce flood damages and preserve natural floodplain corridors / ecosystem values
10. Sediment deposition removal projects to enhance hydraulic capacity and maintain fluvial processes
11. Update local flood management plans and coordinate with landuse planning
12. Designate additional floodways based on current hydraulic and hydrologic conditions
13. Encourage compatible landuse with flood management system and floodplain
14. Mange urban stormwater runoff to natural floodplain to reduce the potential for “hydromodification” impacts including flooding and stream stability
15. Improved accuracy of floodplain mapping/delineation, including urban areas, as well as better assessment of flood risks
16. Increased public information on floodplain hazards through access to floodplain hazard delineation with GIS tools on web based applications
17. Increased awareness and participation of FEMA Community Rating System (CRS) for flood insurance rate adjusting program
18. Identify locations and structures which have repetitive flood damage losses and eliminate
19. Land use planning and decision-making should be based on a more accurate assessment of flood risk from multiple hazards (i.e. influence of wildfires on flooding)
20. Construct new or enlarge existing temporary floodplain storage to attenuate peak flooding downstream
21. Increase flood control allocation by expanding existing or building new off-stream storage.
22. Implement advanced weather- forecast-based operations to increase reservoir management flexibility on a watershed basis such as with the County ALERT Network
23. Manage runoff through watershed management. Runoff from watershed source areas increases, in varying extents, due to increases in impermeable surfaces in developed areas, soil compaction from agriculture, reductions in vegetative cover, incision of stream channels, and losses of wetlands. Runoff flood
24. Remove unnatural hard points in or on the banks of streams (such as bridge abutments, rock revetment, dikes, limitations on channel boundaries, or other physical encroachments into a channel or waterway) can affect the hydraulics of river channels, constraining dynamic natural fluvial geomorphologic processes of erosion.
25. Develop hazardous waste and materials management protocols to identify, contain, and remediate potential water quality hazards within floodplains
26. Operate reservoirs with flood reservation space to more closely approximate natural flow regimes
27. Reduce the incidence of invasive species in flood management systems
28. Remove barriers to fish passage
29. Encourage natural physical geomorphic processes, including channel migration and sediment transport
30. Floodplain and watershed improve the quality, quantity, and connectivity of wetland, riparian, woodland, grassland, and other native habitat communities
31. Develop regional advanced mitigation strategies and promote networks of both public and private mitigation banks to meet the needs of flood and watershed infrastructure projects.
32. An effective and sustainable flood/watershed management system encompass critical habitat and migration corridors through integration of public safety, water supply, and ecosystem function—managing flood infrastructure as a system
33. Coordinate flood response planning and clarify roles and responsibilities of the different flood management agencies/entities related to flood preparedness and emergency response
34. Use Building Code amendments to reduce consequence of flooding
35. Encourage multi- jurisdictional and regional partnerships on flood planning and improve agency coordination on flood management within watersheds to provide system wide planning

6.6 Detailed Application of IFM Strategies

A more detailed assessment was developed for commonly utilized IFM strategies that are applicable to the County. A variety of the different specific strategies or projects were generalized or lumped to ten different types of strategies or applications that could be utilized in Southern California. A series of fact sheets were developed for the different generalized application in order to assist in the guidance and formulation of specific projects.

Strategy Application No.1 - Watershed Management Planning

IFM Objectives / Principles:

- Landuse planning
- LID policies
- Natural resource preservation
- Sustainable development
- Water quality
- Runoff management

Description of Representative Actions / Elements:

Apply core underlying watershed management planning guidelines in developing the proposed strategies and infrastructure for future development. These guidelines would ensure that development (i) mimics existing runoff and infiltration patterns within the project area, (ii) does not exacerbate peak flow rates or water volumes within or downstream of the project area, (iii) maintains the geomorphic structure of the major tributaries within the project area, (iv) maintains coarse sediment yields, storage and transport processes, and (v) uses a variety of strategies and programs to protect water quality. The principles refine the planning framework and identify key physical and biological processes and resources at both the watershed and sub-basin level. The Watershed Planning Principles focus also on the fundamental hydrologic and geomorphic processes of the overall watersheds and of the sub-basins. These principles can be utilized to guide the initial planning of the development program relative to watershed resources and to minimize impacts thereto through careful planning by integrating the initial baseline technical watershed assessments. Non-structural watershed protection planning principles would include minimization of impervious areas/preservation of open spaces, prioritization of soils for development and infiltration, and establishment of riparian buffer zones. Examples of watershed planning principles that can be used include:

Principle 1 – Recognize and account for the hydrologic response of different terrains at the sub-basin and watershed scale.

Principle 2 – Emulate, to the extent feasible, the existing runoff and infiltration patterns in consideration of specific terrains, soil types and ground cover.

Principle 3 – Address potential effects of future land use changes on hydrology.

Principle 4 – Minimize alterations of the timing of peak flows of each sub-basin relative to the mainstem creeks.

Principle 5 – Maintain and/or restore the inherent geomorphic structure of major tributaries and their floodplains.

Principle 6 – Maintain coarse sediment yields, storage and transport processes.

Principle 7 – Protect water quality by using a variety of strategies, with particular emphasis on natural treatment systems such as water quality wetlands, swales and infiltration areas and application of Best Management Practices within

development areas to assure comprehensive water quality treatment prior to the discharge of urban runoff into the floodplain corridor
Potential Benefits: • Integrated land planning process with watershed functions • Managed runoff from development and commercial watershed activities • Maintain natural runoff process • Minimize long term maintenance costs within floodplain

Strategy Application No.2- Floodplain Management	
IFM Objectives / Principles: • Integrated landuse planning • Natural floodplain corridor preservation • Sediment management / stream stability • Natural streambed groundwater recharge	
Description of Representative Actions / Elements: Facilitating improved alignment and coordination between land use and flood management would result in better understanding of flood risk and potential impacts to proposed developments, as well as improved decision making. Specifically, flood risk information has the potential to influence land use policy decisions related to developing and expanding communities within a floodplain, which would result in reductions to flood damage claims and long-term O&M costs on projects. At the planning stage, additional measures might be incorporated into the initial proposed projects that could provide community benefits, such as setback areas that act as greenways or trails, and greatly reduce the need to retrofit or replace undersized infrastructure in the future. Too often, regional and land use policymakers realize flood risk and economic losses only after a damaging flood event. Some of the additional actions associated with this item include defining increased floodways to limit development along the floodplain fringe, floodplain retreat through purchase of properties within the floodplain, ensuring that different landuses are compatible with the floodplain risks.	
Potential Multiple Water Resource Benefits: • Reduction in flood damage subsidies to chronic flood locations	

Strategy Application No.3 – Stream Stabilization
IFM Objectives / Principles: • Sediment control • Increased floodplain capacity

- Water quality
- Reduce sediment deposition downstream

Description of Representative Actions / Elements:

Channel erosion, with substantial stream incision can be a large contributor of sediment to downstream receiving waters and deposition in portions of channels that reduce flood capacity. In addition, increased sediment transport will bulk the runoff flows in the channel and further diminish the flood conveyance capacity. Watershed based regional studies/investigations of the fluvial processes and watershed sediment yields as well as geomorphic assessments/monitoring can evaluate those critical locations within the watershed that require stabilization. Stream erosion and sedimentation adversely impact water quality beneficial uses of both the stream and the receiving waters, and sediment TMDL. Stabilization of the natural alluvial channel system to eliminate future erosion of the streambed and streambank will assist in critical channel areas as a major sediment source as well as disrupting the loss of vegetative habitat within the floodplain. Detailed streambed stability assessments provides part of the technical support for the evaluation of the benefits of and opportunities for alternative stream stabilization / restoration techniques to ensure that the natural geomorphic and fluvial process are maintained in balance.

Potential Benefits:

- Minimize maintenance in floodplains
- Reduce long term operations costs
- Reduce apparent peak discharge through reduced sediment bulking
- Reduce loss of land
- Improve recharge in streambed
- Reduce sediment deposition in riverine /estuarine habitat areas

Strategy Application No. 4 – Watershed Sediment Control / Erosion Management

IFM Objectives / Principles:

- Landuse planning
- Development sustainability
- Water quality enhancement

Description of Representative Actions / Elements:

Soil is considered a water pollutant because it can significantly affect water used for public consumption, recreation and habitat. Therefore, the most effective way to control soil erosion is at its source. Erosion control best management practices (BMPs) are required on all land disturbance sites to provide a defense against soil erosion in addition to different commercial activities within the watershed. Watershed planning implementing and requiring different BMPs can be applied as well as the modification of these commercial activities to minimize sediment disturbances. There are also natural areas which may be de-stabilized and be a significant sediment source which require specialized treatments to reduce the amount of sediment production.

Potential Benefits:

- Receiving waters improved water quality
- Reduce flooding through reduced sediment bulking of flows
- Reduction of sediment deposition in undesirable locations within floodplain

Strategy Application No.5 – Multi-Function Flood Storage / Recharge Basins

IFM Objectives / Principles:

- Flood reduction
- Groundwater recharge
- Stormwater recycling / alternative water source

Description of Representative Actions / Elements:

Regional watershed evaluation and planning to provide flood peak flow attenuation through either off-channel or adjacent in-channel temporary flood volume storage. The reduction in peak flow rates will minimize downstream flooding in addition the stored flood runoff volumes can be recharged into the aquifer to enhance groundwater supplies. Coordination with groundwater management agencies should be performed on a watershed basis to determine the optimum location to ensure that maximum recharge can be provided to the aquifer since different areas of the watershed may not provide any benefit to groundwater supplies. Coordination of both groundwater and flood benefits is necessary as part of advance planning with multiple agencies. In addition, floodplain enlargement can result in increased habitat corridors as well as the in-channel flood storage capabilities.

Potential Benefits:

- Reduced flooding downstream
- Stormwater recycling and additional water source capture

Strategy Application No.6 – Urban Water Quality Treatment / Retention

IFM Objectives / Principles:

- Water reuse / recycling
- Groundwater recharge
- Natural floodplain protection
- Stream stabilization
- Water quality treatment
- Urban flood management

Description of Representative Actions / Elements:

Management of urban stormwater runoff and the associated water quality as well as increased runoff quantities impacting the natural floodplain corridors which result in a variety of impacts, not just increased flooding. Projects involving the capture of non-stormwater flows provide an opportunity for recycling this water source which was a waste-stream in the past

Potential Benefits:

- Improved water quality and reduce impact to downstream receiving waters
- Restore natural floodplain functions
- Reduce impacts of urban hydromodification

Strategy Application No. 7 – Floodplain Habitat Corridor Preservation / Buffer	
IFM Objectives / Principles: • Vegetation buffer • Habitat preservation • Stream corridor stabilization	

Description of Representative Actions / Elements:

Wetlands and floodplain vegetation can provide a hydrologic buffer to the watershed response through reduced velocity and increased time of watershed. The watershed vegetation can buffer the intensity of rainfall events and the corresponding watershed response which will reduce the flooding downstream. The preservation of natural vegetation reduced water flow connectivity by interrupting surface flows of water, for example, by water storage or planting buffer strips of grass or trees.

Potential Benefits:

- Reduction of streambank/streambed erosion through natural protection
- Enhanced wildlife habitat benefits
- Natural water quality biological uptake benefits

Strategy Application No. 8 - Enhanced Floodplain Storage / Recharge	
IFM Objectives / Principles: • Floodplain preservation • Flood storage / groundwater recharge • Peak flow reduction • Flooding reduction • Maintain natural hydrologic processes	
Description of Representative Actions / Elements: Creative use of the floodplain to provide temporary in-channel storage to reduce peak flow rates downstream. The identification of potential flood storage within the floodplain involves integrating wetland and floodplain natural and beneficial functions into floodplain management planning. Integrate the protection and restoration of floodplain and wetland natural and beneficial functions into comprehensive land use planning, watershed planning, and floodplain management planning effort. Protection of floodplain and wetland vegetation to erosion is particularly important for high velocity areas	
Potential Benefits: • Enhanced groundwater supplies • New water source • Habitat enhancement and increased corridor	

Strategy Application No. 9 - Coordination between programs/agencies for water management and flood management planning.	
IFM Objectives / Principles: • Communication between agencies within watershed • Watershed planning guidance / regulations • Enhanced water supplies • Water management	
Description of Representative Actions / Elements: Improving coordination between regional water management and flood management planning is a key strategy to increase implementation of IWM projects. Existing planning groups and forums should be utilized to the extent possible. By coordinating water and flood management planning with balanced representation, a common understanding of flood management, water supply, water quality, environmental stewardship, public safety, and economic sustainability factors would be developed. Where possible, policy changes that promote this holistic approach to IWM should be proposed and sponsored (for example, changes to existing IRWM legislation). In addition, coordination in watershed planning process provides the opportunity to optimize the benefits of joint-use regional facilities to maximize water resources as well as flood mitigation benefits.	

Potential Benefits:

- Maintaining natural watershed response
- Increased groundwater replenishment
- Reduced flood damage
- Reduction in flood maintenance

Strategy Application No. 10 - Watershed / floodplain information management and data exchange

IFM Objectives / Principles:

- Communication between agencies within watershed
- Community involvement
- Increased watershed monitoring

Description of Representative Actions / Elements:

Improving the watershed database to ensure that different watershed stakeholders have access to the different available information and studies being performed. The sharing and the exchange of data, information, knowledge among experts, general public, policy makers, and floodplain managers in a most transparent manner is essential for comprehensive planning and effective management. Significant studies and mapping information are being performed within the watershed on an individual basis with single users or sole functions, but could become a valuable asset is shared with other users as well as saving significant costs. Fragmentation of data is common and providing a common data repository as well as manager provides the technical foundation for comprehensive planning.

Potential Benefits:

- Improved tracking and monitoring of watershed characteristics
- Reduction in data acquisition
- Enhanced community involvement in watershed, include active participation in data collection

7 Watershed Management Planning Recommendations and Guidelines

7.1 Watershed Level Planning Procedures

Effective IFM planning should be conducted at a regional scale in order to study the cause and effect of solutions through a system-wide approach. Although each watershed plan emphasizes different issues and reflects unique goals and management strategies, some common features are included in every watershed planning process. The watershed planning process is iterative, holistic, geographically defined, integrated, and collaborative. A holistic watershed planning approach usually provides the most technically sound and economically efficient means of problems and is strengthened through the involvement of stakeholders that might have broader concerns than just flood mitigation.

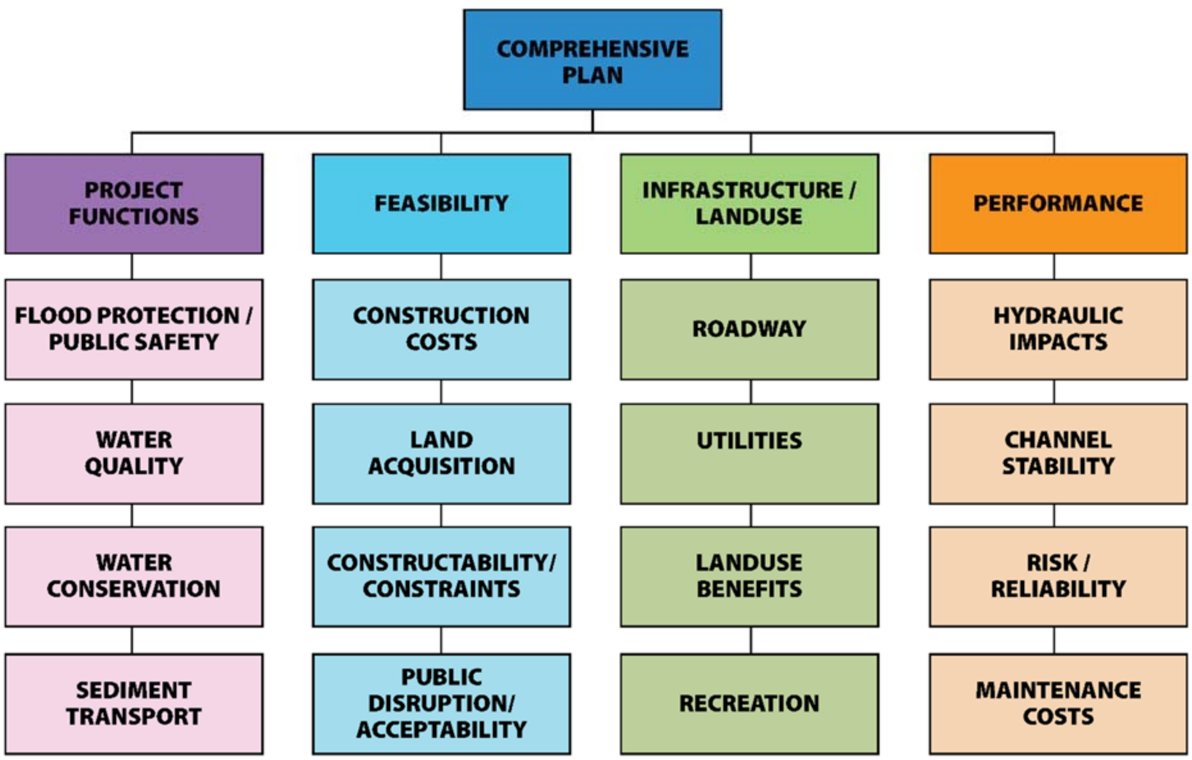


Figure 7-1 – Comprehensive watershed planning involves multiple objectives with an integrated approach to ensure that maximum benefits are achieved

Watershed flood management planning is a specialized discipline of planning that deals with floodplain management and implementation of flood protection systems and facilities to correct existing deficiencies or flooding problems. Flood management planning requires integrating a wide range of disciplines to ensure success of the plan and detailed understanding of the physical processes and system functions so that the "cause" can be effectively treated rather than the "symptom." The typical approach is an integrated planning process which evaluates multiple technical factors and evaluates multi-purpose objectives as part of the plan formulation program.

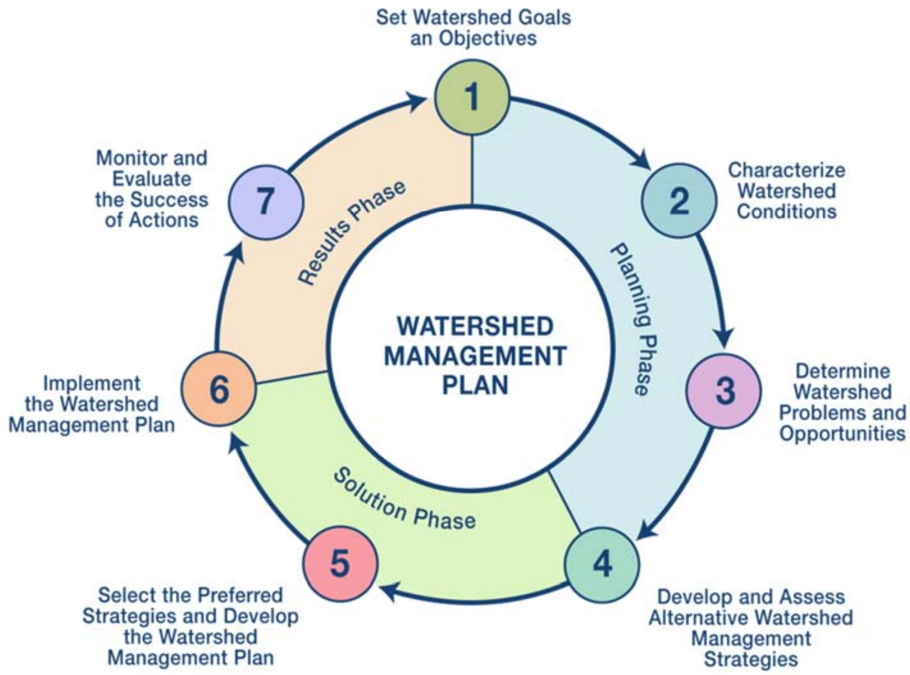


Figure 7-2 – Overview of the typical comprehensive watershed planning process involving sequential plan formulation

The general flood control planning and plan formulation process consists of a series of tasks:

Step 1 – Define Objectives and Criteria: Selection of an appropriate flood control solution requires identifying all the objectives associated with the project, since most projects will have multiple objectives, many which may be in conflict with each other. Objectives should be stated in terms of the desired outcome to be achieved and should not include the method in the objective. Design criteria are a key to establishing understood expectations for implementing a solution and are specific, measurable attributes of project components developed to meet objectives.

Step 2 – Prepare Data Inventory: Develop a database to provide a suitable technical foundation that defines the physical attributes of the system and the constraints. The data and information obtained during the inventory provides the factual basis for all future assessments and analyses.

Step 3 – Baseline Assessments and Analysis: Developing a baseline understanding of the existing conditions is essential through the application of different engineering analysis and modeling techniques.

Step 4 - Identify Problems and Opportunities: Determine the potential problems and identify the corresponding cause/source of the problem or failure mechanism.

Step 5 – Alternatives Plan Formulation: Develop a range of conceptual alternative approaches and solutions which will serve as a toolkit to draw from in order to formulate the different "systems" alternative plans. The systems can incorporate naturalized solutions and minimize impacts to environmental constraints. Plans should develop conceptual projects and should align the proposed facilities for each alternative utilizing different IFM strategies, including structural and non-structural approaches. The alternative formulation process will conceptually identify the range of potential alternative that can be screened to the most feasible alternatives.

Step 6 – Forecasts Analysis / Impacts & Risk Assessment: Prepare "planning level" assessment and analyses, which include conceptual facility hydraulic/hydrologic sizing and assessments of facility hydraulic operation or modifications of floodplain/flood hazards. The engineering analysis should be performed to sufficient level of detail in order to develop approximate construction costs of facilities and assess potential impacts, both to the floodplain and other impacts such as encroachments to biological corridors or integrating environmental habitat restoration and preservation as a key element. An initial assessment of the risk for failure of the solution is evaluated in relation to the return period of flood events, particularly if "soft" solutions or management vs. structural solutions are implemented.

Step 7 – Feasibility and Screening Analysis: A feasibility analysis is performed to screen the number of conceptual alternatives to select the recommended alternative which meets the project objectives. The screening process allows for promising alternatives to be evaluated in more detail while inferior alternatives are excluded from further evaluation. This process will qualify the alternatives different levels of feasibility in order to rank the alternatives. The "feasibility" evaluation addresses the (1) economic suitability, (2) constructability, (3) acceptability so that many of the conceptual alternatives can be eliminated from further investigation. A decision matrix can be utilized for the assisting in the screening of the flood control alternatives which identify the (1) advantages, (2) disadvantages, (3) preliminary construction costs, (4) design constraints, (5) physical constraints, (6) implementation requirements, (7) flood protection, and (8) economic factors including intangible costs. The alternatives are weighted and ranked through this process to identify the most suitable alternatives. A typical decision matrix presents the alternatives comparison based upon the degree of satisfying the various multiple watershed objectives in order to facilitate the decision making process for the recommended alternative.

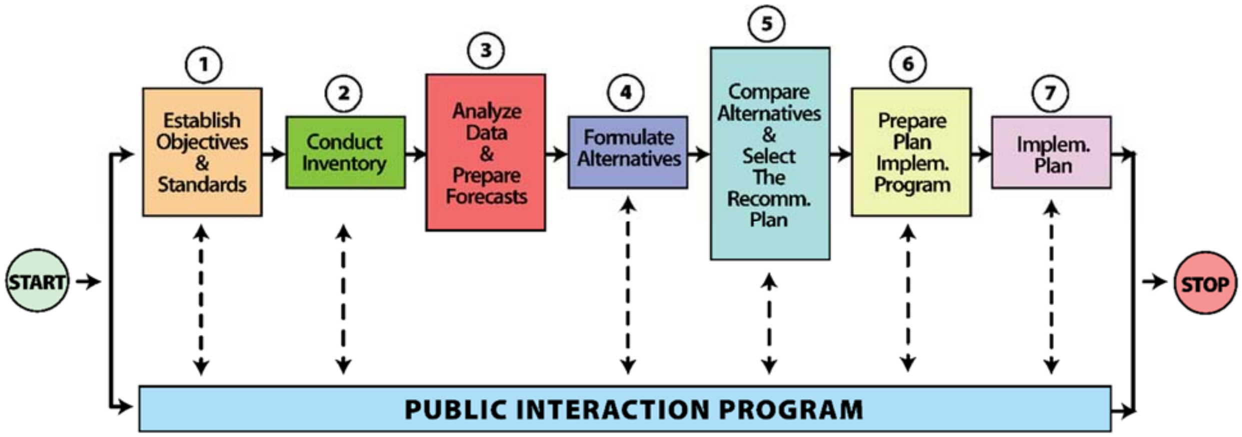


Figure 7-3 – General work flow of the watershed planning process. which includes stakeholder interaction as key element throughout the process

7.2 Specialized GIS Watershed Floodplain Management Planning Tool

The actual implementation of different IFM strategies for specific project should ensure that (1) the maximum number of benefits are achieved, (2) optimum location within the watershed to achieve the maximum flood benefits is identified, (3) multiple flood hazard issues are addressed, and (4) the focus on different water resources objectives is achieved. In order to assist in developing these projects on a watershed basis, a watershed planning tool has been developed to define locations within the watershed or floodplain that would potentially achieve multiple water resources benefits. This guidance document is intended to be used as background in the planning to identify the range of these different types of projects for implementation using multiple IFM strategies. However, the intent of this document is not to limit the range of specific strategies. These potential projects depend in part on the lead agency or entity promoting the particular subwatershed facility plan implementation and many other influential factors such as timing and opportunity. The objective in developing this initial planning tool is to provide as much flexibility as possible in order to allow responding to potential implementation/funding opportunities that may be available in the future that will allow the construction of different facilities. A feature of this planning is to identify feasible alternative regional and subregional facility locations based on specific feasibility selection screening criteria. The results of the alternative screening exercise based on feasibility of opportunities does not preclude the use of additional alternative sites in the future, as other different types of opportunities may be presented since the feasibility screening was based on a specific set of criteria.

