APPENDIX F

CWA 2010 UWMP

San Diego County Water Authority

DRAFT

San Diego County Water Authority
2010 Urban Water Management Plan

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DRAFT 2010 Urban Water Management Plan

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Acronyms and Abbreviations

µg/l	micrograms per liter
°F	degrees Fahrenheit
2005 Plan	Updated 2005 Urban Water Management Plan
2010 Plan	2010 Urban Water Management Plan
AAC	All-American Canal
AB	Assembly Bill
Act	Urban Water Management Planning Act
AF/YR	acre-feet per year
AWMP	Agriculture Water Management Program
AWP	Advanced Water Purification
BDCP	Bay Delta Conservation Plan
BiOp	Biological Opinion
Blueprint	Blueprint for Water Conservation
BMPs	best management practices
Board	Board of Directors
CAC	Conservation Action Committee
CAWCD	Central Arizona Water Conservation District
CC	Coachella Canal
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
CIP	Capital Improvement Program
CO_2	carbon dioxide
CRA	Colorado River Aqueduct
CSP	Carryover Storage Project
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVWD	Coachella Valley Water District
CWSRF	Clean Water State Revolving Fund
D/DBP	Disinfection Byproducts
DBPs	disinfection byproducts
Delta	Sacramento–San Joaquin River Delta

DHCCP	Delta Habitat Conservation and Conveyance Program
DOE	U.S. Department of Energy
DPH	Department of Public Health
DWA	Desert Water Agency
DWR	California Department of Water Resources
EIR	environmental impact report
EIS	environment impact statement
EPA	U. S. Environmental Protection Agency
ESA	Endangered Species Acts
ESP	Emergency Storage Project
Forum	Colorado River Basin Salinity Control Forum
GCM	General Circulation Model
GIS	geographic information system
GO	General Obligation
GPCD	gallons per capita per day
GRP	Groundwater Recovery Program
ICP	Integrated Contingency Plan
ID	Irrigation District
IID	Imperial Irrigation District
IPCC	Intergovernmental Panel on Climate Change
IRWM	Integrated Regional Water Management
lb/day	pounds per day
LISA	Local Investigation and Studies Assistance Program
LPP	Local Projects Program
LRP	Local Resources Program
LWSD	Local Water Supply Development
M&I	municipal and industrial
MAIN	Municipal And Industrial Needs
Master Plan Update	2012 Regional Water Facilities Optimization and Master Plan Update
M&I	Municipal and Industrial
Master Plan	2002 Regional Water Facilities Master Plan
MBR	Membrane Bioreactor
MCB Camp Pendleton	Marine Corps Base Camp Pendleton
MCL	Maximum Contaminant Level
mg/l	milligrams per liter
MGD	million gallons per day
Mission RCD	Mission Resource Conservation District
MOU	Memorandum of Understanding
MSCP	Multi-Species Conservation Program

MTBE	Methyl Tertiary Butyl Ether
MW	megawatts
MWD	Municipal Water District
NCCP	Natural Community Conservation Plan
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OM&R	Operation, Maintenance, and Repair
Otay	Otay Water District
pCi/l	picocuries per liter
PL	Public Law
Poseidon	Poseidon Resources
ppm	parts per million
Project	Carlsbad Desalination Project
PUD	Public Utility District
QSA	Quantification Settlement Agreement
Regional Board	Regional Water Quality Control Board
RFP	Request for Proposal
RO	reverse osmosis
ROD	Record of Decision
RSF	Rate Stabilization Fund
RUWMP	Regional Urban Water Management Plan
RWDF	Recycled Water Development Fund
RWMG	Regional Water Management Group
SANDAG	San Diego Association of Governments
SAWR	Special Agricultural Water Rate
SB	Senate Bill
SBX7-7	Senate Bill 7 of the Seventh Extraordinary Session of 2009 (Water Code §10608); also known as Water Conservation Act of 2009
SCSC	Southern California Salinity Coalition
SDCWA	San Diego County Water Authority
SDGE	San Diego Gas & Electric
SDWA	Safe Drinking Water Act
SEMS	Standardized Emergency Management System
SNWA	Southern Nevada Water Authority
SWA	Source Water Assessment
SWAT	Smart Water Application Technologies
SWP	State Water Project
SWRCB	State Water Resources Control Board