The GIS IFM watershed planning tool evaluated different types of "opportunities" that define water resource benefits and IFM planning principles. From a watershed planning and implementation perspective it is useful to consider the "opportunities" for the implementation of regional and subregional facilities to complement or as an alternative to floodplain management approaches utilizing IFM and the associated planning principles. The series of "opportunities" in GIS mapping layers that were considered in the initial development of this planning tool included: (1) floodplain areas, (2) highly permeable soils (hydrologic soil type A), (3) groundwater basins, (4) riparian vegetation or sensitive habitat area, and (5) high sediment producing watershed areas. These initial mapping layers were overlaid to determine the locations where multiple occurrences of these five criteria occurred and were considered "opportunities." The more opportunities at a particular location then the more there was the possibility of achieving multiple flood management and water resources benefits. For example, in-stream groundwater recharge locations would be possible at location where there is (1) wide floodplain area, (2) permeable soil, and (3) groundwater basin in order to maximize the benefits to the aquifer.

In the future, additional screening criteria can be added to the tool as well as additional features such as evaluating the amount of tributary watershed area to assess the potential benefit or understand facility sizing. The tool provides planning level information to assist in evaluating potential IFM features within the watershed to increase the benefits. Figures 7-4 thru 7-9 illustrate the use of the planning tool with mapped IFM opportunity ranking that was conducted for this planning study on the different watershed units.

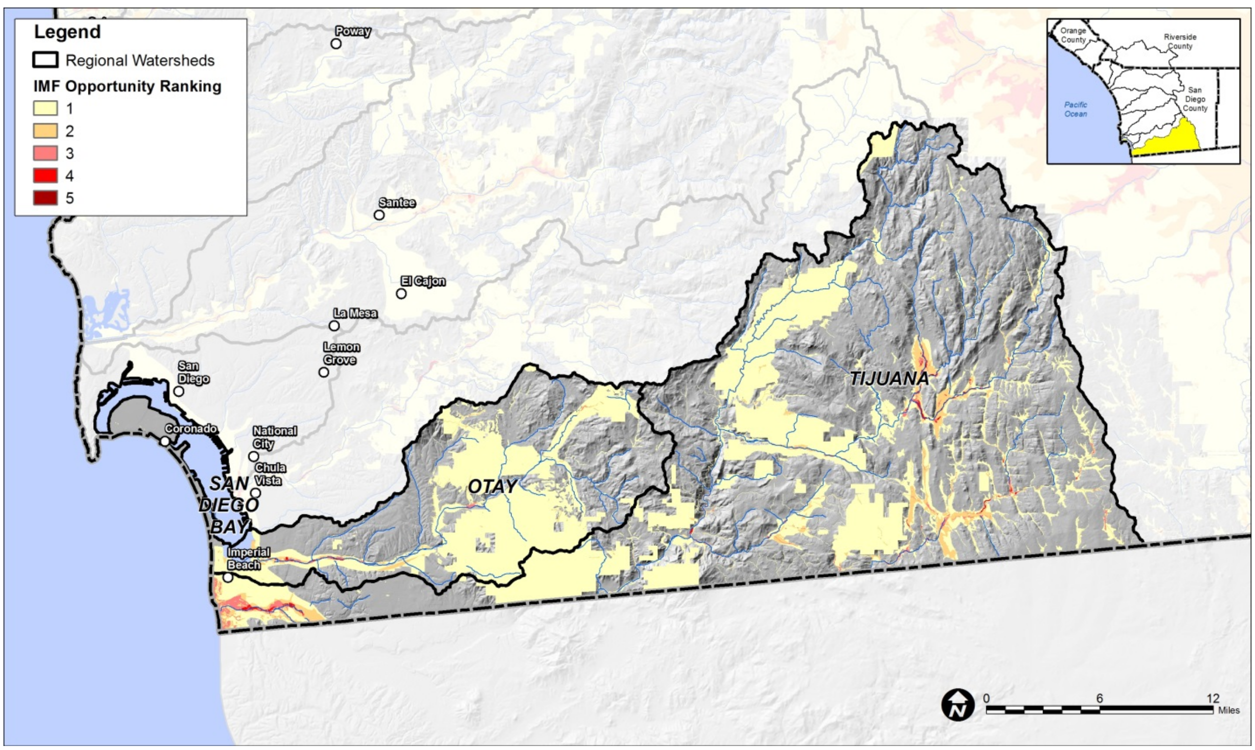


Figure 7-4: IFM opportunity ranking for application of IFM on the Otay and Tijuana River watershed unit

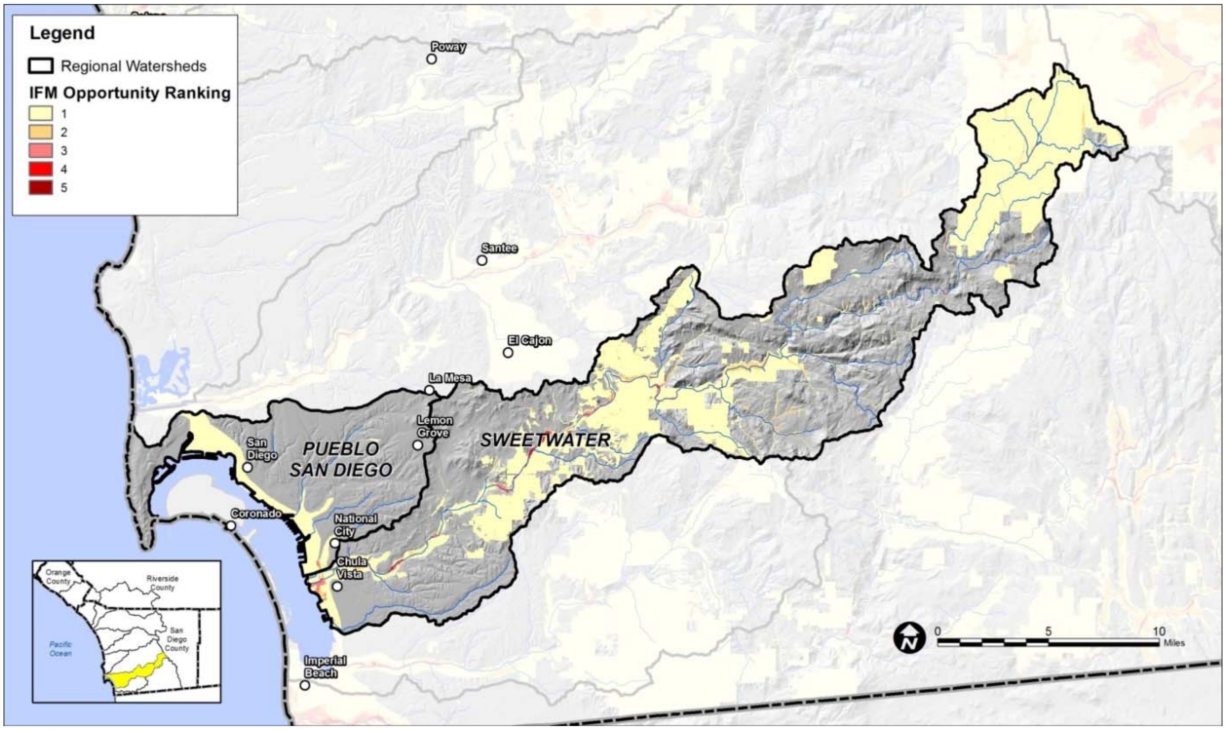


Figure 7-5 IFM opportunity ranking for application of IFM on the Pueblo and Sweetwater River watershed unit

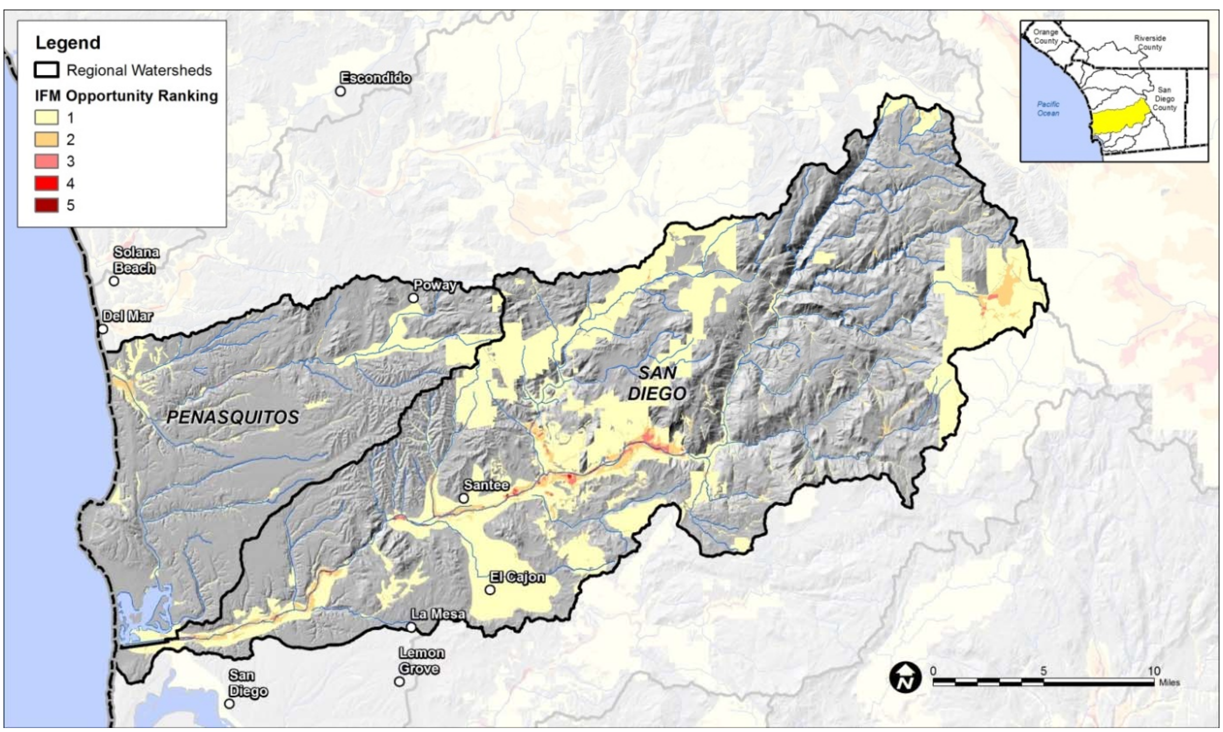


Figure 7-6: IFM opportunity ranking for application of IFM on the Peñasquitos and San Diego River watershed unit

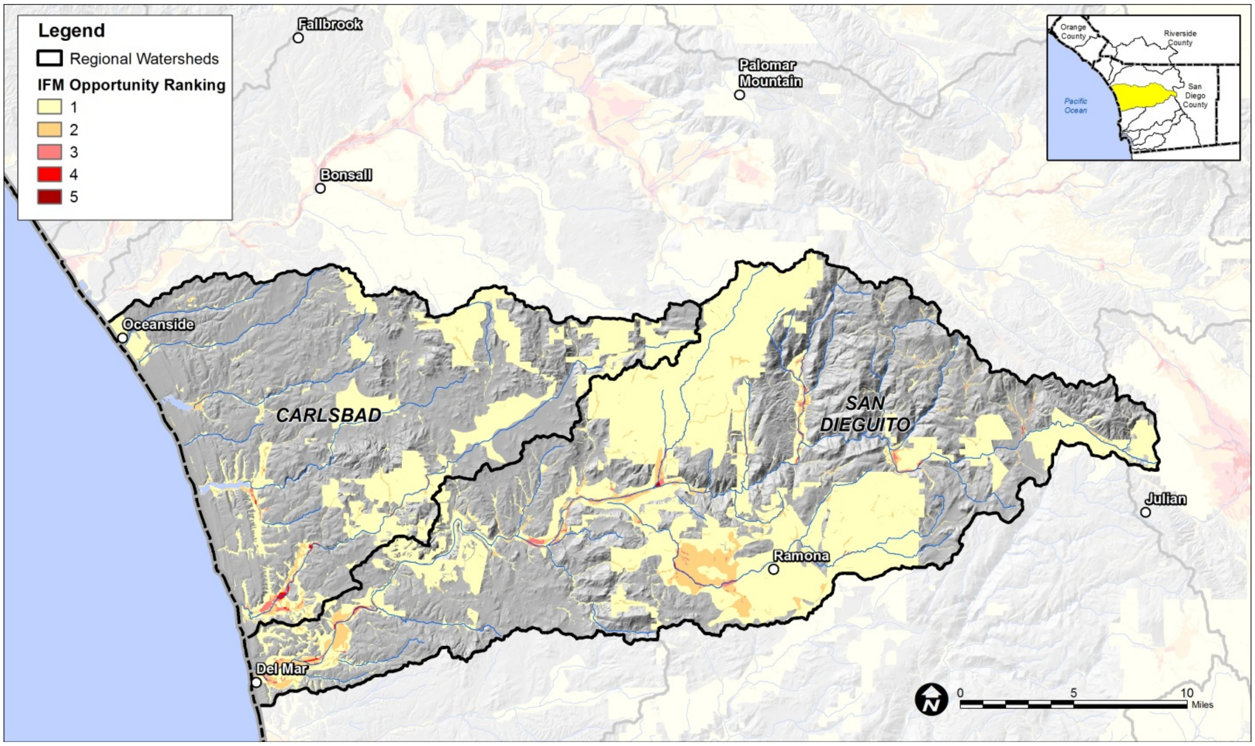


Figure 7-7: IFM opportunity ranking for application of IFM on the Carlsbad and San Dieguito watershed unit

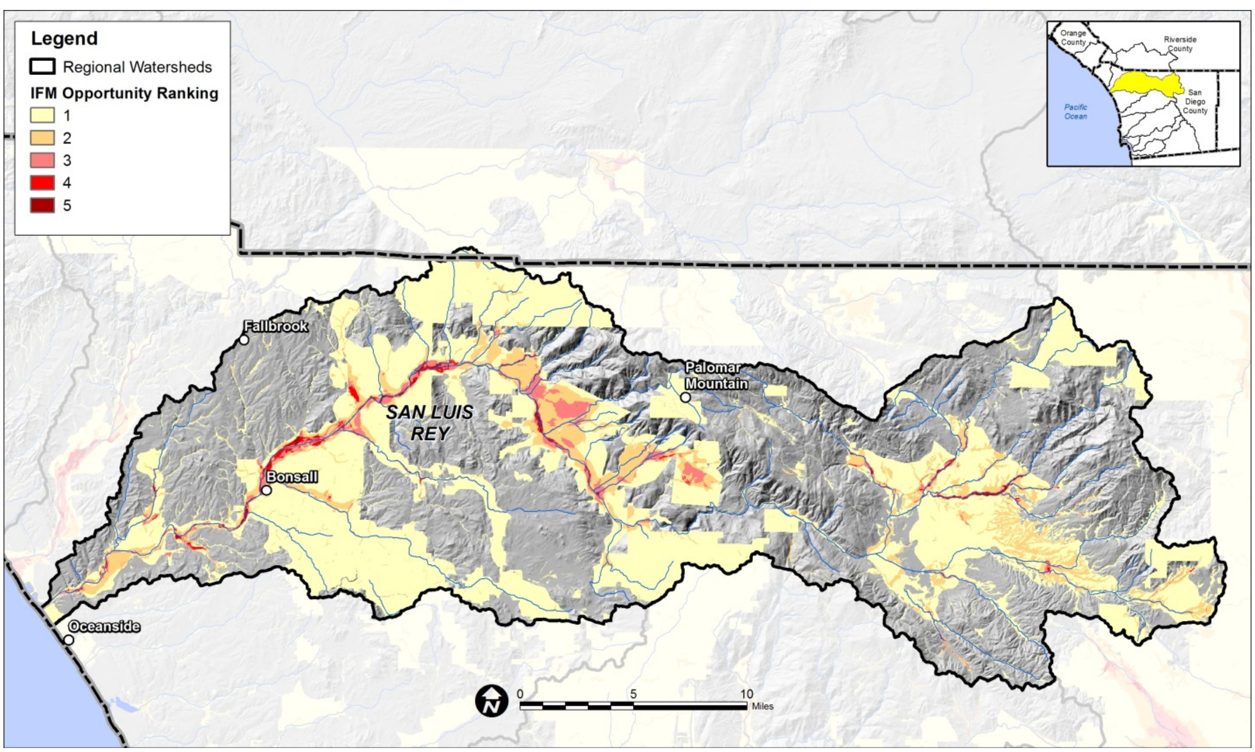


Figure 7-8: IFM opportunity ranking for application of IFM on the San Luis Rey watershed unit

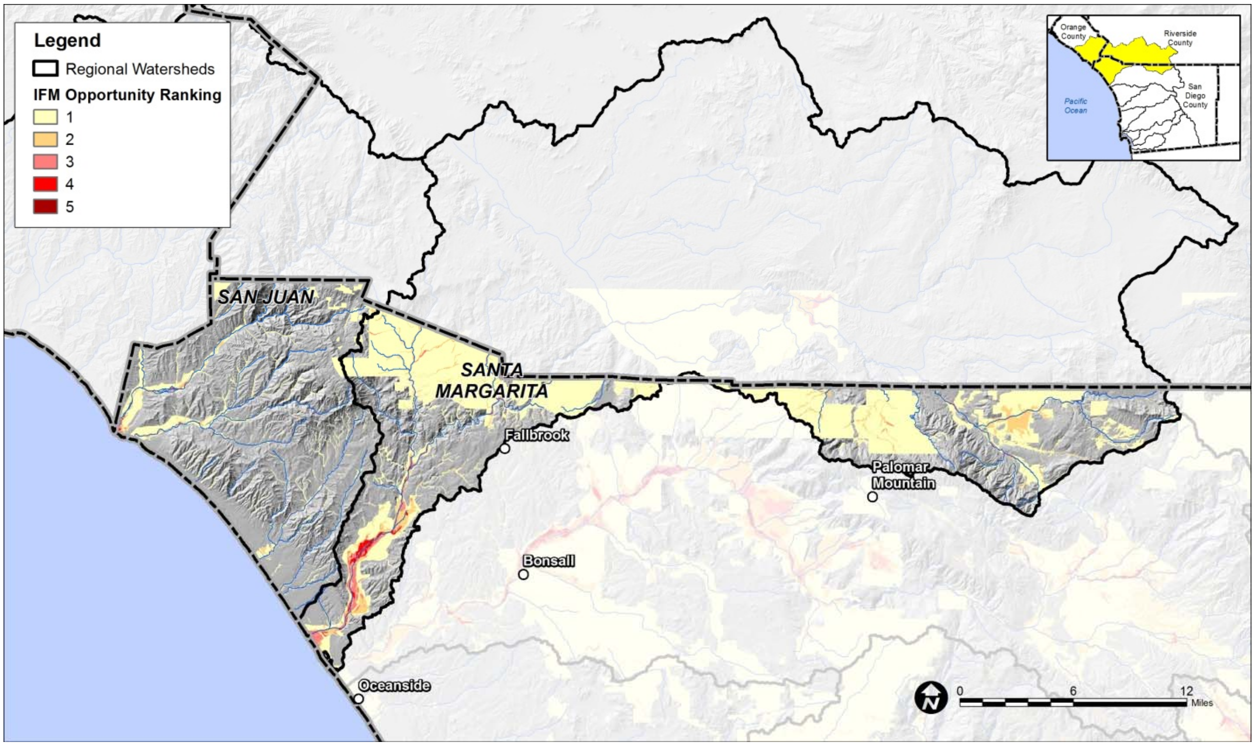


Figure 7-9: IFM opportunity ranking for application of IFM on the Santa Margarita and San Juan/San Mateo watershed unit

7.3 Communication Process – Watershed/Floodplain Managers Forum

The San Diego IRWM Region is unique with regards to floodplain management administration as compared to other areas within the state. There is not a single agency which administers and coordinates the floodplain management activities throughout the County. The SDFCD has the responsibility for areas within the unincorporated areas of the county, while the other 18 cities within the IRWM Region are responsible for the floodplain management within their municipal boundary. The fragmentation of floodplain management responsibility makes watershed scale planning more difficult.

It is recommended that a Watershed/Floodplain Managers Forum be established that promotes the collaboration with the different floodplain managers as well as coordinating with the other water resource agencies in order to implement IFM strategies. This forum would assist in define the framework and process for different levels of communication of the different levels of flood managers and watershed stakeholders. The process will define different strategies and media for communication and disseminating of information or updating of management activities as well as planning. In addition, the forum can engage the different managers and stakeholders through workshops in order to provide participation in the plan development. This working forum is a critical element that should continue into the future after the initial plan structure has developed with this contract. It can be used as an annual or more frequent vehicle for communication and collaboration to ensure effective watershed planning.

7.4 Project Plan Formulation

The initial project formulation process should provide numerous alternative general concepts or approaches that cover an entire range or spectrum of available potential solutions. The range of alternatives generated from this process should be of sufficient extent that it would satisfy an alternative analysis as part of the environmental documentation or regulatory permitting. These different options are developed through the application of a variety of available conventional tools and flood protection techniques that can be developed into different creative and effective solutions.

Conceptual design solutions are developed through an in-depth understanding of the problems and fundamental hydraulic/hydrologic processes. A hierarchy of design components is pieced together utilizing the engineering “toolbox” to develop creative alternatives that provide the desired hydraulic/hydrologic function. Techniques are selected with respect to the hydraulic conditions and fulfilling the objectives/design criteria. The intent of this process is to ensure that novel and innovative solutions are generated rather than focusing on routine alternatives.

An integral component is application of different techniques as part of these solutions that embrace the natural river function/ecology and preservation/enhancement of these resources. An important first step in formulating alternative plans is the process of creating measure of performance of evaluating each alternative since the performance measures often assist in defining potential alternatives. The performance measure must be easily understood and directly related to the planning objective. For example for the flood protection evaluation the change in water surface elevation within the floodplain will be a clear indicator of the alternative performance related to that particular primary objective.

7.5 Project Review and Screening Process

There are many unique challenges associated with the selection and prioritization of watershed projects in order to ensure that the correct or optimum is selected that provides the maximum benefits while addressing multiple watershed objectives, or ensuring the needs of all the watershed stakeholders are adopted. It is desirable to have a planning tool to assist in the alternative screening process which can provide guidance in understanding the relative importance of many different objectives through a numerical weighting scale which can be used in ranking alternatives in forming the decision nexus.

A useful technique where multiple objectives are evaluated in making a decision in the selection of many different alternatives is known as the Analytical Hierarchy Process (AHP). The main advantage to the masterplan process is its ability to rank choices in order of their effectiveness in meeting conflicting objectives. The essence of this process is to construct a matrix expressing the “relative” values of a set of different objectives or attributes. A pairwise comparison or numerical ranking is performed for each different combination of two different objectives, say cost vs. environmental protection, in order to form the matrix. The AHP involves calculating the eigenvector for the matrix which can be performed applying a relatively simplified mathematical process which otherwise would be rather daunting. (Note: an "eigenvector" of a square matrix that when multiplied by another non-zero vector yields the eigenvector multiplied by a single number) AHP is an effective tool to objectively numerically rank and prioritize projects when faced with numerous projects and multiple competing objectives on a planning basis.

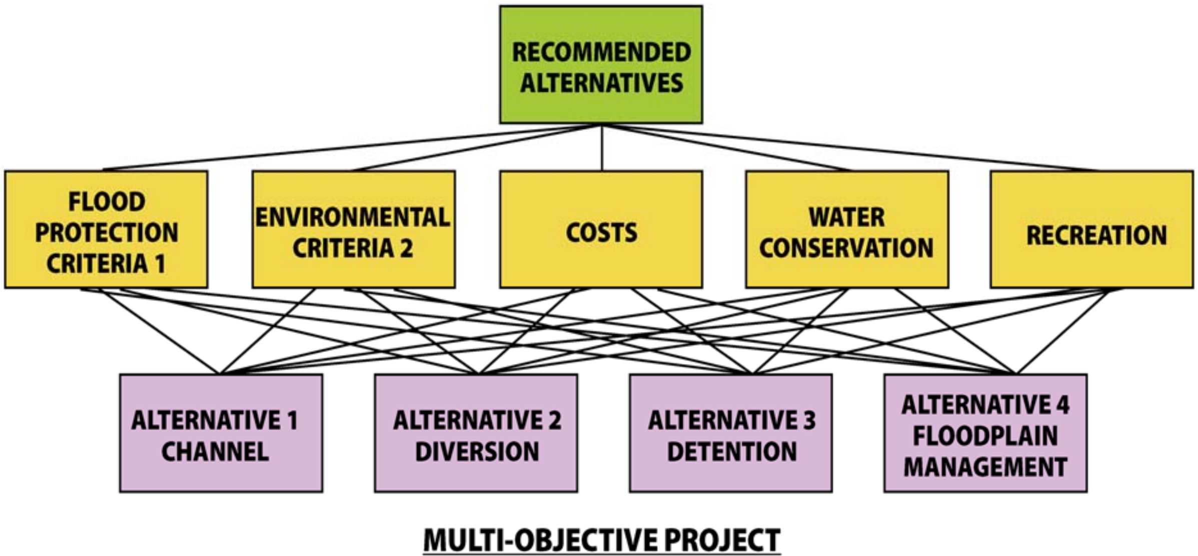


Figure 7-10: Complexity of evaluating multiple projects with different objectives which requires specialized planning tool such as AHP

7.6 Recommended Actions

This study is intended to identify a general framework for the application of an integrated flood management approach throughout the County on a regional basis that will ensure maximizing water resources benefits. General principles and strategies are also provided as guidance to assist in watershed planning. IFM combines land and water resources development in a floodplain, within the context of IRWM with a view to maximize the efficient use of the floodplains and minimize loss of property and life.

Flood management practices have evolved from single purpose projects to a more holistic water resources management approach focusing on a watershed perspective. Using an IFM approach provides significant benefits including high-value multi-benefit projects, which the community can leverage through broader access to funding sources. This report is intended as a "guidance document" to facilitate an integrated water resources approach to flood management. This assessment is based on readily available information to perform planning level risk assessment in order to provide high level recommendations. Based on the findings, the following actions are recommended to advance the use of IFM on a county-wide basis for development of flood management solutions:

1. **Increase collaboration/communication of agencies responsible municipal and regional floodplain management which will increase effectiveness of flood management**
    - Develop framework and process for different level of communication for floodplain managers
    - Provide basis for regional working forum (Watershed/Floodplain Managers Forum) of floodplain managers that allows increased collaboration and future regular meetings
    - Provide basis for a regional work-group forum of floodplain managers and watershed stakeholders that allows increased collaboration and future regular meetings. Utilize existing industry forums or planning groups such as the Floodplain Mangers Association to establish these initial working groups.
2. **Improve understanding and accuracy of regional and local flood risks on a watershed basis**
    - Develop understanding of the different types of flooding from both regional level and local level and include specific flood problems for the different areas as well inventory of common "hot spots" of chronic problems
    - Provide methodology to define the magnitude of flood risks to better prioritize the level of flood risk which integrates potential flood damage
    - Review common recurring flood damage losses and evaluate the sources of these flood problems
3. **Develop regional watershed database to assist in flood management planning that will provide a data exchange of information for all watershed stakeholders as well as sharing of information between public agencies to foster collaboration**
    - Ensure that different watershed stakeholders have access to the different available information and studies being performed
    - Develop community based watershed groups to provide monitoring of floodplains and reduce costs of performing these services while increase the active field database
    - Collect and compile watershed mapping information related to flood hazards and watershed information in a GIS format as well as developing a schema for managing the data to benefit future watershed planning
    - Develop an updated GIS database of all the different flood control and flood management infrastructure
4. **Develop watershed based planning, which includes collaboration with all the different stakeholder groups to minimize conflicts and define specific watershed goals**
    - Develop understanding of the different priority goals of the watershed stakeholders based on the common recurring flooding issues/problems/hazards
    - Involve environmental groups and agencies in the planning process as well as develop an understanding of additional environmental resources
5. **Initiate understanding and awareness of "integrated flood management" (IFM) for agencies and the community**

- Prepare educational material and information on background of IFM to encourage better understanding of the required thought process
- Provide examples of IFM projects to assist in understanding how to apply and the basis of the key planning principles which are different from conventional watershed planning

6. **Identify applicable IFM strategies on a watershed basis that can be utilized within the County to assist agency's understanding on how IFM can be implemented given the nature of the types of flood hazards within the County**
    - Define common types of IFM strategies which integrate different planning principles through different scales (1) watershed level, (2) city level, and (3) neighborhood/local level for the semi-arid climate
    - Develop regional mapping of both opportunities and constraints related to integrated flood management
    - Develop a specialized GIS based tool which assists in the defining locations of IFM projects at a regional scale and can provide maximum multiple benefits and provides method for prioritizing flood management projects
7. **Develop watershed planning guidance program implementing IFM through different land planning regulations and collaboration with agencies during the development planning process**
    - Develop watershed planning process framework with key planning principles for implementing IFM that focuses on linking sustainability, water resource management, and landuse planning to flood management and the entire hydrologic cycle
    - Prepare guidance on integrating "landuse planning" as central element of IFM and define how it can be utilized for different type of floodplain hazards issues
    - Develop overall guidance document that provides stakeholders the basis for watershed planning with IFM

SAN DIEGO
Integrated Regional Water Management

Appendix 7-C:
San Diego IRWM Land Use Planning Study




Land Use and Water Management Study

1 Purpose of Land Use and Water Management Study

As part of the 2013 IRWM Plan Update, the San Diego Region needs to update the discussion of consistency with water management plans, linkages between water management and land use planning, and current relationships between water managers and land use planners. The 2013 IRWM Plan Update will promote the early integration of water management issues into local land use planning, using a watershed-based approach. The purpose of this study is to examine the manner in which integrated land use planning and water resources management occur in the IRWM study area, and to identify ways to improve regional collaboration and coordination between water managers and land use planners in the San Diego Region. Ideally, land use planners and water managers coordinate early and often to make informed, collaborative, and integrated watershed management decisions. In practice, efforts to link water management and land use decisions remain a challenge. Multiple agencies have responsibility for land use and water management decisions, and despite numerous regulatory requirements for both fields, most don't ensure that coordination happens. The relationships are often reactive rather than proactive, due to having to accommodate decisions others have made.

One key objective of the 2013 IRWM Plan Update is the desire for improved relationships between land use planners and water resource managers. Working together, land use planners and water managers can better promote orderly growth and development, and economic and environmental well-being of communities, while ensuring water availability and protecting water resources for the future.

2 Process Used to Prepare the Study

A brief overview of the sequential process used to prepare the Land Use and Water Management Study is presented below. Each step of the process is described in more detail in the following sections.

- *Gap Analysis* – Gaps between water resources management and land use planning were identified. General Plans in the region were reviewed to determine the extent water policy is covered, and the complexity of water resources management as it relates to land use planning was assessed.
- *Surveys* – Surveys were prepared and distributed to land use planners and water managers in the region to determine *the* extent of existing collaboration and coordination between the two groups and to identify preliminary issues and opportunities that affect those relationships.
- *Workshop #1* – Workshop #1 offered the opportunity to present the results of the general plan review (Step 1) and survey results (Step 2) and gather additional input directly from land use planners, water managers, and other interested stakeholders.

- *Key Issues Matrix* – Based on the information gleaned from Steps 1, 2, and 3, preliminary strengths, opportunities, and challenges were identified. This information provided the foundation for development of a Key Issues Matrix, which framed the study's outcomes.
- *Draft Model Water Element* – A draft Model Water Element was prepared as a resource for jurisdictions to use when updating and implementing their general plans.
- *Preliminary Recommendations* – Preliminary recommendations were prepared to improve collaboration and coordination between water managers and land use planners were developed based on input received from the surveys and Workshop #1.
- *Workshop #2* – Workshop #2 provided the opportunity to again bring together water managers, land use planners, and additional stakeholders to review and comment on the draft Model Water Element, and to test, expand, and prioritize the preliminary recommendations discussed in Step 6.
- *Final Documents* – Based on the vetting process from Workshop #2, both the Model Water Element and Recommendations were incorporated and the Key Issues Matrix was completed. (The three documents are presented as attachments to this report.) The study was then forwarded to the RWMG and the final documents were prepared to reflect the RWMG's input.

During development of this study, the RWMG was responsible for overseeing the update of the IRWM plan participated in each of the steps as the study progressed, providing valuable input, attending workshops, and reviewing deliverables.

3 Gap Analysis

This section identifies gaps between water resources management and land use planning. General Plans in the region were reviewed to determine the extent water policy is covered, and the complexity of water resources management as it relates to land use planning was assessed.

3.1 General Plans

California state law requires each city and county to adopt a general plan which expresses the community's development goals, represents public policy relative to the distribution of future land uses, both public and private, and provides a basis for local government decision-making. The general plan also serves to identify the community's land use, circulation, environmental, economic, and social goals and policies as they relate to land use and development. Each general plan must address seven topics or elements: Land Use, Housing, Circulation, Open Space, Conservation, Safety and Noise. Cities are allowed considerable latitude to combine these elements and rename them as appropriate, and to include optional elements.

Water resource related information, including policies, resource inventories, and supply and demand analysis, are typically scattered throughout various chapters of the general plan. Aspects of water policy are typically found in Land Use, Circulation, Open Space, Conservation, and Safety. Water topics may include water supply and demand, water quality, wastewater treatment and disposal, watershed features and processes, flood management, stormwater management, and interagency coordination and collaboration.

For this study, each of the general plans for the 18 cities in San Diego County and the newly adopted San Diego County General Plan were reviewed to determine to what extent water policy is currently addressed, and where there are gaps in water policy in the region. The regional planning agency, San Diego Association of Governments (SANDAG), prepares a Regional Comprehensive Plan (RCP, 2004). The RCP serves as the long-term planning framework for the San Diego region, providing a broad context by which local and regional land use and transportation decisions can be made. The RCP was reviewed to understand the adopted regional land use policy regarding coordinated water resource management.

3.2 Complexity of Water Resource Management in the Region

State law requires coordination between water purveyors and land use planning agencies. State and federal regulators, such as the Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the U.S. Army Corps of Engineers, the State Water Resources Control Board, and the Regional Water Quality Control Board, are significantly involved in water resource protection and enhancement.

Communities are often served by multiple districts and agencies for the different aspects of water management. Water districts, wastewater districts, or private water purveyors serve multiple cities and unincorporated areas with other customers and other planning and reporting requirements. For example, the City of San Diego has its own Water and Wastewater Departments that handle water supply, conveyance, recycled water, wastewater treatment and disposal, and other related issues. In the City of Carlsbad, the Carlsbad Municipal Water District serves as the water purveyor for much of the City; however two different water districts, Vallecitos Water District and Olivenhain Municipal Water District, serve the southern portion of the City. Carlsbad's wastewater services are provided by the City's Wastewater Department, plus the Vallecitos Water District and Leucadia Wastewater District, in the southern portion of the city. This complexity is not uncommon in the region.

When municipalities or the County are considering annexations, the San Diego Local Agency Formation Commission (LAFCO) is charged with providing assistance in overseeing jurisdictional boundary changes. LAFCO has county-wide jurisdiction, but is independent of county government. LAFCO requires the preparation of Municipal Service Reviews (MSR's), which are reports required to address the coordination between growth and population projections and the present and planned capacity and adequacy of public services, including water and sewer service. MSR's also require agencies to demonstrate the financial ability to provide services.

3.3 Water Resources Plans

Water resources plans in the region were inventoried to further understand the complexity of water resources management in San Diego County. A broad spectrum of plans prepared at different times was found, including but not limited to:

- Urban Water Management Plans
- Groundwater Management Plans
- Water and Wastewater Master Plans
- Recycled Water Master Plans
- Watershed Urban Runoff Management Plans
- Floodplain Master Plans
- Watershed Management Plans
- Lagoon Resource Enhancement Plans

- Water Supply Assessments
- Habitat Conservation Plans

3.4 Findings/Outcomes of Gap Analysis:

Review of the region's general plans and water resources plans revealed the following:

- A large range was found between the dates the general plans were prepared. Some were prepared as long ago as the 1970's, while other cities have recently updated their general plans. The plans that are more current were found to address recent legislation and featured more robust water policy.
- None of the general plans in San Diego County feature a self-contained Water Element; rather, each features water policy addressed in at least two or more sections of the plan.
- General Plans for communities expecting new growth tended to include water policy guiding new development. Those communities considered built-out tend to focus on water policy intended to address redevelopment.
- Natural features vary substantially among cities, which affects the issues addressed in general plans. Coastal cities tend to have much more robust policy addressing such issues as stormwater runoff, lagoon preservation, and coastal bluff erosion. Some of the inland cities have rivers or creeks passing through their communities and have associated policies, such as to open up previously channelized sections, address flooding issues, and a desire to redevelop with a focus on the river or creek as an amenity.
- Some cities find their local land use control limited by water-related issues under the jurisdiction of State and Federal responsible agencies such as U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and the California Department of Fish and Game.
- Considerable variation exists in the "strength" of long-range water policy. The general plans adopted in the last twelve years tend to feature more detailed policy language with specific direction, likely attributable to both the growing awareness of the importance of water to the region and state's future and to the adoption of water supply planning legislation. In 2001, Senate Bills 610 and 221 were enacted requiring greater coordination and more extensive data to be shared between water suppliers and local land use agencies for large development projects and land use plans. Some of the older general plans' water policy is weak in comparison. A few examples follow:
    - Strong general plan policy language: "Policy 3.1: Work with the Vista Irrigation District (VID) to reduce per capita water consumption, increase the use of recycled water, and implement, enhance, or promote programs to educate the community about the importance of water conservation and methods to reduce water use."
    - Weak general plan policy language: "Plan for an adequate water system based on the projected needs of the City."
- Responsibility for water management tasks within land use planning departments varies considerably from agency to agency:
    - Some Planning Departments do both long-range planning and development review in one department.
    - Some land use planners only deal with their municipal water and wastewater departments, and some coordinate with multiple water purveyors and wastewater managers within their boundaries.

- o Sometimes it is the City Engineering Department that primarily works with water managers.
- o Many of the region's water purveyors were originally formed to serve the needs of agricultural uses, and the boundaries now overlap multiple jurisdictions.

4 Surveys

The methodology used to survey the regions' land use planners and water managers is discussed in this section. The surveys were used to determine the extent of existing collaboration and coordination between the two groups and to identify preliminary issues and opportunities that affect those relationships.

An objective of the 2013 IRWM Plan Update is to develop recommendations to improve collaboration, coordination, and communication between water resources mangers and local land-use planners to more effectively manage water resources in our Region. The first step was to explore and characterize the nature of the existing relationships from the perspectives of water resources managers and land use planning professionals. One of the methods used to collect and evaluate the information was surveying those persons most likely to be responsible for developing and/or implementing land use and water resource plans. Two surveys were prepared—one for water resources managers and one for land use planning managers. The primary objectives of the surveys were to: 1) characterize the nature of existing relationships, including what was working well and what areas needed improvement; and 2) identify opportunities for increased collaboration, coordination, and communication. The topic areas explored in the surveys are summarized below.

4.1 Key Survey Topic Areas:

- Identification of the degree of awareness of the IRWM Program and its implementation.
- Input regarding perception of the scale of issues—that is, does water resources management require regional, local, or both levels of collaboration and coordination to be effective?
- Characterization of the nature of the existing relationships and identification of what impediments exist to ongoing, proactive relationships.
- Description of the type and degree of coordination that currently occur between water resources managers and land use planners regarding a variety of plans and projects. (For example, do water resources managers review and provide policy and/or technical input on development review projects, specific plans, general plan updates, etc.? Are land use planners involved in providing demographic projections to water resources managers? Do they get involved in review and/or policy input regarding long-range water resource assessment and management plans? Is the current level of collaboration adequate?)
- Examples of types of collaborative policy/implementation projects that currently occur.
- Suggestions for potential opportunities to improve collaboration, coordination, and communication.

The surveys were prepared using SurveyMonkey ™ and were available on-line from April 9 to April 30, 2012. Invitations to complete the surveys were emailed to a total of 44 people (21 land use planners and 23 water managers). Follow-up emails and telephone calls were made to encourage participation. A total of 14 responses were received: six from water resources managers (26% response) and eight from planners (38%).

5 Workshop #1

Results of the general plan review and survey were presented at Workshop #1, and additional input was gathered directly from land use planners, water managers, and other interested stakeholders.

Workshop #1 was held on May 2, 2012 at the San Diego Gas and Electric Energy Innovation Center. Water resource managers and land use planners as well as a broad range of stakeholders interested in the IRWM process were invited to participate. A total of 30 people attended. The purpose of Workshop #1 was to:

- Introduce and/or increase awareness of the Integrated Regional Water Management (IRWM) program and the 2013 San Diego IRWM Plan;
- Receive input regarding the current relationships between land use and water managers in the San Diego region;
- Identify issues and opportunities;
- Identify methods to increase collaboration and coordination regarding land use and water resources planning and decision-making; and
- Identify methods to better align water and land use planning processes.

An overview of regional planning in San Diego County was provided, and findings of the General Plan review were presented. Workshop participants shared their observations regarding General Plans.

The results of the surveys distributed to both land use planners and water managers in the region prior to the workshop were discussed. The surveys were designed to examine both the current extent to which land use planners and water resources managers coordinate, and where the weaknesses exist. A list of preliminary observations regarding the strengths, opportunities, and challenges relating to current relationships was presented and participants offered their views.

In breakout groups, participants thoughtfully provided comments and ideas regarding the following three topics:

Breakout Group #1: Where are the “disconnects” between land use planning and water management planning? How can these planning processes be better aligned to address the “disconnects”?

Breakout Group #2: What water management policy guidance is needed for land use planners? When should this guidance be implemented within the land use process? Where does water management policy guidance already exist?

Breakout Group #3: How can we improve communication and collaboration among land use planning and water management planning (agencies/staff)?

Following the breakout group portion of the workshop, each group reported out to the other workshop participants so that everyone would have the benefit of hearing each group's ideas and all perspectives could be shared.

6 Relationships between Land Use Planners and Water Managers

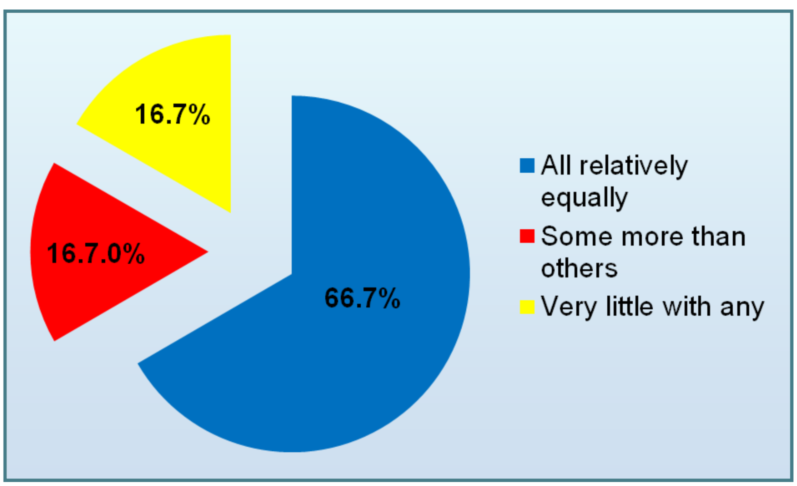
An important aspect of the 2013 IRWM Plan Update is to characterize the nature of existing relationships and coordination between land use planners and water resources managers in the San Diego region. The intent of this characterization, which is summarized in Step 4, is to: 1) identify strengths, opportunities, and challenges, including where gaps currently exist, and 2) help develop methods to overcome existing impediments to build proactive communication and collaboration between land use planners and water managers in all relevant aspects of each entity's planning, management, and implementation processes. Step 4 also provided the basis for preparation of an Issues Matrix (see Attachment 3), and informed refinement of the model water resources general plan policies (see Step 5 and Attachment 1) and development of recommendations (see Step 6 and Attachment 2).

Developing a generalized characterization of the relationship between land use planners and water managers in the San Diego Region is challenging because the nature of the relationships vary greatly in the degree of coordination, the type of water resource involved, and the level at which coordination occurs. For example, while all land use planners who responded to the survey reported collaborating with water resources managers regarding flood management and control, less than half reported coordinating regarding watershed protection. In spite of these constraints, the relationships can be described by evaluating the information gleaned in Steps 1 – 3, which are summarized in this section and include: results of several survey questions; a list of strengths, opportunities, and challenges regarding the relationships; and specific examples of current relationships at both the local and regional levels.

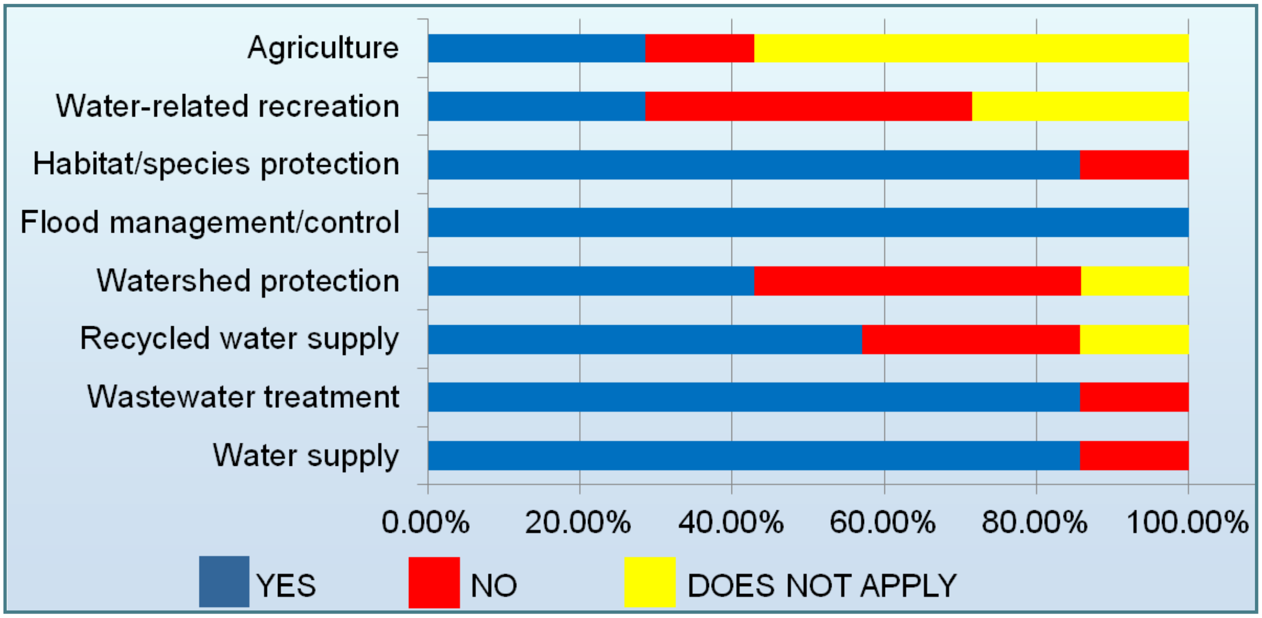
6.1 Selected Survey Questions:

Several of the survey questions depict a generalized description of the existing nature of the relationships and impediments to achieving more proactive relationships.

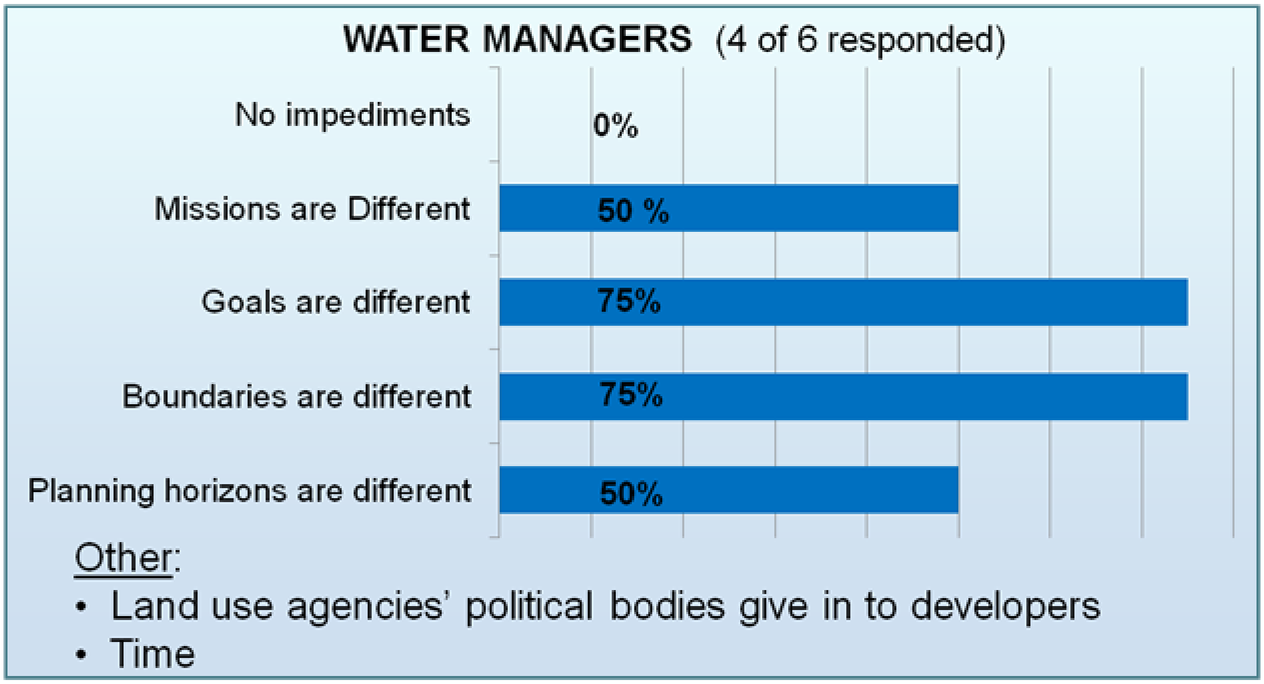
6.1.1 Does your water agency have working relationships with planning/community development departments in your jurisdiction? (6 water agencies responded to this question.)