TDS	total dissolved solids
TOC	total organic carbon
Transfer Agreement	Water Authority–IID Water Conservation and Transfer Agreement
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
VIP	Voucher Incentive Program
Water Authority	San Diego County Water Authority
WD	Water District
WSAP	Water Supply Allocation plan
WSDM	Water Surplus and Drought Management
WSDRP	Water Shortage and Drought Response Plan
WTP	Water Treatment Plant
WUCA	Water Utility Climate Alliance

Section 1
Introduction

The San Diego County Water Authority's (Water Authority) 2010 Urban Water Management Plan (2010 Plan) has been prepared in accordance and compliance with the Urban Water Management Planning Act (Act) (Water Code §10610 through 10656) and includes the conservation measures, programs and policies required by Water Code §10608.36.

Urban water suppliers are required by the Act to update their Urban Water Management Plan (UWMP) and submit a complete version to the California Department of Water Resources (DWR) every five years. The plan serves as the Water Authority's long-term planning document to ensure a reliable water supply for the region. In accordance with its Administrative Code, the Water Authority will also prepare annual water supply reports commencing in 2012 to provide updated information on development of local and imported water supplies. New for the 2010 Plan are the following sections: the Water Authority's climate change mitigation and adaptation strategies in **Section 1.7.3**; measures, programs, and policies to achieve per capita water use targets as required by Water Code § 10608.36 at both the retail agency level and the Water Authority as a wholesale provider in **Sections 1.2, 2.4.2,** and **3**; a discussion on the Water Authority's Integrated Regional Water Management Plan in **Section 8**; the Water Authority's Scenario Planning process to deal with future uncertainties in long-range water planning in **Section 10**; and details on the 2007-2011 water shortage in **Section 11**.

The Water Authority's mission is to provide a safe and reliable supply of water to its member agencies serving the San Diego region. This 2010 Plan identifies a diverse mix of water resources projected to be developed over the next 25 years to ensure long-term water supply reliability for the region.

Since adopting the Updated 2005 Urban Water Management Plan (2005 Plan), the Water Authority and its member agencies have made great strides in conserving and diversifying its supplies. With an aggressive conservation program, the region has conserved an average of 53,605 acre-feet per year (AF/YR) of water over the last five years when compared to the benchmark year of demand in 1991. Conserved agricultural transfer water from the Imperial Valley will provide 200,000 AF/YR by 2021. The Water Authority has contracted rights to 77,700 AF/YR of conserved water from projects to line the All-American and Coachella Canals. Deliveries of conserved water from the Coachella Canal reached the region in 2007, and deliveries from the All-American Canal reached the region in 2010.

Developing these supplies is key to diversifying the region's supply sources, but other factors are also important, such as member agencies implementing and managing local resources. Indeed, local surface water, groundwater, and recycled water are all important elements of a diverse water supply portfolio. Also, the Metropolitan Water District of Southern California (Metropolitan) must continue to provide a reliable supply of imported water to the region. The Water Authority, its member agencies, and Metropolitan should work together to ensure a diverse and reliable supply for the region.

1.1 California Urban Water Management Planning Act

The Act requires all urban water suppliers in the state to prepare UWMPs and update them every five years. The Water Authority utilized DWR's *Guidebook to Assist Urban Water Suppliers to Prepare a 2010 UWMP* in preparation of this Plan.

Major amendments made to the Act since preparation of the Water Authority's 2005 Plan include the following:

- Water Code Section 10631.1 requires a plan by retail water suppliers to include water use projections for single- and multi-family residential housing needed for lower income and affordable households, to assist with compliance with the existing requirement under Section 65589.7 of the Government Code, that suppliers grant a priority for the provision of service to housing units affordable to lower income households.
- Water Code Section 10621(b) clarifies that every urban water supplier preparing a plan must give at least 60 days advanced notice to any city or county prior to the public hearing on the plan within which the supplier provides water supplies to allow for consultation on the proposed plan.
- Water Code Section 10631(j) deems water suppliers that are members of the California Urban Water Conservation Council (CUWCC) and comply with the Memorandum of Understanding (MOU), as it may be amended, to be in compliance with the requirement to describe the supplier's water demand management measures in its UWMP.
- Water Code Section 10631.7 required DWR[1], in consultation with the CUWCC, to convene a technical panel, no later than January 1, 2009, to provide information and recommendations to DWR and the Legislature on new demand management measures, technologies, and approaches. The panel and DWR were to report to the Legislature on their findings no later than January 1, 2010 and each five years thereafter;
- Water Code Section 10633(d) clarifies that the "indirect potable reuse" of recycled water should be described and quantified in the plan, including a determination regarding the technical and economic feasibility of serving those uses.
- Water Code Section 10644(c) requires DWR to recognize exemplary efforts by water suppliers by obligating DWR to identify and report to the technical panel, described above, and "exemplary elements" of individual water suppliers' plans, meaning any water demand management measures adopted and implemented by specific urban water suppliers that achieve water savings significantly above the levels required to meet the conditions to state grant or loan funding.