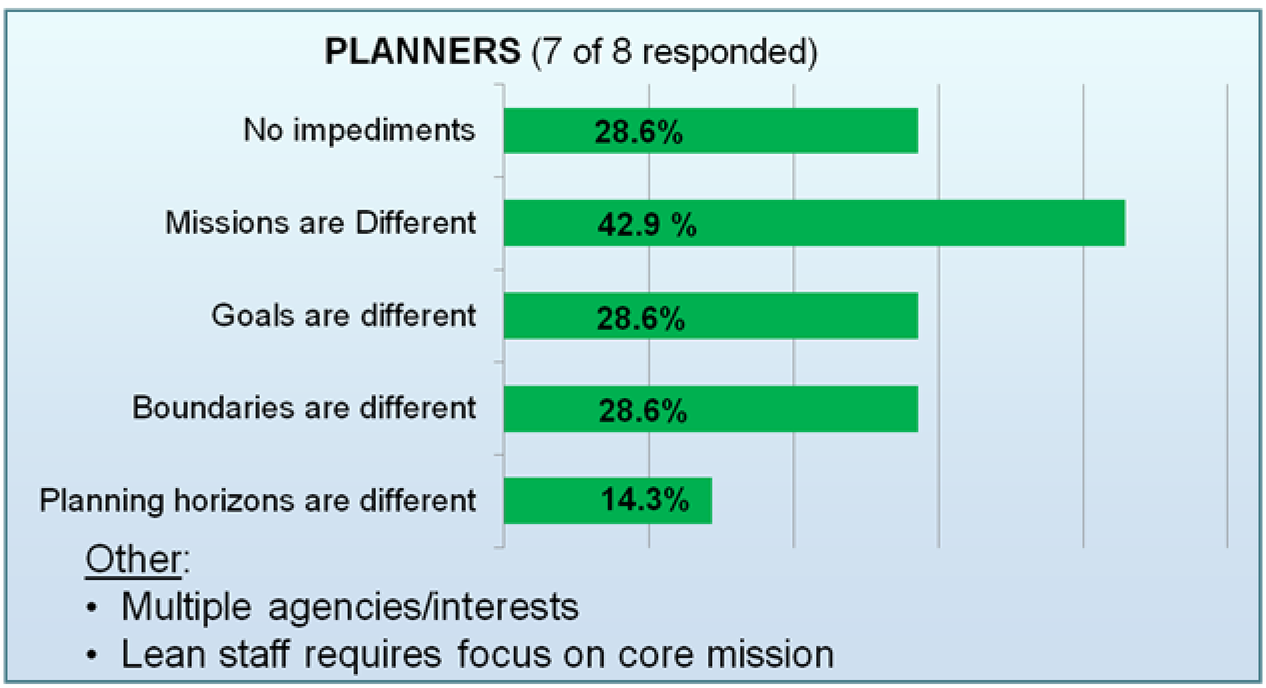


6.1.2 Does your planning/community development department have working relationships with water resources agencies/staff? (7 planning agencies responded to this question.)



6.1.3 What are impediments to achieving ongoing, proactive relationships with each other's agencies?





7 Strengths, Opportunities, and Challenges

The following strengths, opportunities, and challenges represent a compilation of input received from Steps 1, 2, and 3 (described above). Taken together, they provide a more detailed description of the existing nature of the relationships between land use planners and water resources managers.

7.1 Strengths:

- Coordination regarding development review is already occurring regularly.
- Most planners updating their general plans consult with water agencies to provide input into their long-range land use plans.
- Majority of water and planning agencies report that water agencies request data from land use planners for updates of their long range and master plans.
- One water resources agency reports that it uses the general plans from the land use agencies in its jurisdiction for its own plan update.
- Most planning and water agencies report working together on joint policy/implementation efforts, including the following:
  - Water conservation information/programs, communications
  - Water conservation issues, policies
  - Model water ordinance
  - Water efficient landscaping ordinances
  - Use of recycled water for parks
  - Landscape Manual Update
  - General Plan update/General Plan policies
  - Low Impact Development Guidelines
  - Coordination of joint capital improvement work
- Urban Water Management Plans are prepared by water districts in coordination with land use projections from the municipalities.
- Land use planners from several of the local cities and water managers from local jurisdictions and water districts participated in both Workshops #1 and #2, held as part of this effort.

7.2 Opportunities:

- The majority of water resources managers and planners report that it would be beneficial to have:
  - Joint training sessions to improve information exchange regarding long-range planning, legislation, and best management practices.
  - Cross training and joint activities that allow land use planners and water managers to explore improved integration of various land use and water resources plans, process, and projects at the regional, local, and watershed levels. These activities would be most beneficial at the local level.

- Planners report being more likely to be responsible for implementation of water-resource related goals / objectives / policies / programs in their general plans (than other departments).
- Most agencies report that a set of water resources goals / objectives / policies for the region would be beneficial.
- Legislation calls for more interaction between land use planners and water managers, which is needed at a variety of levels.

7.3 Challenges:

- Too many silos exist and there is reluctance to give up authority, both political and financial. Silos need to be broken down between water and land use disciplines and agencies and relationships need to be built or strengthened; this should be guided by the top leaderships of the agencies. To break down silos, persistence is needed. It is a time-consuming and challenging process given the extreme complexity of the current system. Who should take the custodial role of this process?
- Awareness and understanding of both issues and processes is lacking between water managers and land use planners.
- Water resources and land use plans, policies, and implementing projects and programs must be better integrated; a framework is needed upon which to build the integration. However, a "one size fits all" approach will not be effective. Some specific examples of this challenge were cited:
  - Long-term water supply verification is difficult for everyone. Who decides?
  - No one ever discusses what land uses should be allowed from a stormwater viewpoint. Stormwater managers should be part of the land use discussion process.
  - TMDL compliance is typically in conflict with new development.
  - Common terminology is needed.
  - Regulations drive the focus of attention.
- Decision-making by municipalities typically does not consider potential impacts beyond their political boundaries.
- The information regarding the various agencies, plans, laws, etc. that applies to municipalities and water agencies is not readily available, and there is so much to try to identify that land use planners often do not know where to start looking.
- 100% of land use planners who responded to the survey were not aware of the IRWM, even though it has been in existence for 5 years.
- Many general plans do not address the broad spectrum of water management topics, and water policies are often generic and/or vague.
- Addressing water rights with tribes is a challenge.
- Staffs of both municipalities and water agencies often do not have the resources (funds and/or time) to take on extra projects or prepare plans, ordinances, and information for communities beyond those prioritized by their councils/boards/commissions.

7.4 Examples of Existing Relationships

The following describes specific examples of current relationships between land use planners and water resources managers, both on a regional scale and on a local scale. The San Diego County Water Authority (CWA) is an advisory member of SANDAG's Board of Directors, and in 1992, entered into a Memorandum of Agreement (MOA) with SANDAG to coordinate to ensure the availability of water for future growth. Under the MOA, the CWA agrees to use SANDAG's most recent regional growth forecasts for regional water supply planning purposes, provide updated information on changes in plans or programs, and implement relevant actions contained in the water element of the Regional Growth Management Strategy. The MOA ensures that the water demand projections for the San Diego region are linked with SANDAG's growth forecasts and that water supply is a component of the overall growth management strategy. CWA is a member of SANDAG's Regional Planning Technical Working Group, and CWA staff participates in review of the periodic updates to SANDAG's region-wide population forecasts.

A local example of collaboration between land use planners and water managers is water conservation information sharing between the City of La Mesa and Helix Water District. La Mesa residents can easily access a range of water conservation methods and programs offered by Helix Water District from the City's website home page. One of the selections is "water conservation", which links the resident directly to Helix Water District's website listing landscape watering conservation measures, water conservation programs for single-family, multi-family and commercial customers, free landscape plans, water budgets, and other similar helpful informational items.

The region's cities coordinate with their water purveyors when updating their general plans. Helix Water District was consulted to provide input into La Mesa's recent General Plan Update. The General Plan now contains a policy to "encourage development that incorporates water recycling subject to review and approval of the local water purveyor (Helix Water District)," (La Mesa GP, Policy CS-1.3.2) signifying the intent to continue to collaborate on a long-term basis.

8 Draft Model Water Resources General Plan Policy Guide

The need for comprehensive general plan guidance for water resources was identified at the outset of the project. The gap analysis showed that the region's general plans vary widely in terms of the type and strength of adopted water policy. Several of the plans have been recently updated and some are relatively old and in need of updating. The analysis indicated that the newer plans tend to have a broader range of water-related topics addressed, a higher number of more specific policies, and stronger language.

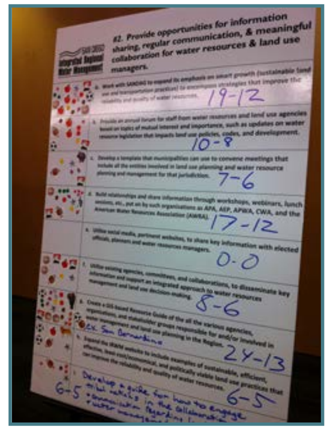
A draft Model Water Resources General Plan Policy Guide (model goals and policies) was developed for jurisdictions to use when updating and implementing their general plans (Attachment 1). The model water policy document is organized around the four IRWM goals. A watershed-based approach using the Ahwahnee Water Principles as a guide was employed to develop the model policy guidance. It showcases policies from recently updated San Diego County general plans, other California general plans and new policy crafted as a result of stakeholder input.

The model water policy document is designed as a reference document for jurisdictions to use when updating or amending their general plans. If desired, a city or county could adopt a stand-alone Water Element. The model policies suggest a format for such an effort. While policy addressing water resources is typically found in other places in a city's General Plan, i.e. land use, circulation, conservation, open space and safety, an integrated water element might be of benefit to a community. By having all water-related policies and actions in one place, the complex issues surrounding water resources are more accessible and understandable to the general public. Imperial County, for example, developed an integrated water element that combines water supply, quality, flood management, wastewater and stormwater policies and analysis into a single general plan element.

The draft water resources general plan policies were reviewed at Workshop #2, and were subsequently revised and refined based on participants' input.

9 Draft Recommendations for Improved Collaboration and Coordination

One of the key objectives of the 2013 IRWM Plan Update is to develop and prioritize a list of recommendations that could be implemented by the IRWM Program to improve communication between water resources and land use planners. The recommendations could be implemented through a variety of methods, including grants, new or existing working groups and collaborations, preparation of work products, such as model ordinances and guidelines, and development and dissemination of information.



Preliminary recommendations were developed in response to input derived from the surveys and suggestions received at Land Use Workshop #1 (May 12, 2012). They were organized into two general categories: 1) collaborative work products and 2) opportunities for information sharing, regular communication, and meaningful collaboration. The preliminary recommendations were discussed at Land Use Workshop #2 (August 21, 2012), at which time participants both refined and added recommendations – see the discussion below and reference to the final recommendations.

10 Workshop #2

Workshop #2 was held on August 21, 2012 at the San Diego Gas and Electric Energy Innovation Center. Approximately 22 people attended. The purpose of Workshop #2 was twofold: 1) to review the draft Model Water Resources General Plan Policy Guide and provide feedback, and 2) to receive input regarding the draft recommendations discussed in Step 6 above and prioritize the recommendations.

Participants worked in groups to review the model water policy document. Each group was assigned one of the three goals with associated policy and asked to evaluate whether the list of topics was complete; provide suggestions for additions, deletions, and/or revisions; and whether language pertaining to specific cities should be included as sample policy or should all policies be presented as more generic?

The draft recommendations were presented and the participants added to the list. The final list of recommendations was then prioritized by the participants. Each participant was given a total of 14 stickers—7 for each of the two categories. They were allowed to place as many stickers on each item as they desired. The method used to prioritize them indicated both the total number of votes each recommendation received as well as the number of individuals who voted for each one.

11 Conclusion and Outcomes

This study examined the existing relationships between land use planning and water resource management in the San Diego region, both processes and working relationships. Through an iterative process, the positive aspects, issues, and opportunities for strengthening these relationships was identified.

Three work products represent the outcome of the study:

1. A **Model Water Resources General Plan Policy Guide** was prepared to serve as a guide to local jurisdictions as they update their general plans. The model policy suggests a broad range of water resources policy topics for inclusion in the region's general plans, and promotes interagency cooperation. (See Attachment #1)

2. **Recommendations** for improved collaboration and coordination between land use planners and water resource managers were developed and prioritized by those participating in the process. The recommendations, implemented over time are intended to improve the way the San Diego region practices integrated land use and water management. (See Attachment #2).

3. The **Key Issues Matrix** was completed based on input derived from Steps 1-7. (See Attachment #3)

Two workshops highlighted this effort. A diverse group of stakeholders with a common interest in land use and water resource management participated in the development and refinement of both the model policy guide and the recommendations. In addition to providing a forum for information sharing and feedback, a secondary but very important outcome of the workshops was to begin the process of regional collaboration and coordination between water resources managers and land use planners.

Attachment #1

Model Water Resources General Plan Policy Guide:

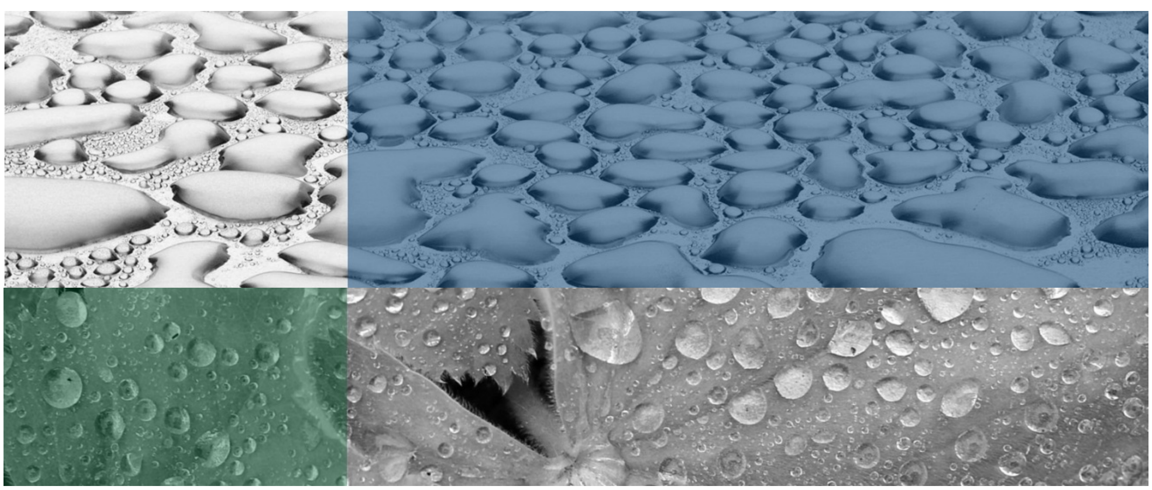
General Plan Goals and Policies for Integrated Water Resource Management

SAN DIEGO
Integrated Regional
Water Management

MODEL WATER RESOURCES GENERAL PLAN POLICY GUIDE:

General Plan Goals and Policies for Integrated Water Resource Management

Prepared for the San Diego County Water Authority, City of San Diego, and County of San Diego



Prepared by CityPlace Planning, Inc.

in association with RMC Water and Environment

Introduction

The Model Water Resources General Plan Policy Guide is designed to serve as a helpful resource for municipalities within the San Diego IRWM Plan Region. It can be used by local governments when updating or amending their general plans to ensure the wide range of water resource topics are addressed as part of land use decision-making processes.

The goals and policies below provide an outline for a stand-alone Water Element, or they can be used throughout various general plan elements, such as the Land Use, Conservation, or Safety Element. Not all the policies listed below will be appropriate for all General Plans. Instead, this document serves as a "smorgasbord" from which municipalities may select policies that are relevant to their circumstances and issues. Depending on individual conditions and the priorities of decision-makers, some goals and topic areas will likely be given more attention than others.

Users of this Model Water Resources Policy Guide may find it more appropriate to tailor the goals and policies to better address their particular circumstances. The policies may be broken into smaller units, combined, or expanded as applicable.

The document is structured around the four IRWM plan goals:

1. Optimize water supply reliability
2. Protect and enhance water quality
3. Provide stewardship of our natural resources
4. Coordinate and integrate water resource management

The policies associated with each goal were chosen from recently updated general plans of cities in San Diego County and the County of San Diego. Additional examples from other cities and counties in California were included where appropriate, and some extra policies were crafted.

Note that these are actual policies that have not been revised to make them generic. Each of the associated general plans can also serve as a further resource for users of this guide.

1. Optimize Water Supply Reliability.

1. Optimize Water Supply Reliability. The intention of this goal is to ensure the reliability and most efficient use of water supplies to meet future needs. Efficiency of water use is really a combination of reducing demand on existing supplies, leading to an increase in local water supply as well as developing new supply options. Water use efficiency should be increased through indoor and outdoor water conservation, recycling of municipal wastewater, reuse of household graywater, and capture and/or infiltration of stormwater. A combination of sustainable water supply options should be employed to achieve reliability.

1.1. Water Supply Planning. These policies address water supply and demand for a variety of uses. Some municipalities combine water supply policies with those to increase efficiency of use into a single policy.

1.1.1 Pursue the following strategies to foster sustainable patterns of growth and water use:

a. Work with water suppliers to identify water requirements needed for future growth;

b. Identify the development, improvement, timing, and location of new water and drainage facilities, to the extent feasible;

c. Use native vegetation or drought tolerant landscaping for public facilities and other large installation;

d. Promote the expansion of recycled water line infrastructure; and

e. Support the development of integrated growth and water supply impact scenarios to the extent feasible. (City of Encinitas Draft General Plan 2035)

1.1.2 Prepare, implement, and maintain long-term, comprehensive water supply plans and options in cooperation with the appropriate state and federal agencies, regional authorities, water utilities, and local governments. (City of San Diego)

1.1.3 Maintain a comprehensive, long-range water resource management plan that provides for appropriate management of all sources of water available to the planning area and ensures that sufficient and sustainable water supplies of good quality will be economically available to accommodate existing and planned urban development. (City of Fresno)

1.1.4 Promote the development and future use of desalinated water to improve local drinking water supply reliability. (New)

1.1.5 Consider future climate scenarios in water supply analyses for future development projects to ensure that an adequate supply will be available. (From City of Saint Helena General Plan Update Background Working Paper)

1.1.6 To the extent of the City's authority, strongly encourage water provides to conduct an evaluation of the water infrastructure based on current (fire) code standards with special emphasis on the upslope wildland-urban interface area. Results from the evaluation should disclose deficiencies (differences between current code and existing conditions). During the planning period, a method should be developed and initiated to correct identified deficiencies. (City of La Cañada Flintridge)

1.2. Water-Use Efficiency. These policies will help with reducing the daily demand for water by promoting conservation measures. They address procedures and actions local government can implement for city operations and promote or mandate for private sector development.

1.2.1 Work with the Vista Irrigation District (VID) to reduce per capita water consumption, increase the use of recycled water, and implement, enhance or promote programs to educate the community about the importance of water conservation and methods to reduce water use. (City of Vista General Plan)

1.2.2 Adopt and implement a comprehensive strategy to reduce the reliance of local water users on imported water by increasing water conservation and the use of recycled water, and by exploring local water resources. (City of Encinitas Draft General Plan)

1.2.3 Promote the use of green building practices and "low impact development" in new and existing development to reduce the use of potable water. (City of National City General Plan)

1.2.4 Support the continued use of graduated rate structures by water suppliers in order to promote water conservation. (City of Chula Vista General Plan)

1.2.5 Incorporate water conservation techniques, such as groundwater recharge basins, use of porous pavement, drought-tolerant landscaping, and water recycling, as appropriate. Require that new development utilize drought-tolerant landscaping and incorporate adequate drought-conscious irrigation systems. (County of Riverside General Plan)

1.2.6 Develop and institute a City-sponsored program of mandatory water conservation measures for new development. Develop a program for existing developments based on a voluntary participation with incentives to achieve specific targets for water conservation, including such elements as:

a. Ultra-low flush toilets;
b. Plumbing retrofits;
c. Leak detection;
d. Efficiency standards for water-using appliances and irrigation devices, and industrial and commercial processes;
e. Graywater use;
f. Swimming pool and spa conservation measures such as covers to reduce evaporation; and
g. Xeriscape landscape design standards. (City of Livermore General Plan)

1.2.7 Implement conservation incentive programs that increase water-use efficiency and reduce urban runoff:

a. Develop a response plan to assist citizens in reducing water use during periods of water shortages and emergencies.

b. Encourage local water agencies to use state-mandated powers to enforce conservation measures that eliminate or penalize wasteful uses of water.

c. Explore alternative conservation measures and technology as they become available.

d. Develop and expand water-efficient landscaping to include urban forestry, urban vegetation, and demonstration projects. (City of San Diego General Plan)

1.2.8 Identify a reliable water source to protect and enhance the City's urban forests. (From IRWM Land Use and Water Management Study Input)

1.3. Groundwater Supplies. Common land use activities can pose a threat to groundwater quality, such as underground storage tanks, laundries and drycleaners, and certain agricultural practices. Excessive extraction of groundwater by certain uses can result in unexpected shortages. These policies address the use and management of groundwater supplies.

1.3.1 Develop potential groundwater resources and storage capacity, combined with management of surface water in groundwater basins, to meet overall water supply and resource management objectives. (City of San Diego General Plan)

1.3.2 Protect the sustainability of groundwater resources. (City of Escondido General Plan)

1.3.3 Institute effective measures to protect groundwater quality from potential adverse effects of increased pumping or potential sources of contamination. (County of Shasta General Plan)

1.3.4 Protect natural groundwater recharge areas and artificial spreading grounds and increase the storage of water underground for future use. (County of Los Angeles General Plan)

1.4. Recycling and Reuse of Water Supplies. These policies address the reuse of treated wastewater for beneficial uses.

1.4.1 Work with water purveyors to expand opportunities for the use of recycled water for activities such as outdoor irrigation, toilet flushing, fire hydrants, commercial and industrial processes, carwashes, concrete batching, laundromats, dust control, parks, golf courses, other landscaped areas, and other appropriate water-intensive areas. (City of San Marcos General Plan)

1.4.2 It is the policy of the City that recycled water be used for any purposes approved for recycled water use, when it is economically, technically and institutionally feasible. Recycled water shall be the primary source of supply for commercial and industrial uses, whenever available and/or feasible. Use of potable water for commercial and industrial uses shall be contrary to city policy; shall not be considered the most beneficial use of a natural resource;

and shall be avoided to the maximum extent possible. (City of Chino General Plan)

1.4.3 Encourage graywater systems, roof catchment of rainwater, and other methods of reusing water and minimizing the need to use groundwater. (County of Sonoma General Plan)

1.5. Stormwater Supplies. These policies promote the use of stormwater as a source of water supply and encourage the use of creative methods for stormwater capture and/or infiltration.

1.5.1 Require the incorporation of Low Impact Development (LID) techniques in accordance with current stormwater regulations to manage stormwater and urban runoff, reduce runoff and pollution, and assist in maintaining or restoring the natural hydrology of the site. Examples of LID techniques include, but are not limited to the following:

a. Use permeable paving or pavers for sidewalks and parking areas instead of impervious material, such as concrete and asphalt.
b. Incorporate bioretention facilities, such as cells (small-scale shallow vegetated depressions), bioswales (linear bioretention features that may mimic natural stream channels), tree box filters (stand-alone or connected mini-bioretention areas that are installed beneath trees), and other bioretention features in site design for development projects and subdivisions.
c. Utilize rain barrels and cisterns to manage rooftop runoff and/or utilize rooftop runoff to provide water for irrigating lawns and gardens.
d. Install street trees in stand-alone or connected tree box filters. (City of Vista General Plan)

1.5.2 Maximize the amount of runoff directed to permeable areas and/or maximize stormwater storage for reuse or infiltration by such means as:

a. Using cisterns, retention structures or green rooftops to store precipitation or runoff for reuse.
b. Grading the site to divert flow to permeable areas.
c. Orienting roof runoff towards permeable surfaces, drywells, French drains or other structural BMP's rather than directly to driveways or non-permeable surfaces so that runoff will penetrate into the ground instead of flowing off-site. (Santa Monica Municipal Code)

2. Protect and enhance water quality. Since land use development can significantly impact both water quality and watershed quality, the following water policies are intended to mitigate development impacts, and protect and improve the quality of water for all beneficial uses. These policies should also be linked to water supply and watershed protection policies.

2.1 Stormwater management. Stormwater management requires regional and site-scale policies. These water quality policies should be linked to watershed protection policies. Treated stormwater can also be considered as a local supply source.

2.1.1 In designing water, wastewater, and drainage facilities, limit the disruption of natural landforms and water bodies. Encourage the use of natural channels that simulate natural drainage ways while protecting property. (City of Chula Vista General Plan)

2.1.2 Plan and design drainage facilities, and upgrade existing facilities, as necessary, to meet current needs, accommodate growth, and satisfy state and federal requirements. (City of Chula Vista General Plan)

2.1.3 For new development, require on-site detention of storm water flows. Slow runoff and maximize on-site infiltration of runoff. (City of Chula Vista General Plan)

2.1.4 Assure that drainage facilities in new development incorporate stormwater runoff and sediment control. (City of Chula Vista General Plan)

2.1.5 Ensure that any alterations of the natural floodplain, stream channels, and natural protective barriers do not impede or unnaturally redirect floodwaters, increase fold hazards in other areas, or result in increased flood damage. (City of Vista General Plan)

2.1.6 Evaluate and make improvements to inadequate storm drain systems, including channels, drains, catch basins, pipes, and inlets, to ensure capacity for maximum runoff flows. (City of Vista General Plan)

2.1.7 Require incorporation of design features that reduce the amount of impervious surface (e.g., paved areas) within new public and private developments, consistent with the San Diego Regional Water Quality Control Board standards and the City's Jurisdictional Urban Runoff Management Plan. (City of Vista General Plan)

2.1.8 Reduce the discharge of pollutants into the storm drain system from existing municipal, industrial, and commercial facilities and residential areas to the maximum extent feasible. (City of Santee General Plan)

2.1.9 Regulate discharge from industrial users and use of agricultural chemicals (pesticides, herbicides, fertilizers, etc.) in accordance with local and State regulations to protect the city's natural water bodies. (City of Escondido General Plan)

2.1.10 Encourage the use of mulch and compost in lieu of chemical fertilizers to improve water quality. (City of La Mesa General Plan)

2.1.11 Control encroachments into wetlands and designated floodways to protect the community's water resources. (City of Escondido General Plan)

2.1.12 Require new development to protect the quality of water resources and natural drainage systems through site design and use of source controls, stormwater treatment, runoff reduction measures, best management practices, and Low Impact Development measures. (City of Escondido General Plan)

2.1.13 Require development projects to avoid impacts to the water quality in local reservoirs, groundwater resources, and recharge areas, watersheds, and other local water sources. (County of San Diego General Plan)

2.1.14 Encourage coordination between land use planning, site design, and stormwater pollution control. (City of Livermore General Plan)

2.1.15 For existing landscapes, runoff, low-head drainage, overspray or other similar conditions where water flows onto adjacent property, non-irrigated areas, walks, roadways or structures shall be prohibited. (City of Palm Desert General Plan)

2.1.16 Design and site development to minimize lot coverage and impervious surfaces, limit post development runoff to pre-development volumes, and incorporate storm drainage facilities that reduce urban runoff pollutants to the maximum extent possible. (City of Santa Cruz General Plan)

2.1.17 Where feasible, direct runoff from rooftops and other areas to drywells. Require low-flow velocity, vegetated open channels, area drains incorporating grease and sediment traps, groundwater recharge facilities and detention ponds directly connected to impervious areas. (City of Santa Cruz General Plan)

2.1.18 Develop and implement a citywide Jurisdictional Urban Runoff Management Program (JURMP) to protect and improve the quality of urban runoff and stormwater discharging to local water bodies (Pacific Ocean and beaches of Encinitas, Batiquitos Lagoon and San Elijo Lagoon; Cottonwood Creek, Escondido Creek and Encinitas Creek and their tributaries). (City of Encinitas Draft General Plan)

2.1.20 Continue to use and update best practices for stormwater management as they improve over time. (From IRWM Land Use and Water Management Study Input)

2.2 Groundwater quality. These policies are intended to assure and protect the quality of groundwater resources, and are related to stormwater quality, groundwater supply, and watershed protection.