Water Code Section 10631.5 was amended to address conditions of eligibility for grants or loans from DWR. DWR will consider whether the urban water supplier has submitted an updated plan when determining eligibility for funds made available pursuant to any program administered by the department.

[1] Due to subsequent changes in the law (see Section 1.2 on Senate Bill 7), DWR has not yet convened this technical panel or submitted a report to the Legislature.

According to Water Code Section 10610.2(2), "[t]he conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level." **Appendix A** contains the text of the Act.

1.2 Senate Bill 7 of the Seventh Extraordinary Session of 2009

In addition to changes in the Act, the state Legislature passed Senate Bill 7 as part of the Seventh Extraordinary Session, referred to as SBX7-7, on November 10, 2009, which became effective February 3, 2010. This new law was the water conservation component to the Delta legislation package, and seeks to achieve a 20 percent statewide reduction in urban per capita water use in California by December 31, 2020. The law requires each urban retail water supplier to develop urban water use targets to help meet the 20 percent goal by 2020, and an interim water reduction target by 2015.

Urban retail water suppliers must include in their 2010 plans the following information from the bill's target setting process: (1) baseline daily per capita water use; (2) urban water use target; (3) interim water use target; (4) compliance daily per capita water use, including technical bases and supporting data for those determinations. An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan. (Water Code Section 10608.20.) Wholesale water suppliers must include in their 2010 Plans an assessment of their present and proposed future measures, programs and policies to help retail agencies achieve their water use reduction targets. (Water Code Section 10608.36.) **Appendix A** also contains the text of SBX7-7.

1.3 Senate Bills 610 and 221

Water Code Sections 10910 through 10914 and Government Code Sections 65867.5, 66455.3, and 66473.7 (commonly referred to as SB 610 and SB 221) amended state law to improve the link between information on water supply availability and certain land use decisions made by cities and counties. SB 610 requires that the water purveyor of the public water system prepare a water supply assessment to be included in the environmental documentation of certain large proposed projects. SB 221 requires affirmative written verification from the water purveyor of the public water system that sufficient water supplies are available for certain large residential subdivisions of property prior to approval of a tentative map.

Section 4, "San Diego County Water Authority Supplies," and Appendix E of the 2010 Plan contains documentation on the existing and planned water supplies being developed by the Water Authority. This documentation may be used by the Water Authority's member agencies in preparing the water supply assessments and written verifications required under state law. Specific documentation on member agency supplies and Metropolitan supplies may be found in their respective plans.

1.4 Water Authority's 2010 Plan Preparation and Implementation

To adequately demonstrate regional water supply reliability over the next 25 years, the 2010 Plan quantifies the regional mix of existing and projected local and imported supplies necessary to meet future retail demands within the Water Authority's service area. Although the 2010 Plan includes specific documentation regarding development of the Water Authority's supplies, the plans submitted by the member agencies and Metropolitan will provide details on their supplies that contribute to the diversification and reliability of supplies for the San Diego region.

Reasonable consistency among the plans of Metropolitan, Water Authority, and its member agencies' plans is important to accurately identify the projected supplies available to meet regional demands. In order to facilitate coordination within the Water Authority's service area, the Water Authority formed an Urban Water Management Plan Working Group made up of staff from the Water Authority and its member agencies. This group provided a forum for exchanging demand and local supply information. The Water Authority further coordinated its efforts by working with the appropriate wastewater agencies. These agencies helped prepare the water recycling element of the 2010 Plan, which describes the wastewater treatment requirements and water recycling potential. In addition, Metropolitan held a Regional Urban Water Management Plan coordination meeting with its member agencies to discuss and share information pertaining to demands and supplies within their service areas. The Water Authority further coordinated with Metropolitan regarding projected needs for imported water deliveries. DWR hosted a webinar on November 30, 2010, and a special workshop on March 7, 2011, to review the requirements of the Act.

An administrative draft of the Water Authority's 2010 Plan was distributed to the Water Authority's member agencies for technical review, and their comments have been incorporated into the public review draft 2010 Plan. Providing member agencies with an administrative draft Plan, which included water supply projections, satisfies Water Code Section 10631(k).

In accordance with the Act, the Water Authority notified the land use jurisdictions within its service area 60 days prior to a public hearing that it was preparing a 2010 Plan (Water Code Section 10635(b)). In addition, the Water Authority encouraged active involvement within its service area prior to and during preparation of the draft Plan (Water Code Section 10642). The public review draft of the 2010 Plan was distributed to the Water Authority's Board of Directors and public for review and comment. The public distribution list included entities such as the San Diego Regional Chamber of Commerce, San Diego County Taxpayer's Association, Sierra Club, San Diego County Farm Bureau, County of San Diego, and cities within the Water Authority's service area. The 2010 Plan is available for public review at the Water Authority and on the Water Authority's internet homepage at www.sdcwa.org. The deadline for receipt of comments on the draft 2010 Plan is June 6, 2011. Notice of the Public Hearing will be published in two separate publications of the San Diego Union-Tribune, the newspaper designated by the Water Authority for publications of notices, as required by Government Code Section 6066 and Water Code Section 10642. Copies of notifications, mailing lists, and other Water Authority 2010 Plan implementation documents are provided in **Appendix B**.

DWR prepared a checklist of items based on the Act that must be addressed in an agency's plan. This checklist allows an agency to identify where in its plan it has addressed each item. The Water Authority has completed the checklist, referencing the sections and appendices included in the 2010 Plan. The completed checklist is included in **Appendix C.**