2.2.1 Require new development to preserve areas that provide opportunities for groundwater recharge (i.e. areas where substantial surface water infiltrates into the groundwater), stormwater management, and water quality benefits. (City of Escondido General Plan)

2.2.2 Protect Escondido's shallow groundwater basin from contamination by regulating stormwater collection and conveyance to ensure pollutants in runoff have been reduced to the maximum extent practicable. (City of Escondido General Plan)

2.2.3 Actively pursue the abatement of failing septic systems that have been demonstrated as causing a health/safety hazard. (Sonoma County)

2.2.4 Require land uses with a high potential to contaminate groundwater to take appropriate measures to protect water supply sources. Potential sources of groundwater contamination include, but are not limited to, landfills, fertilizer, pesticides, manure storage and sales, petroleum product storage tanks, manufacturing plants and on-site wastewater treatment systems. (County of San Diego General Plan)

3. Provide Stewardship of our Natural Resources.

The intent of this goal is to minimize impacts from development and preserve the health of the planning area's watersheds to ensure sustainable water supplies, reduce flood risks, and protect important natural areas and ecological systems. The policies below address how and where development should occur within a watershed. Some use smart growth techniques to promote compact, walkable community design with mixed uses, a well-connected street network and a range of transportation options.

3.1 Compact Development. These policies can minimize the impact of development by reducing the size of the community's footprint, promoting a mix of land uses, and allowing for watershed preservation. Carefully designed compact development can result in increased stewardship of the environment. Multi-modal transportation options can reduce the need for new streets and reduce water pollution from cars.

3.1.1 Design an interconnected street network within and between communities, which includes pedestrian and bicycle access, while minimizing landform impacts. (City of San Diego General Plan)

3.1.2 Intensify development at key nodes to promote compact, integrated, mixed-use development that is pedestrian- and transit-supportive. (City of Vista General Plan)

3.1.3 Support innovative site design techniques such as cluster-type housing and transfer-of-development-rights to preserve sensitive environmental resources and to allow development projects to comply with the city's Habitat Management Plan. (City of Carlsbad General Plan)

3.1.4 Provide incentives for both compact and transit-oriented development, such as a parking reduction consistent with regional standards, for more intense development and higher density residential uses along major transportation corridors or in areas accessible to transit use. (City of La Mesa General Plan)

3.1.5 Encourage information sharing among developers concerning smart growth designs that protect water resources. (U.S. EPA, Protecting Water Resources with Smart Growth, publication number EPA 231-R-04-002)

3.1.6 Ensure compact development design that protects and increases the effectiveness of smart water resource management practices by including such measures as connecting open space areas, promoting low-impact development techniques, and increasing the connectivity of the canopy cover. (From IRWM Land Use and Water Management Study Input)

3.1.7 Promote compact development design solutions that result in multiple positive outcomes, such as combining habitat protection, recreation, heat loss, and groundwater recharge. (From IRWM Land Use and Water Management Study Input)

3.2 Natural Resource Protection and Watershed Management. Policies to protect natural areas are a critical component to watershed management. These policies include those to protect wetlands, streams, creeks, riparian habitat and other sensitive resources, provide standards for buffers and setbacks, promote habitat restoration projects and include open space acquisition and protection.

3.2.1 Apply the appropriate zoning and environmentally sensitive lands regulations to limit development of floodplains, wetlands, steep hillsides, canyons and coastal and waterfront lands. (City of San Diego General Plan)

3.2.2 Manage floodplains and floodways to address their multi-purpose use, including natural drainage, habitat preservation, and open space and passive recreation, while also protecting public health and safety. (City of San Diego General Plan)

3.2.3 Integrate ecosystem protection and restoration into water storage and conveyance and flood control/management planning. (From IRWM Land Use and Water Management Study Input)

3.2.4 Implement the Agua Hedionda Watershed Management Plan and develop and implement a similar watershed management plan for Buena Vista Creek and its major tributaries, dependent upon available funding. (City of Vista General Plan)

3.2.5 Restrict the installation of new concrete lining or channelization projects within open creeks and waterways and restore the creek system to its natural state where feasible in an effort to balance flood protection, water quality benefits, and habitat preservation. The daylighting and restoration of covered creek channels is encouraged. (City of Vista General Plan)

3.2.6 In order to minimize impacts of development on wetlands, require development projects to:

a. Mitigate any unavoidable losses of wetlands, including its habitat functions and values; and
b. Protect wetlands, including vernal pools, from a variety of discharges and activities, such as dredging or adding fill material, exposure to pollutants

such as nutrients, hydromodification, land and vegetation clearing, and the introduction of invasive species. (County of San Diego)

3.2.7 Control encroachments into wetlands and designated floodways to protect the community's water resources. (City of Escondido General Plan)

3.2.8 Maintain Escondido's natural creek system in an undisturbed state, with a minimum of a 50-foot buffer and setback for development, or as established by appropriate wildlife agencies, unless stream course alteration, channelization, or improvements are approved by necessary state and federal agencies and the City. (City of Escondido General Plan)

3.2.9 Protect all wetlands and buffers identified and included within development projects by permanently conserving those areas within a required open space easement or other suitable device. (City of Encinitas Draft General Plan)

3.2.10 Require development to preserve existing wetland areas and associated transitional riparian and upland buffers and retain opportunities for enhancement. (County of San Diego General Plan)

3.3 Vegetation Protection and Management. These policies promote and protect tree cover and natural vegetation for maintaining watershed processes.

3.3.1 Preserve the integrity of riparian habitat areas, creek corridors, and other drainages that support biological resources and contribute to the overall health of the watershed areas through the preservation and restoration of native plants and the removal of invasive, exotic, and nonnative species. (City of Vista General Plan)

3.3.2 Preserve existing trees where appropriate and require planting of new trees in conjunction with public and private developments. (City of La Mesa General Plan)

3.3.3 Continue to implement the City's Heritage Tree ordinance in order to formally identify and protect significant trees throughout the City. (City of Encinitas Draft General Plan)

3.3.4 Protect, preserve, and create the conditions that will promote the preservation of significant trees and other vegetation, particularly native California species. (City of San Luis Obispo General Plan)

3.3.5 Require that drainage channels be designed to accommodate riparian vegetation growth. (City of Escondido General Plan)

3.4 Sustainable Site Preparation Practices. These policies are intended to promote responsible site preparation activities and protect existing natural resource features for water resource protection.

3.4.1 Only allow grading and vegetation removal if adequate erosion and sediment controls are designed and constructed immediately after grading/vegetation removal. Require revegetation and appropriate landscaping of all areas graded or cleared of natural groundcover due to development activities.

Select plants, hydroseed mix, and irrigation systems that minimize erosion and conserve water. (Coastal Act/30251) (City of Encinitas Draft General Plan)

3.4.2 Encourage and facilitate construction and land development techniques that minimize water quality impacts from urban development. (City of Chula Vista General Plan)

3.4.3 The use of "green construction" and land development techniques shall be encouraged as a means to reduce the environmental impacts of construction activity. (City of Livermore General Plan)

3.4.4 Require submission of a comprehensive erosion control plan with final grading, building permit and improvement plans, subject to review and approval prior to commencement of grading and construction. (Coastal Act/30251) (City of Encinitas Draft General Plan)

4. Coordinate and integrate water resource management.

The intent of this goal is to coordinate and integrate water management efforts to achieve the other goals. It acknowledges the effect our local land use decisions have on regional and state water resources in terms of quality, quantity, and availability. This goal addresses the processes, partnerships, and information sharing necessary to do our part to promote integrated solutions to our community's and the Region's water management issues.

4.1. Integrated water resource management. These policies recognize the importance of employing multiple and interconnected water resource management strategies, whether at the site, neighborhood, local (jurisdictional), watershed, or regional levels. They also emphasize the need for coordinated water resource and land use planning and implementation at the various levels.

4.1.1 Integrate water and land use planning into local decision-making, including using water supply and land use studies in the development review process. (City of San Diego)

4.1.2 Integrate the City's conservation planning efforts with watershed planning, GHG reductions, and other regional planning efforts involving natural resources when possible in order to maximize opportunities for grant funding for conservation purposes. (City of Vista)

4.1.3 Integrate water management programs that emphasize multiple benefits and balance the needs of urban, rural, and agricultural users. (City of Escondido)

4.1.4 Pursue a multi-jurisdictional approach to protecting, maintaining and improving water quality and the overall health of the watershed. A comprehensive, integrated approach will ensure compliance with federal and state standards, and address a range of interconnected priorities including: water quality and runoff; stormwater capture, storage and flood management techniques that focus on natural drainage; natural filtration and groundwater recharge through green infrastructure and habitat restoration; and water recycling and conservation. (City of Richmond)

4.1.5 Continue to participate in the development and implementation of Watershed Management Plans for water quality and habitat protection. (City of San Diego)

4.1.6 When reviewing development projects, evaluate impacts on the entire watershed, and consider using mitigation banking when development projects create adverse impacts on water reliability, watershed quality, and natural resources that extend beyond the project parameters and/or jurisdictional boundaries. (From IRWM Land Use and Water Management Study Input)

4.1.7 Mitigate and adapt for risks and impacts associated with climate change in regional and local-level water management and land use planning. (From IRWM Land Use and Water Management Study Input)

4.1.8 Link hazard mitigation planning and coordinate safety elements with water management planning to include the following: flooding; debris flows; impact of climate change on communities; impact of wildfires on watersheds; sufficient water flows for firefighting; and any additional elements. (From IRWM Land Use and Water Management Study Input)

4.2. Partnerships and coordination. These policies promote the establishment or enhancement of partnerships with other agencies and organizations to increase the opportunity for sharing information and data, resources, and infrastructure.

4.2.1 Coordinate local land use planning with state and regional water resource planning to help insure that the citizens of San Diego have a safe and adequate water supply that meets existing needs and accommodates future needs. (City of San Diego General Plan)

4.2.2 Foster coordination and cooperation between City departments, outside agencies, service providers, and adjacent jurisdictions. (City of Chula Vista)

4.2.3 Participate in regional and subregional planning forums, including SANDAG's Regional Comprehensive Plan, or others that may directly affect the quality of life in Chula Vista and the San Diego region. (City of Chula Vista)

4.2.4 Work with SANDAG to expand the Healthy Environment Element of the Regional Comprehensive Plan (RCP) to incorporate the broader range of water resources goals to support the IRWM Plan. (From IRWM Land Use and Water Management Study Recommendations)

4.2.5 Coordinate City habitat management planning efforts with federal, state, and local agencies, and other planning efforts of the City. (City of Carlsbad)

4.2.6 Engage tribal nations in collaboration, coordination, and communication regarding land use planning and water management. (From IRWM Land Use and Water Management Study Recommendations)

4.2.7 Consult with North Coast Regional Water Quality Control Board staff as part of the CEQA process for proposed developments to help them identify wetland and vernal pool habitat that has candidacy for restoration / protection based on actual and potential beneficial uses, and determine appropriate locations for mitigation banking. (City of Santa Rosa General Plan)

4.2.8 Participate in development of, and utilize, a GIS-based Resource Guide of all the various agencies, organizations, and stakeholder groups responsible for and/or involved in water management and land use planning in the Region. (From IRWM Land Use and Water Management Study Recommendations)

4.2.9 Participate in and/or host workshops, webinars, and other types of information-sharing sessions designed to strengthen relationships between water managers and land use planners. (From IRWM Land Use and Water Management Study Recommendations)

4.2.10 Work with water purveyors to develop water efficiency policies. (From IRWM Land Use and Water Management Study Input)

4.3. Stakeholder and community involvement and education. These policies are intended to engage communities and educate the public regarding the interconnectedness of water supply, water quality, and natural resources while promoting individual and community ownership of the problems and solutions.

4.3.1 Continue to develop and implement public education programs.

a. Involve the public in addressing runoff problems associated with development and raising awareness of how an individual's activities contribute to runoff pollution.

b. Work with local businesses and developers to provide information and incentives for the implementation of Best Management Practices for pollution prevention and control.

c. Implement watershed awareness and water quality educational programs for City staff, community planning groups, the general public, and other appropriate groups. (City of San Diego General Plan)

4.3.2 Support volunteer Creek Stewards who help serve to identify and report undesirable conditions and activities. Creek Stewards also perform minor maintenance and monitoring tasks and provide suggestions to enhance creek areas. (City of Santa Rosa General Plan)

4.3.3 Provide guidelines to developers, homeowners and homeowners associations, contractors, and others to encourage "watershed friendly" design, construction, and maintenance of new and existing development. (From IRWM Land Use and Water Management Study Recommendations)

4.3.4 Utilize a variety of methods, such as social media and pertinent websites, to share key information with elected officials, planners, and water resources managers. (From IRWM Land Use and Water Management Study Recommendations)

Attachment #2

Recommendations:

Improved Communication, Collaboration, and Coordination between Water Resources Managers and Land Use Managers

Recommendations:

Improved Communication, Collaboration, & Coordination between Water Resources and Land Use Managers

Introduction

The IRWM Program provides overarching goals, objectives, and strategies for the range of planning and water resources agencies within the San Diego IRWM Plan Region (Region), which consists of eleven westward draining watersheds within San Diego County. To be effective, they should guide development and implementation of individual agencies' plans; at the same time, the plans of the individual agencies should inform the IRWM Program's planning and implementation processes. Between the Regional and local levels are the individual watersheds that require additional collaboration and coordination. In essence, water resource and land use goals and policies need to "roll up and roll down" from the Regional, watershed, and local levels to achieve integration and effectiveness.

While some coordination currently occurs between water resources agencies and land use planners, there is an identified need for improved collaboration and communication between them and better alignment of all related plans and implementation programs within the Region. Input received at the IRWM update Land Use Planning Workshops indicates the following.

- Silos need to be broken down between water and land use disciplines and agencies.
- Relationships need to be built or strengthened.
- Water resources and land use plans, policies, and implementing projects and programs must be better integrated.
- The land use community needs to be better involved in water management in the region.
- Decision-making by municipalities* should consider potential impacts beyond their political boundaries.
- The IRWM Program should create incentives for cities to undertake and/or participate in cooperative projects that link land use and water management.

One of key objectives of the 2013 IRWM Program update is to develop and prioritize a list of recommendations that could be implemented through the IRWM Program to improve communication between water resources and land use planners and enhance collaboration and coordination regarding associated plans and implementation programs.

Preliminary recommendations were developed in response to input derived from the surveys and suggestions received at Land Use Workshop #1 (May 12, 2012). They were discussed at Land Use Workshop #2 (August 21, 2012), at which time participants both refined and added recommendations. The final list of recommendations was then prioritized by the participants.

The recommendations can be implemented through a variety of methods, such as grants and new or existing working groups and collaborations. Processes need to be put into place to initiate, expand, and sustain this effort. Such an effort will require commitment, time, persistence, political will, leadership, and resources.

Recommendations

The recommendations have been organized into two general categories: 1) collaborative work products and 2) opportunities for information sharing, regular communication, and meaningful collaboration. Please note that the categories are not mutually exclusive; in fact, an argument could be made to move some items between categories. The intent is to distinguish specific products (Category 1) from activities that are primarily designed to promote communication (Category 2.) However, an outcome of implementing items from Category 1 will be improved communication and coordination between land use planners and water resources managers.

The recommendations are prioritized from highest to lowest within each category, with 1 being the highest priority.

Category 1: Support or facilitate collaborative preparation of various joint water resources and land use planning efforts and work in the Region.

This may include work products such as plans, guidelines, model ordinances, and reference materials for cities to use or adopt, tailored to the Region and using best practices taken from local agencies, groups, and other water/land use collaborations.

1. Distribute the model water resources policies developed through the IRWM Program update for municipalities to use when updating their existing general plans.
2. Prepare a model gray water ordinance.
3. Seek funding to provide a grant program that enables municipalities to fund updates to their general plans to incorporate the model water resource policies in 1. above or develop water resources element of their general plans. (This recommendation is modeled after County of San Diego's grant program for health and wellness elements through its Healthy Works program).
4. Prepare guidelines agencies can provide to developers, homeowners and homeowner associations, contractors, and others to encourage "watershed friendly" design, construction, and maintenance of new and existing development.
5. Prepare information sheets regarding potential water resource-related impacts of certain land uses for land use planners to refer to when evaluating proposed development requests, such as landfills, pharmaceutical industries, etc.
6. Prepare a model sustainable landscape ordinance.
7. Work with SANDAG to expand the Healthy Environment Element of the Regional Comprehensive Plan (RCP) to incorporate the broader range of water resources goals to support the IRWM Plan.
8. Prepare a model stormwater management ordinance.
9. Prepare model guidelines for green infrastructure for public agencies. (Tie)
10. Prepare model guidelines for green infrastructure for private development. (Tie)
11. Prepare conservation or resource management plans/guidelines for community gardens and backyard gardening.
12. Coordination of BMPs in municipal codes when the water agency is not the municipality. (Tie)
13. Prepare conservation or resource management plans/guidelines for agricultural operations. (Tie)
14. Prepare model green building standards.

Category 2: Provide opportunities for information sharing, regular communication, and meaningful collaboration for water resources and land use managers.

Based on input from interviews and workshops, "Agencies just need to sit down and talk to each other!" This is particularly important at the watershed and/or local level(s), especially between land use planners and stormwater, flood control, water supply, wastewater, habitat conservation, and water quality managers. While this does occur throughout the Region to a certain extent, it is not consistent, not always ongoing, is often a voluntary effort rather than an identified priority, and has varying degrees of success. Water resources managers and land use planners often do not have the opportunity to interact unless they are part of the same municipality, nor are there forums that provide meaningful and ongoing opportunities for information sharing, or joint policy and program development. A key factor that is often missing is representation from agencies responsible for land use planning. The following recommendations are intended to increase opportunities for information sharing, regular communication, and meaningful collaboration.

1. Create a GIS-based Resource Guide of the all the various agencies, organizations, and stakeholder groups responsible for and/or involved in water management and land use planning in the Region. The IRWM website could serve as the host for the Resource Guide. Information would be provided for each plan and each entity, such as "what they do," their mandates, timing of plan updates, mapping of their jurisdictional boundaries showing how they overlap, etc. Include a chapter on common terminology. Provide the ability to search by various boundaries, such as watershed, municipality, water resources agencies, tribe, and the geographic boundaries of various water resources plans, both legal and cooperative. Consider including information that would be useful for both policy and implementation purposes. (For example, the information in Appendix 13 of the current IRWM—Summary of the Region's Local Water Management Plans, would be mapped and populated.) Eventually, the information could be provided on a parcel level. If it already exists at a parcel level, incorporate it. Where it does not, pursue grant funding or encourage/support cooperative efforts to develop it. (Example: San Bernardino)
2. Work with SANDAG to expand its emphasis on smart growth (sustainable land use and transportation practices) to encompass strategies that improve the reliability and quality of water resources.
3. Build relationships and share information through workshops, webinars, lunch sessions, etc., put on by such organizations as APA, AEP, APWA, CWA, and the American Water Resources Association (AWRA). These could be hosted by different agencies, preceded by informal "meet and greet" time, to strengthen relationships between the water managers and land use planners and share information of a variety of topics. Topics could include:
    i. how to improve coordination in the development review and CEQA processes;
    ii. coordinating with water agencies to prepare water supply and demand analyses for general plan updates;
    iii. updating and implementing UWMPs, specific plans, master plans;
    iv. adopting ordinances that support the integration of water resource management and land use planning;
    v. developing baselines and indicators;
    vi. information and examples regarding the use of techniques, such as conservation easements, TDRs (transfer of development rights), buffer zones and green belts,

urban growth boundaries, open space districts, and habitat conservation districts; and

vii. coordinating integrated approaches to legislation.

4. Provide an annual forum for staff from water resources and land use agencies based on topics of mutual interest and importance, such as updates on water resource legislation that impacts land use policies, codes, and development. It could recognize innovative plans, programs, and processes that exemplify water resource and land use coordination and collaboration, and showcase examples of local best management practices, including details of processes taken to achieve them. This could be accomplished either by expanding the annual IRWM Summit or creating a separate forum/workshop.
5. Develop a template that municipalities can use to convene meetings that include all the entities involved in land use planning and water resource planning and management for that jurisdiction. The idea is to bring everyone together to discuss their role, responsibilities, mandates, and plans in the intersection between land use planning and water resource management in the policy/planning, regulatory, and project levels. This process could facilitate "tiering" or better alignment of various land use and water resource plans within watersheds, at both the policy and implementation levels. This forum also could provide the opportunity to develop best management practices.
6. Utilize existing agencies, committees, and collaborations, to disseminate key information and support an integrated approach to water resources management and land use decision-making.
7. Expand the IRWM website to include examples of sustainable, efficient, effective, least-cost/economical, and politically viable land use practices that can improve the reliability and quality of water resources.
8. Develop a guide for how to engage tribal nations in the collaboration, coordination, and communication regarding land use planning and water management.
9. Utilize social media, pertinent websites, and other methods to share key information with elected officials, planners and water resources managers.

Concluding Comments

Some of the recommendations could be implemented on a "volunteer" basis by any number of existing entities. However, attendees at the workshops noted that, ideally, effective implementation will necessitate one or more entities taking lead or co-responsibility for overall collaboration and coordination between water resources and land use planning agencies at the policy/planning, regulatory, and project levels. It could be an existing entity (such as the IRWM RAC or RWMG, SANDAG, CWA, SDRWQCB, etc.), a new one created for this purpose (such as a Water Resources Coordinating Council), or a combination. Whatever the organization, it should be intentional, structured, politically supported, ongoing, and funded.

*The term "municipality" as used by the International City/County Management Association (ICMA) refers to local government at both the city and county levels.

Attachment #3

Key Issues Matrix

Key Issues Matrix

The Issues Matrix summarizes the key issues identified through the 2013 IRWM Land Use and Water Management Study process as existing obstacles to integration of land use and water management plans and programs. One of key objectives of the 2013 IRWM Program update is to develop and prioritize a list of recommendations that could be implemented through the IRWM Program to improve communication between water resources and land use planners and enhance collaboration and coordination regarding associated plans and implementation programs. The intent of the matrix is to show how the recommendations developed through the Land Use Study process will help to overcome the issues through implementation of the IRWM Program. While the emphasis of this study is on identification of recommendations for IRWM Program implementation, positive outcomes depend on the involvement of, and commitment by, the decision-makers and staff of the Region's municipalities and water agencies. (See Attachment 2 for the overview and complete prioritized list of the recommendations.)