1.5 History and Description of the Water Authority

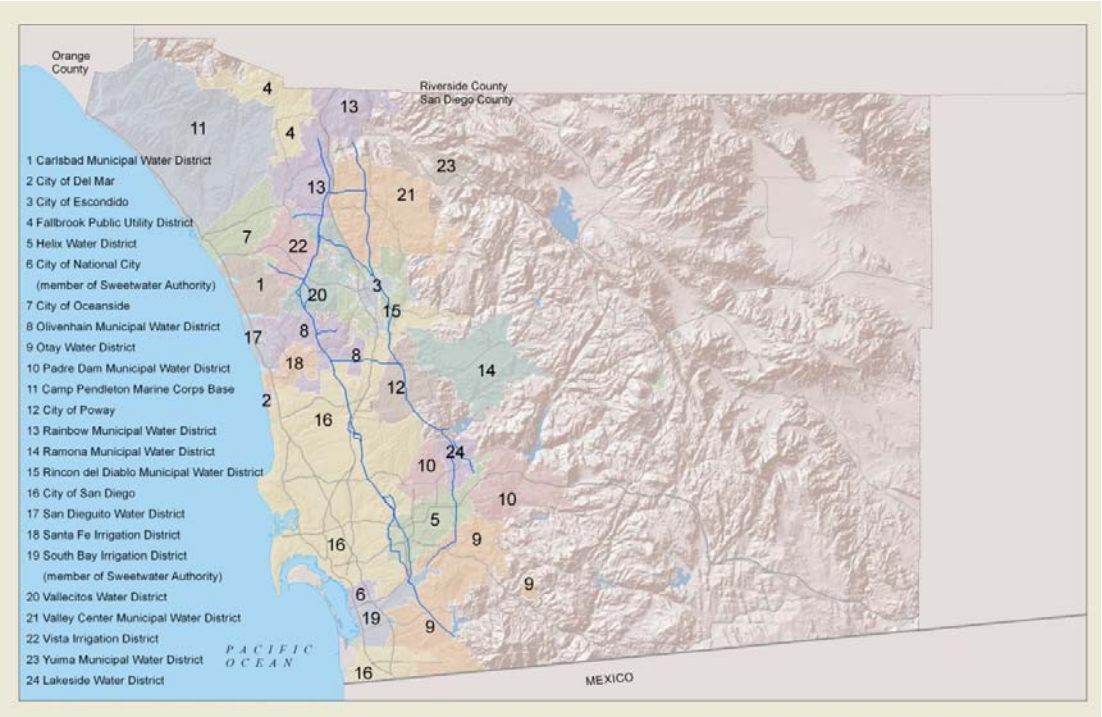
1.5.1 History

The Water Authority was established pursuant to legislation adopted by the California State Legislature in 1943 to provide a supplemental supply of water as the San Diego region's civilian and military population expanded to meet wartime activities. Because of the strong military presence, the federal government arranged for supplemental supplies from the Colorado River in the 1940s. In 1947, water began to be imported from the Colorado River via a single pipeline that connected to Metropolitan's Colorado River Aqueduct (CRA) located in Riverside County. To meet the water demand for a growing population and economy, the Water Authority constructed four additional pipelines between the 1950s and early 1980s that are all connected to Metropolitan's distribution system and deliver water to San Diego County. The Water Authority is now the county's predominant source of water, supplying from 75 to 95 percent of the region's needs depending upon weather conditions and yield from surface, recycled, and groundwater projects.

1.5.2 Service Area

The Water Authority's boundaries extend from the border with Mexico in the south, to Orange and Riverside counties in the north, and from the Pacific Ocean to the foothills that terminate the coastal plain in the east. With a total of 951,000 acres (1,486 square miles), the Water Authority's service area encompasses the western third of San Diego County. Figure 1-1 shows the Water Authority's service area, its member agencies, and aqueducts (shown as blue lines).

Figure 1-1
Water Authority Service Area and Member Agencies



1.5.3 Member Agencies

The Water Authority's 24 member agencies purchase water from the Water Authority for retail distribution within their service territories. A 36-member Board of Directors (Board) comprised of member agency representatives governs the Water Authority. The member agencies' six cities, five water districts, eight municipal water districts, three irrigation districts, a public utility district, and a federal military reservation have diverse and varying water needs.

In terms of land area, the city of San Diego is the largest member agency with 210,726 acres. The smallest is the city of Del Mar, with 1,159 acres. Some member agencies, such as the cities of National City and Del Mar, use water almost entirely for municipal and industrial purposes. Others, including Valley Center, Rainbow, and Yuima Municipal Water Districts, deliver water that is used mostly for agricultural production.

1.6 Water Authority Physical Water Delivery System

The Water Authority was organized for the primary purpose of supplying imported water to San Diego County for wholesale distribution to its member agencies. These imported water supplies consist of water purchases from Metropolitan, core water transfers from Imperial Irrigation District (IID) that are wheeled through Metropolitan's conveyance facilities, and spot water transfers that are pursued on an as-needed basis to offset reductions in supplies from Metropolitan. The largest single-year of imported water sales recorded by the Water Authority was 661,300 AF in fiscal year 2007.

1.6.1 Aqueduct System

Imported water supplies are delivered to the Water Authority member agencies through a system of large-diameter pipelines, pumping stations, and reservoirs. The pipelines deliver supplies from Metropolitan are divided into two aqueduct alignments, both of which originate at Lake Skinner in southern Riverside County and run in a north to south direction through the Water Authority service area. Metropolitan's ownership of these pipelines extends to a "delivery point" six miles into San Diego County. From there, Pipelines 1 and 2 comprise the First San Diego Aqueduct, which reaches from the delivery point to the San Vicente Reservoir. These two pipelines share five common tunnels and operate as a single unit to provide 180 cubic feet per second (cfs) of conveyance capacity. Pipelines 3, 4, and 5 form the Second San Diego Aqueduct. These pipelines, which are located several miles to the west of the First San Diego Aqueduct, have delivery point capacities as follows: Pipeline 3 provides 280 cfs; Pipeline 4 provides 470 cfs; and Pipeline 5 provides 500 cfs.

In addition to the above north–south pipelines, there are several east–west pipelines that extend service to multiple member agencies. A listing of the pipelines owned and operated by the Water Authority is provided in Table 1-1, with the pipeline locations shown in Figure 1-1.

Table 1-1. Water Authority Pipelines

Pipelines	Length (miles)	Diameter (in)
First San Diego Aqueduct:		
Pipeline 1 and Pipeline 2	64.4	48–72
La Mesa-Sweetwater Extension	16.4	18–42
Moreno-Lakeside Pipeline	4.5	54–60
Second San Diego Aqueduct:		
Pipeline 3	57.0	66–75
Pipeline 4	75.0	69–108
Pipeline 5	33.3	96–108
Crossover Pipeline	7.5	66
North County Distribution Pipeline	4.5	72
Tri-Agencies Branch Pipeline	6.4	21–42
Ramona Pipeline	7.2	36–57
Valley Center Pipeline	4.5	66
Olivenhain Pipeline	4.5	78
Olivenhain-Hodges Pipeline	1.5	120

Although most of the water conveyed through the aqueduct system is by gravity flow, the Water Authority also maintains several pumping stations that enhance the operational flexibility of the pipeline system to meet daily, seasonal, and emergency needs. The Water Authority-owned pump stations are listed in Table 1-2.