KEY ISSUES	RECOMMENDATIONS		
	IRWM Program	**Municipalities / Land Use Planners**	**Water Agencies / Managers**
Silos need to be broken down between water and land use disciplines and agencies and relationships need to be built or strengthened.	• Provide an annual forum for staff from water resources and land use agencies based on topics of mutual interest and importance.	• Attend forum • Share case studies, best practices	• Attend forum • Share case studies, best practices
	• Develop a template that municipalities can use to convene meetings that include all the entities involved in land use planning and water resource planning and management for that jurisdiction.	• Volunteer to be a convener.	• Participate in the meetings with the various member jurisdictions.
	• Build relationships and share information through workshops, webinars, lunch sessions, etc., put on by such organizations as APA, AEP, APWA, CWA, and the American Water Resources Association (AWRA).	• Attend workshops, webinars, etc. • Share case studies, best practices	• Attend workshops, webinars, etc. • Share case studies, best practices
	• Develop a guide for how to engage tribal nations in the collaboration, coordination, and communication regarding land use planning and water management.	• Utilize the guide	• Utilize the guide
Water resources and land use plans, policies, and implementing projects and programs must be better integrated.	• Work with SANDAG to expand its emphasis on smart growth (sustainable land use and transportation practices) to encompass strategies that improve the reliability and quality of water resources.	• Participate	• Participate
	• Place a priority on partnerships between land use and water agencies in the IRWM grant funding process	• Pursue projects in partnership with water agencies and other	• Pursue projects in partnership with land use planners /

	(such as outlined in the application process for the Prop 84-Round 2 implementation grant funding).	stakeholders.	municipalities and other stakeholders.
	• Seek funding to provide a grant program that enables municipalities to fund updates to their general plans to incorporate more integrated and comprehensive water management policies, such as the model water element.		
	• Seek funding to support implementation of policies and programs identified in the model water element that emphasize integrated solutions to water management.		
Decision-making by municipalities should consider potential impacts beyond their political boundaries.	• Utilize existing agencies, committees, and collaborations, to disseminate key information and support an integrated approach to water resources management and land use decision-making.		
	• Utilize social media, pertinent websites, to share key information with elected officials, planners and water resources managers.		
	• Work with SANDAG to expand its emphasis on smart growth (sustainable land use and transportation practices) to encompass strategies that improve the reliability and quality of water resources.		
The information regarding the various agencies, plans, laws, etc. that applies to municipalities and water agencies is not readily available.	• Create a GIS-based Resource Guide of the all the various agencies, organizations, and stakeholder groups responsible for and/or involved in water management and land use planning in the Region. The IRWM website could serve as the host for the Resource Guide.	• Utilize the Resource Guide • Share information / participate in development and updates	• Utilize the Resource Guide • Share information / participate in development and updates
	• Utilize existing agencies, committees, and collaborations to disseminate key information to water resources management and land use decision-making.		
	• Expand the IRWM website to include examples of sustainable, efficient, effective, least-cost/economical, and politically viable land use practices that can improve the reliability and quality of water resources.		
Majority of land use planners are not aware of the IRWM Program.	• Utilize existing agencies, committees, and collaborations, to disseminate key information and support an integrated approach to water resources management and land use decision-making.		

	• Provide an annual forum for staff from water resources and land use agencies based on topics of mutual interest and importance.		
	• Share information through workshops, webinars, lunch sessions, etc., put on by such organizations as APA and AEP.		
Many General Plans do not address the broad spectrum of water management topics, and water policies are often generic and/or vague.	• Distribute the model water element (water resources policies) developed through the IRWM Program update for municipalities to use when updating their general plans.	• Utilize the model water element policies provided by the IRWM Program when updating their general plans.	• Provide input to municipalities to help them tailor the model water policies to address their community's issues and needs.
	• Seek funding to provide a grant program that enables municipalities to fund updates to their general plans to incorporate more integrated and comprehensive water management policies, such as the model water element.	• Update their general plans to incorporate more integrated and comprehensive water management policies, such as the model water element.	• Provide input to municipalities to help them tailor the model water policies to address their community's issues and needs.
	• Expand the IRWM website to include examples of sustainable, efficient, effective, least-cost/economical, and politically viable land use practices that can improve the reliability and quality of water resources.		
Staffs of both municipalities and water agencies often do not have the resources (funds and/or time) to take on extra projects or prepare plans, ordinances, and information for communities beyond those prioritized by their councils/boards/commissions.	• Create incentives, such as grants, to encourage municipalities and agencies to participate in cooperative projects that link land use and water management.		
	• Prepare a model gray water ordinance for use by local municipalities. (Could be accomplished through an interagency team, funded by the IRWM.)	• Participate in development of the model gray water ordinance if possible. • Adopt the model gray water ordinance (modified as necessary for the individual municipality.)	• Participate in development of the model gray water ordinance if possible. • Provide input to municipalities to help them tailor the model gray water ordinance to address their community's issues and needs.
	• Prepare a model sustainable landscape ordinance.	• Participate in development of the model sustainable landscape ordinance if possible. • Adopt the model sustainable landscape ordinance (modified as necessary for the individual municipality.)	• Participate in development of the model sustainable landscape ordinance if possible. • Provide input to municipalities to help them tailor the model sustainable landscape ordinance to address their community's issues and needs.

	• Prepare a model stormwater management ordinance.	• Participate in development of the model stormwater ordinance if possible. • Adopt the model stormwater ordinance (modified as necessary for the individual municipality.)	• Participate in development of the model stormwater ordinance if possible. • Provide input to municipalities to help them tailor the stormwater ordinance to address their community's issues and needs.
	• Prepare model guidelines for green infrastructure for public agencies.	• Participate in development of the model guidelines for green infrastructure for public agencies if possible. • Adopt the guidelines for green infrastructure for public agencies (modified as necessary for the individual municipality.)	• Participate in development of the model guidelines for green infrastructure for public agencies if possible.
	• Prepare model guidelines for green infrastructure for private development.	• Participate in development of the model guidelines for green infrastructure for private development if possible. • Adopt the model guidelines for green infrastructure for private development (modified as necessary for the individual municipality.)	• Participate in development of the model guidelines for green infrastructure for private development if possible.

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Water Management

Appendix 7-D:
San Diego IRWM Climate Change Study




SAN DIEGO
Integrated Regional
Water Management

Climate Change Planning Study

Final

Prepared by:

RMC
Water and Environment

May 2013

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List of Abbreviations

AB	Assembly Bill
AF	Acre-foot
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CAT	Climate Action Team
CCAR	California Climate Action Registry
CCAS	California Climate Action Strategy
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	Methane
CNRA	California Natural Resources Agency
CO_2	Carbon Dioxide
DWR	Department of Water Resources
EO	Executive Order
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
HFCs	Hydrofluorocarbons
IRWM	Integrated Regional Water Management
kWh	kilowatt hours
$MMTCO_2E$	Million metric tons carbon dioxide equivalent
MSHCP	Multiple Species Habitat Conservation Plan
N_2O	Nitrous Oxide
NF_3	Nitrogen Trifluoride
OPC	Ocean Protection Council
OPR	Office of Planning and Research
PFCs	Perfluorocarbons
RMS	Resource Management Strategy
SB	Senate Bill
SDCWA	San Diego County Water Authority

SDG&E	San Diego Gas & Electric
SDRIP	San Diego River Improvement Project
SF_6	Sulfur Hexafluoride
SLR	Sea Level Rise
SWP	State Water Project
SWRCB	State Water Resources Control Board
TCR	The California Registry
TMDL	Total Maximum Daily Load
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
WET-CAT	Water Energy Team of the Climate Action Team

1 Climate Change in Water Resources

This chapter addresses requirements set forth in the Resource Management Strategies (RMS) Standard in the *2012 IRWM Program Guidelines* (DWR 2012). As such, this chapter considers each RMS listed in the *California Water Plan (CWP) Update 2009* (DWR 2009), documents which RMS will help achieve the IRWM Plan Update objectives, presents all RMS considered for the IRWM Plan Update, and includes an evaluation of the adaptability of water management systems in the San Diego IRWM Region to climate change.

1.1 Introduction

Climate change projections have shown that California can expect to be impacted by changes to temperature and precipitation in the future, and even now California is beginning to experience the effects of these impacts. Water resource planners already face challenges interpreting new climate change information and discerning which response methods and approaches will be most appropriate for their planning needs. This Climate Change Planning Study (Study) examines current climate change science, policies, and regulations in terms of how they affect the San Diego Integrated Regional Water Management Region (Region). This Study serves as an initial guide for the Region to begin incorporating climate change adaptation and mitigation measures into its Integrated Regional Water Management (IRWM) Plan, where adaptation is how the Region can respond to climate change effects and mitigation is how the Region can reduce future climate change effects, and includes the following sections:

- Chapter 1: Climate Change in Water Resources
- Chapter 2: Climate Change in IRWM Planning
- Chapter 3: Effects of Climate Change on the Region
- Chapter 4: Vulnerability Analysis
- Chapter 5: Climate Change Management Strategies
- Chapter 6: Recommendations

1.2 Adaptation Relationship

Climate change is expected to directly impact a number of areas related to water resources, in particular temperature, precipitation, and sea level rise. As global temperature increases, seasonal precipitation patterns including the timing, intensity and form of precipitation, are projected to continue to change. Sea level rise, which has risen about seven inches over the last century due to warming, is expected to rise further in the future. In order for the Region to adapt to, or protect against, climate change, it must first identify the impacts climate change is expected to have on the Region.

These impacts are expected to further impact local water resources as follows (DWR, 2011):

- Temperature increases:
    - More winter precipitation falling as rain rather than snow, leading to reduced snowpack water storage, reduced long term soil humidity, reduced groundwater and downstream flows, and reduced imported water deliveries

  - Higher irrigation demands as temperatures alter evapotranspiration rates, and growing seasons become longer
  - Exacerbated water quality issues associated with dissolved oxygen levels, increased algal blooms and increased concentrations of salinity and other constituents
  - Impacted habitats for temperature-sensitive fish and other life forms, and increased susceptibility of aquatic habitats to eutrophication
- Precipitation pattern changes:
  - Increased flooding (both coastal and inland) caused by more intense storms
  - Changes to growth and life cycle patterns caused by shifting weather patterns
  - Threats to soil permeability, adding to increased flood threat and decreased water availability
  - Reduced water supply caused by the inability to capture precipitation from more intense storms, and a projected progressive reduction in average annual runoff (though some models suggest that there may be some offset from tropical moisture patterns increasingly moving northward)
  - Increased turbidity caused by more extreme storm events, leading to increased water treatment needs and impacts to habitat
  - Increased wildfires with less frequent, but more intense rainfall, and possibly differently timed rainfall through the year, potentially resulting in vegetation cover changes
  - Reduction in hydropower generation potential
- Sea level rise:
  - Inundation and erosion of coastal areas (coastal bluffs in particular), including coastal infrastructure
  - Saline intrusion of coastal aquifers
  - Increased risk of storm surges and coastal flooding and erosion during and after storms
  - Changes in near-shore protective biogeography such as loss of sand, tide pools and kelp beds

Although the extent of these changes is uncertain, scientists agree that some level of change is inevitable; therefore, it will be necessary to implement flexible adaptation measures that will allow natural and human systems to respond to these climate change impacts in timely and effective ways. Adaptation measures may be implemented in response to climate change impacts that have already occurred, or expected impacts that are projected to occur. It is important to take note that water resources decisions made in the future will impact the rate of climate change.

In addition to adapting to climate change, the Region has the opportunity to mitigate against climate change by minimizing greenhouse gas emissions emitted by water supply and wastewater activities. The relationship between water resources and greenhouse gas emissions is discussed further in the next section.

1.3 Water-Energy Nexus

To understand how water is related to climate change, it's helpful to understand the connection between water resources planning and energy, which is known as the water-energy nexus. Energy production accounts for between 30% and 40% of total GHG production in California, and can emit a number of different types of GHGs. California's Air Resources Board recognizes and inventories the following GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3). These GHGs vary in magnitude in terms of their GHG strength, and therefore are converted to be equivalent to CO_2 for the purposes of measuring GHG emissions across the state. CO_2 emissions (or the equivalent for other GHGs) are the common measurement for GHG emissions. (CARB, 2013). Currently, statewide water use accounts for nearly 20% of electricity use, and 30% of non-power plant related natural gas consumption (CEC, 2006). Water use and energy are linked in at least three critical ways (CEC, 2011):

1. Water pumping and purification: The amount of energy used to pump water will depend upon the source (e.g., surface versus groundwater), the distance and height the water must be moved, and the treatment requirements. For example, pumping water to San Diego County through the State Water Project, which accounts for nearly 80% of the County's water supply, uses about 4,600 kilowatt hours (kWh) per acre-foot of electricity (DWR, 2012a), while groundwater pumping typically uses 300 kWh/AF (Cohen, 2007).
2. Wastewater treatment: The amount of energy used in wastewater treatment plant typically ranges from 1,100 to 4,600 kWh per million gallons of wastewater treated (CEC, 2006).
3. Water heating: In an average California home, 41 percent of the water is used for dishwashing, faucets, laundry, and bathing water that is often heated.

These amounts, in total, are so significant that we must also count the amount of GHGs from the fossil fuels that are burned to produce the oil, gas, coal and other combustibles which are then burned to produce the electricity. Understanding the water-energy nexus in California provides opportunities to attain significant energy benefits through two primary strategies (CEC, 2006):

1. Conserving water saves the energy that would have been used to convey, treat, and distribute the water, and energy that may have been needed to collect, treat and dispose of the wastewater.
2. Reducing the energy intensity of water operations reduces the total amount of energy consumed in the water sector and ultimately reduces the value of energy embedded in saved water.

By reducing the energy used through the above strategies, GHG production can be reduced.

It should be noted that, at times, the above processes may also be used to generate energy, such as through cogeneration at wastewater treatment plants, or capturing energy as water flows downhill. Concurrently, energy production processes require water for steam production for thermoelectric power and to cool equipment by absorbing waste heat. Energy conservation in the Region can reduce this need.

These strategies are reflected in California's legislation and policy regarding climate change mitigation and greenhouse (GHG) emissions reduction discussed in the remainder of Chapter 1.

1.4 Legislative and Policy Context

In order to address currently-projected climate change impacts to California's water resources, the Department of Water Resources' (DWR's) 2012 IRWM Grant Program Guidelines require that IRWM Plans describe and consider climate change adaptation and mitigation. Below is a summary of State legislation and policy that were considered as part of this IRWM Plan.

Executive Order S-3-05

Executive Order (EO) S-3-05, signed on June 1, 2005 by Governor Arnold Schwarzenegger, is one of the key pieces of legislation that has laid the foundation for California's climate change policy. This piece of legislation recognizes California's vulnerabilities to the impacts of climate change, which include its water-related natural resources. EO S-3-05 established three GHG reduction targets for California:

- By 2010, reduce GHG emissions to 2000 California levels
- By 2020, reduce GHG emissions to 1990 California levels
- By 2050, reduce GHG emissions to 80 percent below 1990 California levels

In addition to establishing GHG reduction targets for California, EO S-3-05 dictates that the Secretary of the California Environmental Protection Agency (CalEPA) establish the Climate Action Team (CAT) for State agencies to coordinate oversight of efforts to meet these targets. As laid out in EO S-3-05, the CAT submits biannual reports to the governor and State legislature describing progress made toward reaching the targets.

There are currently 12 sub-groups within the CAT, one of which is the Water-Energy group (also known as WET-CAT). WET-CAT was tasked with coordinating the study of GHG effects on California's water supply system, including the development of GHG mitigation strategies for energy consumption related to water use. Since the adoption of the Assembly Bill 32 Scoping Plan (see the following section), WET-CAT has been working on the implementation and analyses of six water-related measures identified in the Scoping Plan:

- Water Use Efficiency
- Water Recycling
- Water System Energy Efficiency
- Reuse Urban Runoff
- Increase Renewable Energy Production
- Public Goods Charge for Water

Assembly Bill 32: The California Global Warming Solutions Act of 2006

Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006 was signed by Governor Schwarzenegger to codify the mid-term GHG reduction target established in EO S-3-05 (reduce GHG emissions to 1990 levels by 2020) through, among other mechanisms, imposing an enforceable cap on GHG emissions. AB 32 directed the California Air Resources Board (CARB) to develop discrete early actions to reduce GHG emissions by 2007, and to adopt regulations to implement early action measures by January 1, 2010.

Climate Change Scoping Plan

AB 32 also required CARB to prepare a Scoping Plan to identify and achieve reductions in GHG emissions in California. The approved Climate Change Scoping Plan, adopted by CARB in December 2008, recommends specific strategies for different business sectors, including water management, to achieve the 2020 GHG emissions limit. The Scoping Plan as it relates to water resources is discussed further in Section 0 below.

Senate Bill 97

Senate Bill 97 (SB 97) directed the Governor's Office of Planning and Research (OPR) to develop amendments to the California Environmental Quality Act (CEQA) Guidelines to determine how climate change is analyzed in documents required by CEQA. On December 31, 2009, the California Natural Resources Agency adopted amendments to the CEQA Guidelines and sent them to the California Office of Administrative Law for approval and filing with the Secretary of State. These CEQA Guideline amendments became effective on March 18, 2010. The CEQA Guidelines are not prescriptive; rather they encourage lead agencies to consider many factors in performing a CEQA analysis, and maintain discretion with lead agencies to make their own determinations based on substantial evidence.

Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water

DWR, in collaboration with the State Water Resources Control Board, other state agencies, and numerous stakeholders, has initiated a number of projects to begin climate change adaptation planning for the water sector. In October 2009, DWR released the first state-level climate change adaptation strategy for water resources in the U.S., and the first adaptation strategy for any sector in California. Entitled Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water, the report details how climate change is currently affecting the state's water supplies, and sets forth ten adaptation strategies to help avoid or reduce climate change impacts to water resources.

Central to these adaptation efforts will be the full implementation of IRWM plans, which address regionally-appropriate management practices that incorporate climate change adaptation. These plans will evaluate and provide a comprehensive, economical, and sustainable water use strategy at the watershed level for California.

Executive Order S-13-08

Given the potentially serious threat of sea level rise to California's water supply and coastal resources, and the subsequent impact it would have on our state's economy, population, and natural resources, Governor Schwarzenegger issued EO S-13-08 to enhance the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation, and extreme weather events. It requested a California Sea Level Rise Assessment Report to be conducted by the National Academy of Sciences, which was released in June 2012.

California Climate Adaptation Strategy

In response to the passage of EO S-13-08, the California Natural Resources Agency released the report entitled 2009 California Climate Adaptation Strategy that summarizes the best known science on climate change impacts in the state, assesses vulnerabilities, and outlines possible solutions that can be implemented within and across the state agencies to promote resilience to climate change.

GHG Reporting Rule

While California has taken the lead in climate change policy and legislation, there have been several recent important developments at the federal level. On September 22, 2009, the United States Environmental Protection Agency (USEPA) released its final GHG Reporting Rule (Reporting Rule). Starting in 2010, facility owners that emit 25,000 metric tons of $CO2$ emissions or more per year are required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. These activities will dovetail with the AB 32 reporting requirements in California.

Water Code Section 10541

California has included climate change in its water code to ensure that it is considered as part of water management. California Water Code Section 10541 contains requirements for considering climate change in IRWM Plans. Specifically, it states that the guidelines for IRWM Plans are required to include:

- Consideration of GHG emissions of identified programs and projects
- Evaluation of the adaptability to climate change of water management systems in the region

1.5 AB 32 Scoping Plan and CARB Strategies

As stated previously, AB 32 required CARB to prepare a Scoping Plan to identify and achieve reductions in GHG emissions in California, and recommended specific strategies for different business sectors to achieve the 2020 GHG emissions limit. This Scoping Plan was introduced in 2005, and adopted in 2008. Water use is identified in the AB 32 Scoping Plan as a sector requiring significant amounts of energy, and sets a goal to "continue efficiency programs and use cleaner energy sources to move and treat water." This goal recognizes that California has a history of advancing water efficiency and conservation programs.

The Scoping Plan identifies six greenhouse gas emissions reduction (mitigation) measures for the water sector that could reduce GHGs if implemented statewide (please note that not all of these measures may be applicable to the San Diego IRWM Region):

1. Water Use Efficiency: Through increases in water use efficiency measures, reduce total statewide emissions
2. Water Recycling: Through increases in water recycling, reduce total statewide emissions
3. Water system energy efficiency: Through increases in water system energy efficiency, reduce total statewide emissions
4. Reuse of urban runoff: Through reuse of urban runoff, reduce total statewide emissions
5. Increase renewable energy production: Through the increase in renewable energy production, reduce statewide emissions
6. Public goods charge: To be determined

The first three of the measures will reduce energy requirements associated with providing reliable water supplies. The next two measures will reduce the amount of non-renewable electricity associated with conveying and treating water. The final measure (public goods charge) focuses on providing sustainable funding for implementing these actions. Other sectors identified in the Scoping Plan, such as Agriculture and Green Building, recognize that water use efficiency measures will help to decrease GHG emissions as well, but do not calculate water use efficiency savings separately. The Scoping Plan states that to implement these GHG reduction measures, CARB and other State agencies will work with stakeholders and the public to develop regulatory measures and other programs.

1.6 California Climate Action Registry/The Climate Registry

The California Climate Action Registry (CCAR) was a program of the Climate Action Reserve which closed in December 2010. It served as a voluntary GHG registry to promote early actions to reduce GHG emissions by organizations. CCAR members voluntarily measured, verified, and publicly reported their GHG emissions. Members of the CCAR have been transitioned over to The Climate Registry (TCR), which is a nonprofit GHG emissions registry for North America that provides organizations with the tools to help them calculate, verify, report and manage their GHG emissions within a single registry. A number of agencies and organizations in the IRWM Region are voluntary members of TCR, including:

- San Diego County Water Authority
- City of San Diego
- County of San Diego
- Metropolitan Water District of Southern California

TCR's tools and database are particularly useful to those entities required to report their GHG emissions according to the EPA's Greenhouse Gas Reporting Rule (74 FR 56260) which requires reporting of GHG data and other relevant information from large sources and suppliers in the United States, and went into effect in January 2010. Though primarily affecting facilities that supply fossil fuels or industrial GHGs, manufacturers of vehicles and engines, this rule also applies to facilities that are responsible for the emission of 25,000 metric tons or more of GHG emissions per year, and therefore may apply to water and wastewater utilities, and large water purchasers. In addition to meeting USEPA requirements, by becoming a member of TCR, a utility, agency or company may better be able to respond to California's requirements for reporting and reducing GHG emissions.

1.7 Climate Action Plans and Climate Initiatives

Climate action plans are becoming more common among California's cities and counties. A climate action plan, which may also be referred to as a climate mitigation and adaptation plan, is a set of strategies intended to guide efforts for reducing GHG emissions, and typically covers a range of sectors such as energy, transportation, water, wastewater, solid waste, infrastructure, urban forestry and agriculture, and public health. Plans may also include strategies to guide efforts for reducing the impact of climate change effects on the area. Within the Region, the County and a number of cities and agencies have developed or are developing climate action plans and adaptation plans:

- County of San Diego Climate Action Plan
- San Diego County Water Authority Climate Action Plan and Climate Mitigation Plan
- City of San Diego Climate Mitigation and Adaptation Plan

- City of San Diego Long Range Water Resources Plan
- City of Chula Vista Adaptation and Mitigation Plan
- City of Encinitas Climate Action Plan
- City of Escondido Climate Action Plan
- City of San Marcos Climate Action Plan
- Port of San Diego Climate Mitigation and Adaptation Plan
- San Diego Association of Governments (SANDAG) Regional Energy Strategy and Climate Action Strategy
- San Diego Bay Sea Level Rise Adaptation Study
- San Diego Foundation Focus 2050 Study

In addition to the Climate Action Plans developed in the Region, the San Diego Foundation has developed a Climate Initiative to support community awareness about the local impacts of climate change. This initiative aims to educate the community about climate change, support climate change research, partner with local governments to address climate change, and provide technical assistance for climate action planning. As part of this initiative, every jurisdiction in the County has completed a GHG emissions inventory.

2 Climate Change in IRWM Planning

2.1 DWR Requirements

As previously discussed, the California Water Code contain language stating that IRWM Plan guidelines require climate change be considered as part of IRWM Plans. In line with this, DWR has included a Climate Change Standard in the IRWM Guidelines that requires IRWM plans to include a "cursory analysis of the effects on the region due to climate change, with the intent that a more refined analysis be required as additional guidance is made available." To meet these guidelines, DWR has suggested that climate change be included in IRWM Plans as shown in Table 1.

Table 1: IRWM Plan Standards in Relation to Climate Change

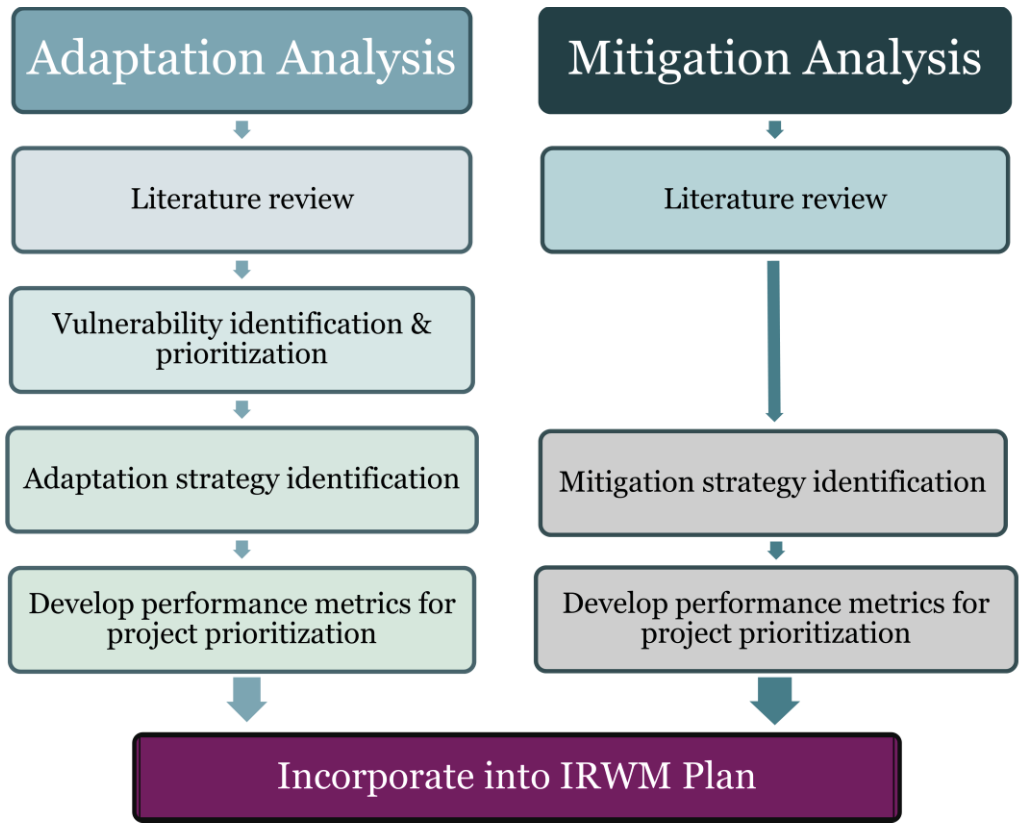
Plan Section According to IRWM Plan Standards	Climate Change Information to Include[1]
Region Description	Language that describes likely climate change impacts on the Region as determined from a vulnerability assessment
Plan Objectives	Adaptation to climate change: • Address adapting to changes in the amount, intensity, timing, quality and variability precipitation, runoff and recharge. • Consider sea level rise effects on water supply and other water resource conditions (e.g., recreation, habitat) and identify suitable adaptation measures. Consider OPC's Sea Level Rise Policy Reducing emissions (mitigation of greenhouse gasses) • Reduce carbon consumption, especially the energy embedded in water use, and ultimately reduce GHG emissions • Consider the strategies adopted by CARB in its AB 32 Scoping Plan, including innovative applications • Consider options for carbon sequestration where such options are integrally(directly or indirectly) tied to supporting IRWM Plan objectives
Resource Management Strategies	Identify and implement adaptation strategies that address region-specific or local climate change contributions or impacts
Project Review Process	Include the following factors: • Contribution of the project to adapting to climate change • Contribution of the project in reducing GHG emissions as compared to project alternatives
Relation to Local Water Planning	Consider and incorporate water management issues and climate change adaptation and mitigation strategies from local plans into the IRWM Plan.
Relation to Local Land Use Planning	Demonstrate information sharing and collaboration with regional land use planning in order to management multiple water demands through the state (as described in CWP Update 2009), adapt water management systems to climate change, and potentially offset climate change impacts to water supply.
Plan Performance and Monitoring	Contain policies and procedures that promote adaptive management.
Coordination	Consider the following: • Stay involved in CNRA's California Adaptation Strategy process • Consider joining The California Registry (www.theclimateregistry.org)

1. Based on information in DWR's 2012 Prop 84 and Prop 1E IRWM Guidelines, Appendix C, Table 7

2.2 Adaptation and Mitigation Analysis

In order to meet the IRWM Plan standards discussed in the previous section, the climate change analysis process shown in Figure 1 was followed. As previously discussed in this Study, climate change includes both adaptation (responding to climate change) and mitigation (reducing GHGs), and therefore is reflected in the analysis process below. While both the adaptation analysis and mitigation analysis include a literature review, strategy identification and performance metrics development, the adaptation analysis includes an extra step to identify and prioritize climate change vulnerabilities. The information gathered through this climate change analysis will be incorporated into the Region's IRWM Plan update. By working through each of these steps, the Region can meet the requirements contained in DWR's IRWM Plan Guidelines.

Figure 1: Climate Change Analysis Process



2.3 San Diego IRWM Region Climate Change Study

To fulfill DWR's requirements and work through the climate change analysis discussed above, the Region established a Climate Change Workgroup (Workgroup) comprised of various water resources and planning representatives that have experience in climate change planning within the Region to work with a consultant to develop this Climate Change Planning Study (Study). In addition, local climate change efforts, in particular the San Diego Foundation Regional Focus 2050 Study which defines Region-specific climate change impacts, were used in the climate change assessment.

3 Effects of Climate Change on Region

3.1 Impacts and Effects on Region

Estimating the impacts of climate change at a regional level is challenging due to the coarse spatial scale of models that project climate change impacts of temperature and rainfall, and due to the long time scale evaluated in many models (to the year 2100). Recently, state and local entities have been working to downscale climate models to allow for climate change planning at a level that can be useful for planning efforts. The timescale used for these models has also been downscaled to provide outputs for the year 2050, and though this is still a longer timescale than is used in IRWM planning, is still useful for assessing climate change.

To incorporate climate change into water resources management, downscaled temperature and precipitation projections are input into other models, such as hydrologic models, to project impacts to water supply, water demand, snow pack, sea level rise, and wildfires. The results of these models have been summarized in a variety of studies and planning documents at the state, regional, and local levels. As part of this Study, a number of these documents were reviewed to determine which best represented the impacts for the Region. These documents include:

- *Regional Focus 2050 Study* (San Diego Foundation, 2008a & 2008b)
- *2010 Urban Water Management Plan* (San Diego County Water Authority, 2011)
- *Using Future Climate Projections to Support Water Resources Decision Making in California,* (California Climate Change Center, 2009)
- *Reconciling Projections of Colorado River Streamflow, Southwest Hydrology* (Hoerling et al., 2009)

Climate change impacts and effects are based on very different climate change assumptions and analysis approaches. Table 2 summarizes the impacts and effects of climate change on the San Diego Region by 2050 (unless otherwise indicated), which are typically based on an average of various climate change analyses. Generally, climate change is expected to increase temperature in the region. Rainfall projections vary with some projections showing that the Region will receive as much as 35% less rainfall and some showing up to 17% more rainfall (San Diego Foundation, 2008a). It's generally accepted that storms will be less frequent, but more intense (San Diego Foundation, 2008a). With higher temperatures and changes in rainfall volume and frequency, additional impacts will be felt in the Region.

Imported water supply from the State Water Project is projected to decrease by up to 25% (California Climate Change Center, 2009), while Colorado River Aqueduct supply may decrease by up to 20% (Hoerling et al, 2009). An overall shortfall of 164,000 acre-feet per year (AFY) in imported water is expected by 2050 (San Diego Foundation, 2008b).

Preliminary analysis of regional water demand trends in the San Diego County Water Authority service area indicate that climate change impacts may result in a slight demand increase, between 0.6 and 1.8%, by the year 2035. (SDCWA, 2011).

In currently accepted models, sea level rise is projected to be at least 12 to 18 inches by 2050, which would both inundate the coast due to the average rise, and impact coastal flood control during storms (San Diego Foundation, 2008a).

The changes to climate are also expected to increase the frequency of wildfires. Studies suggest that there will be a 40% increase in Coastal Sage Scrub acreage burned (San Diego Foundation, 2008a), and that 54% more acreage in the Western U.S. will burn compared to present (San Diego Foundation, 2008a). Increases in wildfires have the potential to increase sedimentation and turbidity of surface waters, and increase flash flooding.

Knowing what climate change impacts and effects are projected to have on the Region, it's possible to determine what water resources in the Region are most vulnerable to climate change. The next sections identify and prioritize the vulnerabilities to determine how to best apply management practices. These effects were presented to and vetted by the Workgroup at a meeting held on June 12, 2012.

Table 2: Impacts and Effects of Climate Change on Region by 2050

Impact	Effect
Temperature	• 1.5°F to 4.5°F average temperature increase
Rainfall	• Variable projections predict between 35% drier and 17% wetter • Increase in variability between years
Supply	• Up to 25% decrease in SWP supply • Up to 20% decrease in Colorado River supply • 164,000 afy average shortfall in imported supply
Demand	• Potential 0.6% to 1.8% increase in demand by 2035
Sea level rise	• 12 to 18 inch rise in mean sea level rise
Wildfires	• 40% increase in California Coastal Shrub acreage burned in Southwestern U.S. • 54% increase in overall acreage burned in Western U.S.

3.2 Identification of Vulnerabilities

Understanding the potential impacts and effects that climate change is projected to have on the Region allows an informed vulnerability assessment to be conducted for the Region's water resources. A climate change vulnerability assessment helps a Region to assess its water resource sensitivity to climate change, prioritize climate change vulnerabilities, and ultimately guides decisions as to what strategies and projects would most effectively adapt to and mitigate against climate change. DWR has identified a series of questions to help regions identify key indicators of potential vulnerability, including (DWR, 2011):

- Currently observable climate change impacts (climate sensitivity)
- Presence of particularly climate sensitive features, such as specific habitats and flood control infrastructure (internal exposure)
- Resiliency of a region's resources (adaptive capacity)

The Workgroup developed an analysis of the Region's vulnerabilities to climate change at the June 12, 2012 climate change workshop by asking a series of questions suggested by DWR in its 2011 *Climate Change Handbook for Regional Water Planning.* Table 3 summarizes the analysis, which includes:

- Vulnerability Question: Taken from Box 4-1 of DWR's *Climate Change Handbook*

- Answer: Provided at June 12, 2012 workshop
- Justification: Why Y (yes) or N (no) was selected
- Vulnerability Issue: What is the climate change vulnerability issue that is identified by asking the question?

Following this analysis, the vulnerability issues were prioritized by the Workgroup. This activity and results are described in Chapter 4.

Table 3: Climate Change Vulnerability Indicator Questions

Vulnerability Question	Answer	Justification	Vulnerability Issue
Water Demand			
Are there major industries that require cooling/process water in your planning region?	Y	Electronics and aerospace manufacturing, energy generation, research development, pharmaceutical. Biotech and energy growing. Room for efficiency improvements	Increase in industrial demand
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?	Y	Primary crops include avocados, nurseries and citrus which can be climate sensitive, but agricultural land use is expected to decrease. Rise in smaller agricultural/urban farms/residential gardens, and increased crop diversity. Decrease in larger agricultural users.	Increase in agricultural crop water demand per acre; small food production use of permaculture could decrease per acre use
Do groundwater supplies in your region lack resiliency after drought events?	Y	The small groundwater basins in the Region tend to decrease resiliency. Increasing impermeability reduces recharge. Sweetwater, Oceanside, Escondido/Vista. Salt water intrusion as water tables drop.	Lack of groundwater storage to buffer drought
Are water use curtailment measures effective in your region?	Y	Shortage management activities currently in place were effective in meeting demands during the last major drought which began in 2007. Management measures not previously considered, such as soil conditions, may provide additional opportunities.	Perceived limited ability to conserve further
Does water use vary by more than 50% seasonally in parts of your region?	Y	Water agencies have peaking factors ranging from 2:1 to 6:1. Some of the higher peaking agencies dependent on imported water will have reduced peaking as agricultural use declines and more development occurs.	Limited ability to meet summer demand
Are some in-stream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	N	Most streams are intermittent; however, some agencies that move water between reservoirs via streams have in-stream requirements to protect species during certain times of the year which impacts when water can be moved.	Habitat demand would be impacted
Water Supply			
Does a portion of the water supply in your region come from snowmelt?	Y	Imported supplies (SWP, Colorado River) come from snowmelt.	Decrease in imported supply
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?	Y	Approximately 80% of the Region's supplies are imported.	Decrease in imported supply

Vulnerability Question	Answer	Justification	Vulnerability Issue
Would your region have difficulty in storing carryover supply surpluses from year to year?	N	No, the County has sufficient storage capacity, and is currently completing an emergency storage carryover project. It should be noted that there is little transfer market available in California, with a focus of storage in northern California.	Decrease in reliability
Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	Y	Some brackish groundwater exists near the coast which limits the use of coastal aquifers.	Decrease in groundwater supply
Has your region faced a drought in the past during which it failed to meet local water demands?	Y	Drought management plans had to be put into effect. It should be noted that the Region has never failed to meet its customers' demands once drought measures were put into place. Development of additional supplies may reduce the Region's vulnerability to this issue.	Sensitivity due to higher drought potential
Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	Y	Quagga, Arundo, Tamarisk	Invasives can reduce supply available
Water Quality			
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?	Y	Wildfires are a common occurrence in the area, and often cause increased erosion in the Region's watersheds.	Increased erosion and sedimentation
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?	Y	Several water bodies are 303(d) listed for water quality issues related to eutrophication including the Lake Hodges, Famosa Slough, Guajome Lake, Loma Alta Slough, Mission Bay at the mouths of Rose Creek and Tecolote Creek, lower San Diego River, Sal Elijo Lagoon, Santa Margarita Lagoon, Tijuana River, and the Tijuana River Estuary.	Increased eutrophication
Are seasonal low flows decreasing for some water bodies in your region? If so, are the reduced low flows limiting the water bodies' assimilative capacity?	Y	At times during the year, the only flow in some streams is irrigation overflow, which in turn increase the concentration of constituents.	Increased constituent concentration
Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	Y	At times recreation use in some reservoirs is impacted, and beach closures occur. Wildlife habitat and freshwater habitat issues as well.	Decrease in recreational opportunity

Vulnerability Question	Answer	Justification	Vulnerability Issue
Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	Y	Total dissolved solids (TDS), turbidity and nutrient levels in reservoirs may increase during storm events, impacting water treatment, particularly after fires. Oils and feces show up in reservoirs as well.	Increase in treatment needs and cost
Sea Level Rise			
Has coastal erosion already been observed in your region?	Y	Coastal erosion occurs at unstable bluffs along the coast, for example: Sunset cliff, bluffs along City of San Diego, Encinitas, military infrastructure at Coronado Island and Camp Pendleton..	Decrease in land due to erosion
Do tidal gauges along the coastal parts of your region show an increase over the past several decades?	Y	San Diego Bay Adaptation shows increasing levels	Damage to coastal recreation/tourism due to inundation
Is there land subsidence in the coastal areas of your region?	N	None noted	
Are there coastal structures, such as levees or breakwaters, in your region?	Y	Examples include Mission Bay, San Diego Harbor	
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?	Y	Beach community - wide-spread	
Are there climate-sensitive low-lying coastal habitats in your region?	Y	Habitat type - salt marsh	Damage to ecosystems/habitats
Are there areas in your region that currently flood during extreme high tides or storm surges?	Y	Mission Valley flooded from San Diego river during high tidal events	Storm drains and sewer systems will be inundated
Flooding			
Does critical infrastructure in your region lie within the 200-year floodplain?	Y	There is low-lying water and wastewater infrastructure. Pump stations.	Increases in inland flooding
Does aging critical flood protection infrastructure exist in your region?	Y	San Diego River Flood Improvement project. San Diego River Improvement Project (SDRIP) at Mission Valley.	

Vulnerability Question	Answer	Justification	Vulnerability Issue
Have flood control facilities (such as impoundment structures) been insufficient in the past?	Y	Flooding (and flash flooding in particular) has been a danger in certain areas of the Region due to overflowing drainage channels, low lying areas with poor drainage, and debris build-up in basins. Some areas identified by the County include localized areas in Mission Valley, Moreno Valley, Ocotillo Wells, Lemon Crest, below San Vicente Reservoir, Ramona, etc.	
Are wildfires a concern in parts of your region?	Y	Wildfires are a common occurrence in the Region.	Increases in flash flooding
Does part of your region lie within the Sacramento-San Joaquin Drainage District?	N	Not applicable	Not applicable
Ecosystem and Habitat			
Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	Y	Erosion and sedimentation issues in Penasquitos Canyon, San Onofre, Crest Canyon, San Dieguito lagoon, Del Mar area, Encinitas area,	Increased impacts to coastal species
Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?	Y	A number of brackish lagoons exist along the coast including Batiquitos Lagoon, Buena Vista Lagoon, Agua Hedionda Lagoon, and San Elijo Lagoon.	
Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?	Y	Estuaries, coastal dunes, wetlands, marshes and exposed beaches exist along the entire coast of the region. Historically, coastal storms have caused erosion.	
Do climate-sensitive fauna or flora populations live in your region?	Y	Numerous species dependent upon the Mediterranean climate live in the Region	Decreases in ecosystem services
Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	Y	A number of endangered and threatened species exist in the Region.	Decrease in available, necessary habitat
Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	Y	Beach tourism, reservoir recreation, river trails	
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?	Y	Multiple Species Habitat Conservation Plans (MSHCPs) working on ensuring corridors but some need to be created	

Vulnerability Question	Answer	Justification	Vulnerability Issue
Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?	N	No, the Region is not within any of the ten listed habitats.	
Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?	Y	Some rivers and streams have quantified flow requirements but are primarily related to water rights. There is a bacteria Total Maximum Daily Load (TMDL) covers almost every water body in region. Nutrient TMDLs on lots of water bodies	Decrease in environmental flows
Hydropower			
Is hydropower a source of electricity in your region?	Y	Approximately 10% of electricity provided by SDG&E is hydropower. The Water Authority also produces hydroelectric power which is sold to San Diego Gas & Electric (SDG&E).	Decrease in hydropower potential
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 your region?	Y	Energy demand is expected to increase in the future with population increase and development. Additional hydropower was recently created at Lake Hodges/Olivenhain Reservoir, and an additional project is possible at the San Vicente Dam.	

4 Vulnerability Analysis

Once the Workgroup identified the Region's areas of concern in terms of climate change issues, it was able to begin examining the adaptability of its water resources to climate change by prioritizing the vulnerability issues. In prioritizing the vulnerability issues, the Workgroup identified those water resources that are of highest concern to the Region in terms of the significance of the impact of climate change and therefore the level of adaptation that will be needed.

4.1 Vulnerability Prioritization Process

The vulnerabilities identified were then prioritized during an exercise conducted with the Working group. Each member selected five vulnerability issues they determined should have the highest priority in being addressed. In total, the nine members of the Workgroup resulted in 45 votes. Votes were spread across nearly all of the categories, indicating the Workgroup perceived there to be a wide range of climate change vulnerabilities. The vulnerability issues were then grouped into five priority levels ranging from very high to very low according to the number of votes: very high (nine votes), high (three to four votes), medium (two to three votes), low (one to two votes), very low (no votes).

At a subsequent meeting held on July 26, 2012, the Workgroup reviewed the results and made suggestions for refinements that could be made to better align the prioritization with the vulnerabilities identified in planning documents. These suggestions were incorporated into the prioritized vulnerability issues which are shown in the next section.

4.2 Vulnerability Prioritization Results

The Region's list of prioritized vulnerabilities developed by the Workgroup is shown in Table 4, and discussed further below.

Table 4: Prioritized Climate Change Vulnerability Issues

Priority Level	Category and Vulnerability Issue
Very High	• Water Supply: Decrease in imported supply
High	• Water Supply: Sensitivity due to higher drought potential • Water Quality: Increased constituent concentrations • Flooding: Increases in flash flooding and inundation (extreme weather) • Sea Level Rise: Inundation of storm drains and sewer systems • Ecosystem/Habitat: Decrease in available necessary habitatEcosystem/Habitat: Decrease in ecosystem services
Medium	• Water Demand: Crop demand would increase • Water Demand: Industrial demand would increase • Water Supply: Decrease in groundwater supply • Water Quality: Increase in treatment cost • Sea Level Rise: Damage to coastal recreation / tourism due to inundation
Low	• Water Demand: Limited ability to conserve further • Water Supply: Lack of groundwater storage to buffer drought • Water Quality: Increased eutrophication • Flooding: Increases in inland flooding • Ecosystem/Habitat: Increased impacts to coastal species

Priority Level	Category and Vulnerability Issue
Very Low	• Water Demand: Limited ability to meet summer demand • Water Supply: Invasives can reduce supply available • Water Quality: Decrease in recreational opportunity • Sea Level Rise: Decrease in land • Sea Level Rise: Damage to ecosystem/habitat • Ecosystem/habitat: Decrease in environmental flows • Hydropower: Decrease in hydropower potential

Very High Prioritization

Water supply: Decrease in imported supply

The water supply vulnerability issue of "decrease in imported supply" was identified by the Workgroup as the highest priority issue. The Region is highly dependent on imported water with nearly 80% of its supplies currently coming from the State Water Project and the Colorado River aqueduct. Given the Region's limited local water supplies and the projected 20% to 25% decrease in imported water supply, a decrease in imported supply with climate change could have a significant impact on the Region and is an issue that needs to be addressed.

High Prioritization

Water Supply: Sensitivity due to higher drought potential

Climate change is expected to increase drought potential in the Region. In past years, water suppliers in the Region have successfully implemented drought management measures in order to lower demand. However, there are limits on the effectiveness of drought management measures. For example, tourists visiting the area are not likely to take part in drought management measures. Taking these issues into account, the Region is expected to be more susceptible to drought conditions. As drought is expected to increase in frequency and severity, more direct/long-term measures may be warranted as well as evaluation of revenue impacts to local water districts.

Water Quality: Increased constituent concentrations

The water quality vulnerability issue of increased constituent concentrations with climate change was ranked highly as water bodies in the area already require treatment to meet water quality standards, such as pathogens and nutrients. Climate change is expected to decrease local water resources in the future, which will increase constituent concentrations leading to difficulty in meeting water quality standards and increases to treatment cost.

Flooding: Increases in flash flooding and inundation (extreme weather)

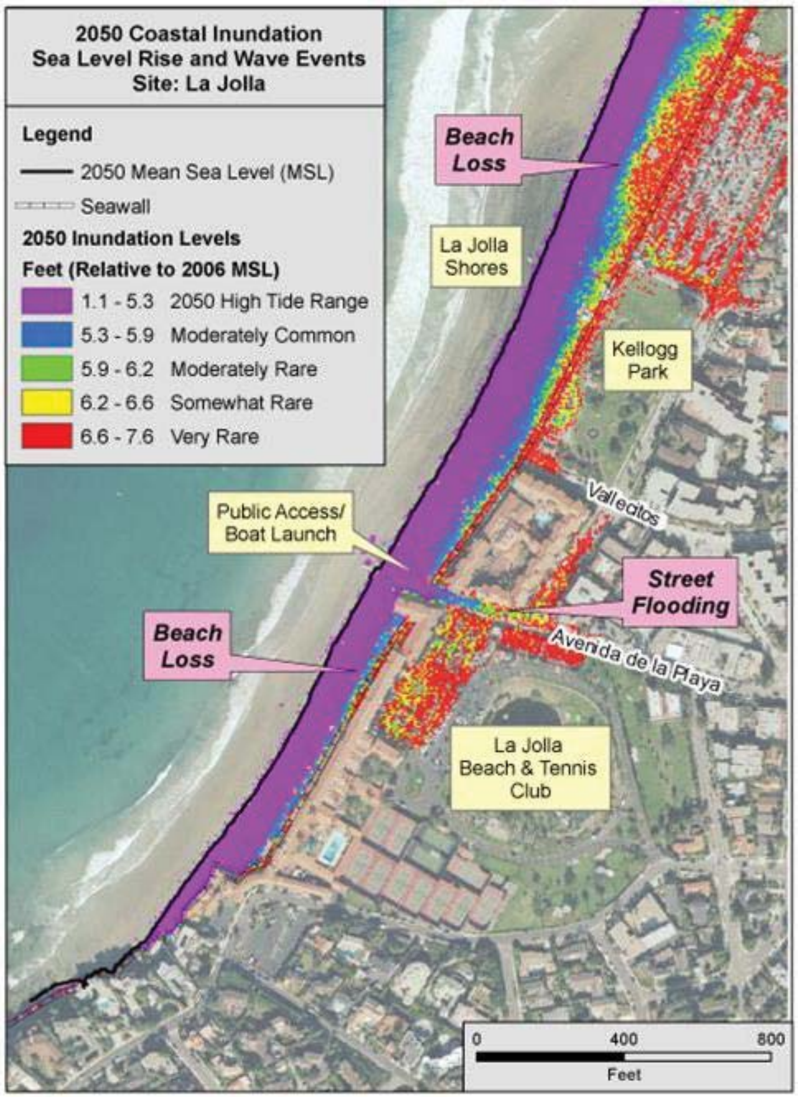
Flash flooding has been an issue for the Region in the past. Foothill areas are especially in danger from flash floods from large seasonal storms, which become a greater concern as the Region is prone to wildfires. Given that more frequent and intense storms are predicted as a consequence of climate change, in addition to increased wildfire risk, increases in flash flooding and inundation are of high concern.

Sea Level Rise: Inundation of storm drains and sewer systems

Regional studies have found that sea level rise is already occurring, and is expected to continue to rise an additional 12 and 18 inches by 2050. This new sea level will inundate a number of low-lying areas along the Region's coast such as Oceanside, La Jolla, Del Mar, Mission Beach, Coronado Island

and Camp Pendleton (Coastal Data Information Program, 2008), and impact their storm drains, wastewater systems, and other facilities and infrastructure. Coastal stormwater infrastructure and wastewater infrastructure that discharge to the ocean will be inundated with increased sea level rise, in particular during coastal storms, causing increased coastal flooding and sewer system overflows. An example of the extent of sea level rise on La Jolla is shown in Figure 2. Concern over aging systems and systems not designed for the increased capacity that will be needed with sea level rise led the group to give this issue a high-priority ranking

Figure 2: Projected 2050 Coastal Inundation with Sea Level Rise in La Jolla



(CDIP, 2008)

Ecosystem/Habitat: Decrease in available necessary habitat

The Region has numerous unique habitat areas extending from the mountains to the oceans which sensitive and endangered species are dependent upon. Anticipated higher temperatures, longer more frequent droughts, and more extreme precipitation events are projected to cause shifts and loss of habitat necessary for these species. Of particular concern to IRWM planning is the shift and loss of riparian and wetland habitat. Riparian habitat will be altered due to decreased flows, increased water temperatures and increased constituent concentrations. These reductions in habitat and associated loss of sensitive and endangered species will, in turn, create biodiversity shifts and increase invasive species.

Ecosystem/Habitat: Decrease in ecosystem services

Ecosystem services provide important functions, such as material cycling and treatment of stormwater runoff that, if decreased, may result in the need for additional water treatment. As discussed above, climate change is expected to decrease available necessary habitat. This reduction in habitat and associated biodiversity shift and increase in invasive species is expected to decrease ecosystem services in the Region, and could result in additional cost.

Medium Prioritization

Water Demand: Increase in agricultural crop water demand per acre

Crop water demands are expected to increase with the increased temperatures caused by climate change. Though the number of acres of agricultural land is expected to decrease slightly in the future, the net demand for irrigation supply on the remaining acres may exceed current demand under climate change conditions. Through current jurisdictional plans, notably the County of San Diego General Plan, it is apparent that agriculture is an important industry to the Region, particularly smaller agricultural productions and urban farms that provide an economic base and community character to the Region. Given that agricultural land is decreasing, the Workgroup has given this climate change vulnerability issue a medium prioritization.

Water Demand: Increase in industrial demand

Industrial demand is expected to increase with temperature increases due to the need for cooling and process water. This vulnerability issue is particularly of concern for industries such as electronics and aerospace manufacturing, energy generation, research development and the pharmaceutical industry. Industrial demand increases are of concern in particular as increased demand in the Region could impact companies' decision to locate their plants within the Region, which would impact economic development.

Water Supply: Decrease in groundwater supply

Groundwater supply is projected to decline by seven inches per year with climate change. In addition, sea water intrusion caused by rising sea levels also has the potential to impact groundwater supply quality, which will reduce the amount of groundwater available for pumping. Despite these impacts, this vulnerability issue was prioritized as medium since the Region only obtains a small portion of its supplies through groundwater due to the limited size of the groundwater basins. This issue may be of a higher priority in localized areas such as the community of Lakeside, the Marine Corps Base at Camp Pendleton, Pauma Valley, the San Luis Rey River area, and National City where groundwater is a greater portion of supply.

Water Quality: Increase in treatment cost

Total dissolved solids (TDS) levels in reservoirs may increase due to increases in precipitation intensity, particularly after fires, which would in turn increase the cost of water treatment. The Region has a number of reservoirs which are downstream of forested watersheds, and are susceptible to increased turbidity due to runoff from the surrounding area. However, this is not currently a large issues and therefore, the Workgroup rated this vulnerability issue as medium.

Sea Level Rise: Damage to coastal recreation / tourism due to inundation

As discussed previously, sea level rise is already documented as occurring, and is expected to continue to rise to between 12 and 18 inches by 2050. This rise in sea level is expected to cause damage to coastal recreation and tourism areas (such as beaches), though planning efforts such as the *Sea Level Rise Adaptation Strategy for San Diego Bay*, are ongoing. As the Region's economy relies partially on recreation and tourism, this vulnerability issue has been given a medium prioritization.

Low Prioritization

Water Demand: Limited ability to conserve further

The Region has already succeeded in implementing a large amount of water use efficiency measures. These measures have proven to be successful in mitigating against droughts such as in the severe drought that occurred in 2007. With this in mind, the Region may have difficulty in conserving further to meet greater drought frequency and intensity. However, additional savings measures are available and are being incorporated into Urban Water Management Plans and local climate action plans, which allow the Region to classify this issue as low.

Water Supply: Lack of groundwater storage to buffer drought

As mentioned under the water supply issue of decrease in groundwater supply, the Region's groundwater basins are limited in size, meaning there is very limited storage availability in the groundwater basins for use in buffering drought. Despite this, the Region's low reliability on groundwater makes this issue relatively less of a priority.

Water Quality: Increased eutrophication

Several water bodies in the Region are 303(d) listed for water quality issues related to eutrophication, including a number of lagoons, Tecolote Creek, lower San Diego River, and the Tijuana River Estuary. Consequently, it's probable that temperature increases caused by climate change could increase eutrophication of the Region's water bodies. This climate change vulnerability was ranked low, however, relative to other water quality vulnerability issues.

Flooding: Increases in inland flooding

Inland flooding was listed as a low priority for the Region, though there has been localized flooding in low-lying areas caused by insufficient and/or aging flood infrastructure. More extreme storms due to climate change could cause an increase in inland flooding, but as this is not a Region-wide issue, it has been prioritized as low as the Workgroup felt that this issue could best be addressed through local planning efforts.

Ecosystem/Habitat: Increased impacts to coastal species

Coastal dunes, wetlands, marshes and beaches provide unique habitats for the Region's species. Changes to temperature and precipitation have the potential to impact sensitive species. In addition, brackish lagoons provide estuarine habitat that depends on seasonal freshwater flow patterns. Habitat shifts and loss caused by climate change induced sea level rise, coastal erosion, and changes to freshwater flow patterns could also impact coastal species. Because coastal species are already protected and because this is a localized issue, the Workgroup decided to classify it as low priority.

Very Low Prioritization

Water Demand: Limited ability to meet summer demand

Increased seasonal temperatures associated with climate change may create a challenge for the Region in meeting summer demands. However, as this is an issue mainly caused by agricultural and urban irrigation, it is ranked low compared to other vulnerability issues.

Water Supply: Invasives can reduce supply available

Invasive species in the Region such as Arundo, Tamarisk and Quagga mussels have the potential to damage water conveyance facilities. Climate change is expected to increase invasive species in the region, which has the potential to impact water supplies in the future. However, this is not currently an issues affecting the Region's water supply infrastructure, and therefore is ranked very low.

Water Quality: Decrease in recreational opportunity

As previously discussed, climate change is expected to increase constituent concentrations in the Region's reservoirs and beaches, a number of which are frequently used for recreation. The Regional already experiences beach closures due to poor stormwater quality which deposits contaminants in near shore areas. A decrease in water quality could impact this beneficial use of these water resources. However, because this is a localized issue, it is ranked very low.

Sea Level Rise: Decrease in land

Coastal erosion is already occurring in the Region along bluffs and cliffs. The continued rise of sea level with climate change is expected to continue to erode land along the Region's coast, and could eventually begin to impact water and wastewater facilities near to the coast, but is a localized issue.

Sea Level Rise: Damage to ecosystem/habitat

As discussed under the vulnerability issue of *increased impacts to coastal species*, sea level rise can be expected to damage coastal ecosystems and habitats. This may occur both through loss of land and through alterations to freshwater flow patterns. Again though, this is a localized issue.

Ecosystem/habitat: Decrease in environmental flows

Aquatic and wetland species often depend upon a minimum flow to survive, and could be impacted with a decrease in minimum flow caused by climate change. In addition, a reduction in flows may increase constituent concentrations in the Region's waters that could stress aquatic life. There are a number of known water quality issues that have the potential to impact species should they worsen in the future, however, there are currently no minimum environmental flows in the Region's rivers and streams,

Hydropower: Decrease in hydropower potential

The Region currently generates 40 megawatts of peak hydropower at the Olivenhain Reservoir and additional hydropower at the Rancho Peñasquitos Pressure Control Hydroelectric Facility, and is examining potential for construction of hydropower facilities elsewhere. Alterations to the Region's hydrology could decrease hydropower generation potential, however, hydropower generation within the Region is not currently a major electricity source.

Vulnerabilities Summary

As can be seen in the above discussion, the Region is faced with a wide range of climate change vulnerability issues. Should the Region not implement strategies to adapt to these, it would face a number of risks, such as:

- Insufficient water supply if current dependence on imported supply is maintained
- Inability to meet demand during droughts given increased overall seasonal demands without increases in long-term operational storage
- Poorer water quality that further impacts beneficial uses and increases treatment needs
- Damage from increased flash flooding and inland flooding
- Coastal flooding and inundation of storm drains and sewer systems due to sea level rise
- Damage to coastal ecosystems and habitats, and associated impacts to sensitive species due to reduced terrestrial flows and sea level rise

5 Climate Change Management Strategies

The next step in conducting the Region's climate change analysis is to identify appropriate strategies for adapting to the climate change vulnerability issues identified and prioritized in Chapter 4. The strategies selected will help the region to respond to or prevent future impacts of climate change on water resources. These strategies also have the potential to mitigate against further climate change by reducing the energy used to treat or convey water supplies and reducing GHG emissions, and some have the potential to provide carbon sequestration. This chapter details how the Workgroup identified, evaluated and prioritized adaptation and mitigation strategies relevant to the Region.

5.1 Identification of Strategies

Strategies were identified through the review of relevant climate change related documents. These documents include:

- California Water Plan (DWR, 2009)
- Managing an Uncertain Future (DWR, 2008)
- Climate Change Scoping Plan (CARB, 2006)
- Climate Action Team Biennial Report (CalEPA, 2010)
- Resolution on Sea Level Rise (OPC, 2010)
- California Climate Extremes Workshop Report (Scripps, 2011)

The California Water Plan contains Resource Management Strategies (RMS) that provide the primary list of strategies used for this Study. The remaining documents in the above list were reviewed for additional and/or more detailed versions of the strategies. The Workgroup reviewed the strategies from the above documents, and discussed them relative to each strategy's potential for addressing the vulnerability issues prioritized above and mitigating GHG emissions.

5.2 Strategy Prioritization

A series of criteria were used by the Workgroup to refine and prioritize the list of strategies. The Workgroup first determined which strategies may be infeasible or not currently relevant to the Region at this time, or were determined not to be desired by the Region, and were not considered further in the strategy identification process.

Following the acceptance screening process, the strategies were analyzed further by evaluating each strategy according to the following questions:

- Is the strategy a "no regret" strategy?
- Does the strategy help to adapt to the vulnerability issues identified and evaluated in Chapters 3 and 4 of this Study?
- Does the strategy help the Region to mitigate GHGs?

By definition, "no regret" strategies are those strategies that would provide benefits today while also reducing vulnerability to climate change impacts. "No regret" strategies are desirable for immediate implementation as they will provide some benefit even under the uncertainty of climate change projections. The strategies were cross referenced with the vulnerability issues discussed in Chapters 2 and 3 to determine the number and type of climate change vulnerabilities that can be addressed. In addition, a strategy received a higher priority if it addresses vulnerability issues vulnerable determined to be high priority. Finally, the strategies were evaluated to determine whether they would mitigate GHG emissions through energy efficiency, emissions reduction, and/or carbon sequestration. Appendix A shows the results of this evaluation.

Using this evaluation, an initial prioritization was completed based on the criteria shown in Table 5.

Table 5: Initial Strategy Prioritization Criteria

Tier	Criteria
Tier 1	• Considered "no regret" • Mitigates GHGs/is GHG neutral • Addresses the imported water (very high) vulnerability
Tier 2	• Included in other local climate change documents • Mitigates GHGs/is GHG neutral • Addresses at least 3 vulnerability areas
Tier 3	• Addresses at least 1 vulnerability or mitigates GHGs

This initial prioritization was then presented to the Workgroup at the August 23, 2012 meeting where the listing of strategies and prioritization were further refined to best represent the needs of the Region. The final list of prioritized climate change management strategies and definitions is shown in Table 6, Table 7 and

Table 8 as Tier 1, 2, and 3 strategies. Strategies that were not prioritized as they were determined to be infeasible or irrelevant for the Region, or would have opposition, are shown Table 9. By prioritizing these strategies, the Region can better define the types of projects and targets that will help respond to climate change.

Table 6: Tier 1 Climate Change Management Strategies

Strategy	Description
Reduce Water Demand	
Urban water use efficiency	Technological and behavioral improvements that decrease indoor and outdoor residential, commercial, industrial and institutional water use.
Crop idling for water transfers	Remove lands from irrigation (with the aim of returning the lands to irrigation at a later time) in order to make water available for transfer.
Education	Implement outreach program to educate urban and agricultural water users in water demand reduction practices.
Gray water use	Implement gray water use systems to reduce water supply demand.
Rainfed agriculture	Transfer crop consumptive use to be supplied directly by rainfall.
Improve Operational Efficiency/Transfers	
Conveyance - Regional/local	Improvements to regional and local conveyance facilities that improve conveyance capacity, including locating and widening narrow points that constrict the movement of water to increase the water transmission capacity of the entire system, and improve operational flexibility.
System Reoperation	Change existing operation and management procedures for existing reservoirs and conveyance facilities to increase water related benefits from these facilities. May improve the efficiency of existing water uses or may increase the emphasis of one use over another.
Increase Water Supply	
Conjunctive Management & Groundwater Storage	Coordinate and plan use and management of both surface and groundwater resources to maximize the available and reliability of supplies.
Recycled Municipal Water	Increase supply of recycled water through additional wastewater treatment, and/or expand conveyance of recycled water to end users.
Improve Water Quality	
Drinking Water Treatment and Distribution	Develop and maintain adequate water treatment and distribution facilities, and protect the quality and safety of the raw water supply.
Groundwater/Aquifer Remediation	Remove contaminants that affect the beneficial use of groundwater. Can include passive or active methods.
Pollution Prevention	Prevent pollution of local surface waters and groundwater using tools that prevent point and non-point sources of pollution. Examples include water management actions and projects such as the increase of local flows, recharge area protection, etc.
Salt and Salinity Management	Manage salt and salinity in surface and/or groundwater. Examples of methods include dilution and displacement, desalination, and salt collection and storage. The Region is currently working to meet State Salinity/Nutrient Management Planning Guidelines, and will help to implement this strategy.
Urban Runoff Management	Prevent pollution of local surface waters by implementing best management practices (BMPs) designed to reduce the pollutant loading and reduce the volumes and velocities of urban runoff discharged to surface waters.
Improve Flood Management	
Flood Risk Management	Enhance flood protection through projects and programs that assist in the management of flood flows and to prepare for, respond to, and recover from a flood.
Practice Resource Stewardship	

Strategy	Description
Agricultural Lands Stewardship	Conserve natural resources and protect the environment by conserving and improving land for food, fiber and biofuels production, watershed functions, soil, air, energy, plant and other conservation purposes. Can also protect open space and the traditional characteristics of rural communities.
Economic Incentives (Loans, Grants, Water Pricing)	Provide incentives such as financial assistance, water pricing, and water market policies intended to influence water management in order to influence amount of use, time of use, wastewater volume, and source of supply.
Ecosystem Restoration	Improve the condition of modified natural landscapes and biological communities to provide for their sustainability and for their use and enjoyment by current and future generations.
Land Use Planning and Management	Integrate land use and water management for the planning of housing and economic development needs of a growing population while providing for the efficient use of water, water quality, energy and other resources.
Recharge area protection	Protect recharge areas to ensure that areas suitable for recharge continue to be capable of adequate recharge rather than covered by urban infrastructure, and prevent pollutants from entering groundwater.
Water-dependent recreation protection	Incorporate planning for water-dependent recreation activities in water project, and implement project that protect/create water-dependent recreation opportunities.
Watershed/Soils/Forest management	Create and implement plans, programs, projects and activities to restore, sustain, and enhance watershed functions, soil functions, and forests.
Water-dependent cultural resources and practices preservation	Create and implement plans, programs, projects and activities to preserve water-dependent cultural resources and practices
Increase urban forest management	Encourage the planting of trees in urban areas to improve urban water quality and local supplies.
Sea Level Rise	
Building water facilities in coordination with land use/sea level rise (SLR) planning	Integrate water/wastewater resources planning with land use/sea level rise planning.

Table 7: Tier 2 Climate Change Management Strategies

Strategy	Description
Improve Operational Efficiency/Transfers	
Conduct emissions inventory and target	Create inventory of all emission coming from water/wastewater operations, and develop a target for reduction of emissions.
Increase use of renewable energy sources	Use renewable energy sources for the treatment and conveyance of water and wastewater.
Increase Water Supply	
Surface Storage - Regional/local	Add or increase the storage capacity of surface storage reservoirs to increase carryover storage and optimize supplies in drought situations.
Improve Flood Management	
Protective Infrastructure	Construct flood management facilities to reduce the impact of climate change enhanced flooding.
Sediment Management	Implement sediment management practices to reduce the impact of climate change enhanced flash flooding.
Sea Level Rise	
Protect water facilities through the relocation or removal of vulnerable structures	Relocate or remove water/wastewater facilities that may be impacted by sea level rise.
Protect resources and facilities by constructing seawalls or levees	Construct seawalls or levees to protect from sea level rise caused by climate change.
Protect/restore/create coastal wetlands	Protect, restore or create coastal wetlands to prevent the loss of wetland due to sea level rise.

Table 8: Tier 3 Climate Change Management Strategies

Strategy	Description
Reduce Water Demand	
Water Meters Installation	Installation of water meters in order to bill customers volumetrically.
Improve Operational Efficiency/Transfers	
Treatment and Distribution Efficiency	Improve treatment and distribution efficiency or water/wastewater systems in order to reduce energy usage.
Water Transfers	Transfer or exchange of water or water rights that result in temporary or long-term change in the point of diversion, place of use, or purpose of use.
Localized Treatment	Implement localized (or decentralized) treatment of water/wastewater to reduce the energy required for conveyance.
Shift water use to off-peak hours	Implement policies that will shift water use (e.g. irrigation) to off-peak hours to reduce evaporative loss.
Optimize Sewer Systems	Optimize sewer systems (wastewater or stormwater) to adapt to increased precipitation caused by climate change.
Increase Water Supply	
Desalination (Seawater or Brackish Groundwater)	Construct desalination plant to treat seawater or brackish groundwater.
Indirect Potable Reuse/ Potable Reuse	Implement program that will use recycled water to recharge groundwater, or use advanced treated recycled water to augment drinking water supplies.

Table 9: Additionally Reviewed Climate Change Management Strategies

Strategy
Reduce Water Demand
Irrigated Land Retirement
Improve Operational Efficiency/Transfers
Conveyance - Delta
Increase Water Supply
Waterbag Transport/Storage Technology
Precipitation Enhancement
Surface Storage – CALFED
Dewvaporation or Atmospheric Pressure Desalination
Fog Collection
Matching Quality to Use
Sea Level Rise
Rolling Easements
Expendable/Movable Structures in Risk Areas

5.3 Performance Measures/Metrics for Adaptation and Mitigation Strategies

The set of strategies evaluated in the previous section were determined to be those that will best help the Region in responding to and reducing climate change impacts. When implementing these strategies, it will be necessary to develop performance measures or metrics to assess the effectiveness of a project in meeting the Region's goals. Though specific measures and metrics will be defined according a specific project or portfolio of projects, Table 10 provides examples of how these measures or metrics might be defined according to general water resource perspective. It should be noted that several of the strategies (the no regret strategies) may apply to additional objectives in the Region's IRWM Plan, and not solely to adapting to and/or mitigating climate change. Without specific metrics, it would be difficult to assess the effectiveness of strategies in responding to climate change. Moreover, some of the strategies implemented to adapt to climate change are "good planning" for future vulnerabilities and may not be immediately measurable. Many of the effects of climate change are anticipated past the planning horizon of the IRWM Plan. To respond to this uncertainty, the Region should update this climate change analysis during each IRWM Plan update, and implement adaptive management measures which will be discussed in the next chapter.

Table 10: Sample Performance Measures/Metrics

Strategy Category	Sample Performance Measures/Metrics
Reduce Water Demand	• Average (annual) water demand reduction • Peak (seasonal, monthly) water demand reduction
Improve Operational Efficiency	• Additional supply • Supply reliability
Increase Water Supply	• Additional supply • Potable demand offset • Supply reliability
Improve Water Quality	• Salt line migration • Stream temperature • Dissolved oxygen • Turbidity • Pollutant concentrations
Improve Flood Management	• Acres of a certain habitat or floodplain function restored/protected • Volume of natural flood storage provided • Storm return period used for planning • Expected damage resulting for a certain return period storm
Practice Resource Stewardship	• Presence/absence of key indicator species • Acres of a certain habitat or floodplain function restored/protected • Volume of natural flood storage provided • Acres of recharge area protected
Sea Level Rise	• Acres of coastal wetlands created/restored/protected • Miles of pipeline or number of facilities relocated away from coastlines • Length of coastline protected by seawalls or levees

6 Recommendations

The Region has taken the first steps in planning for climate change by examining current climate change projections to determine potential impacts, assessing water resource vulnerabilities, and developing a series of strategies that can be used in projects to adapt to climate change and mitigate GHGs. Chapter 6 discussed recommendations that may be used to successfully implement these strategies, including: use of adaptive management, objectives and targets for inclusion in the IRWM Plan, and project selection considerations for including climate change.

6.1 Adaptive Management

There is a level of uncertainty in projecting the effects and impacts of climate change. To respond to this, DWR recommends the use of adaptive management in implementing climate change strategies (DWR, 2011). Adaptive management consists of identifying and monitoring the most important uncertainties and translating them into risk triggers or early warning indicators. This allows for a flexible path of actions to take as triggers occur. DWR's *Climate Change Handbook* recommends the following steps in developing an adaptive management plan:

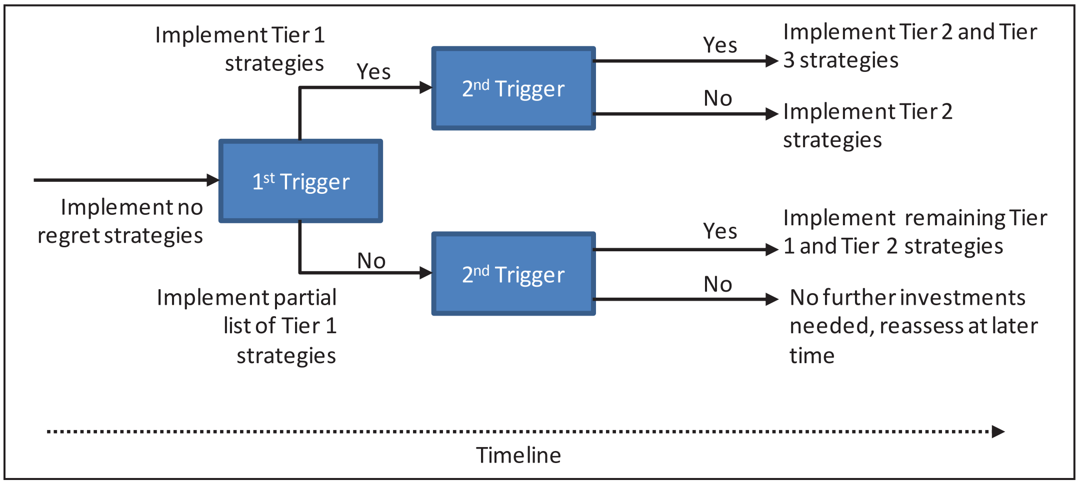
1. Identify risk triggers associated with important vulnerabilities or uncertainties
2. Quantify impacts and uncertainties
3. Evaluate strategies and define flexible implementation paths of action that allows for multiple options at specific triggers
4. Monitor performance and critical variables in the system
5. Implement or reevaluate strategies when triggers are reached

Under Step 1, the Region identifies risk triggers in order to monitor the Region's response to climate change. Risk triggers can be established deterministically (e.g., a threshold) or probabilistically (e.g. frequency of exceedance). The quantification of risk triggers are developed in Step 2, and serve as the basis for the definition of a path for plan implementation under Step 3.

Step 3 involves the definition of an implementation path for the evaluated strategies, and is central to the adaptive management process. The implementation path incorporates risk triggers over the course of time to allow the Region to determine what level of climate change adaptation/mitigation strategy should be implemented. Step 4 of the process, performance monitoring, incorporates performance measures and metrics used to evaluate water resources projects, and will help to define whether a risk trigger has been reached. Step 4 leads into the final step of implementing or reevaluating strategies, Step 5. The general structure of an adaptive management plan can be seen in Figure 3.

The key to successfully implementing the adaptive management process over time is continued active participation by stakeholders, and a clear understanding of project objectives. This should involve ongoing identification, monitoring, and updating of the most important impacts and uncertainties, and re-evaluation of the Region's vulnerabilities (DWR, 2011).

Figure 3: General Adaptive Management Plan



6.2 Climate Change Related Objectives and Targets

DWR requires that climate change be incorporated in the development of IRWM Plan objectives in terms of both climate change adaptation and GHG mitigation (DWR, 2012b). The strategies developed in Chapter 4 include both adaptation and mitigation, and therefore can be incorporated into climate change related objectives and targets that will meet DWR's requirement. The following objective and targets are recommended for inclusion in the IRWM Plan:

Objective: Effectively address climate change through adaptation and mitigation in water resource management.

Target 1: Encourage development of cost-effective carbon-efficient strategies for water management projects.

Target 2: Incorporate adaptation strategies to respond to sea-level rise, rainfall variability, and temperature variability in planning for water and wastewater management.

Target 3: Reduce or neutralize GHG emissions in all areas of water resource management.

6.3 Climate Change in Project Selection Considerations

In order for the Region to adapt to and mitigate against climate change, it will be necessary to ensure that projects utilize strategies identified in this study as helping the Region to adapt to and mitigate against climate change. It is recommended that the Region consider using the strategy priority levels discussed in Chapter 5 to assess the adaptation capacity of the project, and also consider whether the project helps the Region to mitigate GHGs. Oftentimes, a project that implements multiple strategies has the potential to increase the level of benefits provided while reducing the unit cost.

A recommended prioritization approach is presented in Table 11. In these prioritization criteria, projects are given higher priority for utilizing Tier 1 strategies and lower priority for Tier 3 strategies. Additionally, projects that contribute to two or more GHG measures, including energy efficiency, emissions reduction and carbon sequestration, are prioritized more highly. Projects that contribute to one of these mitigation measures receive higher prioritization, and projects that would increase GHGs receive reduce prioritization. In the future, it is recommended that the Region define a threshold for GHG production or remediation to be used in the prioritization of projects. A worksheet to assist the Region in scoring projects according to the number of strategies utilized can be found in Appendix B. In this way, the Region can ensure that projects will help it to both adapt to climate change vulnerabilities of high concern, and will mitigate against climate change.

Table 11: Climate Change Project Prioritization Criteria

Adaptation	Mitigation[1]	Priority
Tier 1 Strategy	Contributes to 2 out of 3 mitigation measures	High
	Contributes to 1 out of 3 mitigation measures	High
	Increases greenhouse gasses	Medium or Low
Tier 2 Strategy	Contributes to 2 out of 3 mitigation measures	High
	Contributes to 1 out of 3 mitigation measures	Medium
	Increases greenhouse gasses	Low
Tier 3 Strategy	Contributes to 2 out of 3 mitigation measures	Medium
	Contributes to 1 out of 3 mitigation measures	Low
	Increases greenhouse gasses	Low

1. Mitigation measures referred to are: energy efficiency, emissions reduction, and carbon sequestration

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