Three of the water pump stations are for untreated water and are sized to protect the region from potential disruptions of imported water supplies. If a supply disruption occurs, the untreated water pump stations will deliver emergency water supplies from newly expanded or existing local storage reservoirs. For more information on emergency facilities and a description of the Emergency Storage Project (ESP), please refer to **Section 11.1.2**.

At other times, except for the Miramar Pump Station, all the Water Authority–owned pumping stations can be used to move water supplies into and out of storage reservoirs to meet seasonal delivery needs and to augment daily supplies to the member agencies. The Miramar Pump Station is mainly used to deliver treated water via the aqueduct system from the city's Miramar Water Treatment Plant to city service connections south of the treatment plant.

Table 1-2. Water Authority Pump Stations

Pump Stations	Capacity(cfs)
Escondido Pump Station	20
Valley Center Pump Station	20
Miramar Pump Station	85
Olivenhain Pump Station	314
San Vicente Pump Station	444
Olivenhain-Hodges Pumped Storage[1]	760

[1] Under construction

1.6.2 Storage Facilities

Storage facilities are used by the Water Authority to both manage daily operations and provide reserves for seasonal, drought, and emergency storage needs. System Regulatory Storage facilities, which consist of enclosed reinforced concrete storage tanks, are available to manage the daily balance of treated and untreated water deliveries. System Regulatory Storage within the aqueduct system currently totals 56 million gallons, with the bulk of this amount in storage tanks located in Twin Oaks Valley and the Mission Trail Regional Park.

Water Authority seasonal, drought, and emergency storage capacity currently includes 24,300 AF of in-region surface water storage at the Olivenhain Reservoir and 70,000 AF of out-of-region leased groundwater storage in the San Joaquin Valley. The groundwater storage includes 30,000 AF of storage and capacity rights acquired in June 2008 in the Semitropic Water Bank, and 40,000 AF of storage provided by the Semitropic-Rosamond Water Bank Authority that was acquired in August 2008.

As part of its ESP, the Water Authority is set to significantly increase its in-region surface water storage capacity. Upon completion of the San Vicente Dam Raise (estimated completion 2013) and the Olivenhain-Hodges Pumped Storage project (estimated completion 2011), surface water storage capacity will increase to a total 192,000 AF. Of this amount, a rolling two month average of consumptive of demand is considered emergency storage, which will be available to offset any loss of imported water supplies from Metropolitan during an extended shutdown or outage of the aqueduct system. The balance of the in-region storage is for carryover, seasonal, or operational storage needs. Carryover storage helps to ensure supply reliability for the region during periods of potential shortages resulting from drought conditions and when pumping restrictions may impact deliveries from Metropolitan and the State Water Project.

Until the San Vicente and Olivenhain-Hodges storage projects are complete, and as a response to recent drought conditions and State Water Project pumping restrictions, the Water Authority has entered into short-term agreements with the Sweetwater Authority and the city of San Diego giving it the right to use available storage space within local reservoirs. To date, the Water Authority has placed approximately 42,000 AF of carryover storage into Sweetwater and city of San Diego reservoirs. When the construction is complete on the San Vicente Dam Raise, the Water Authority will maintain its in-region carryover storage in San Vicente Reservoir.

1.6.3 Water Treatment

Up until 2008, the Water Authority purchased its treated water supplies from Metropolitan and from member agencies that own and operate local water treatment plants. As early as 2001, the supplies from Metropolitan were being constrained by increasing treated water demands on the Metropolitan system and insufficient treated water pipeline conveyance capacity. As a result, in June 2004, the Water Authority began construction of the 100 million gallons per day (MGD) Twin Oaks Valley Water Treatment Plant (WTP). This WTP was completed and placed in service in April 2008, and now produces high-quality drinking water serving mainly northern San Diego County.

In addition to the Twin Oaks Valley WTP, the Water Authority entered into an agreement with the Helix Water District to purchase 36 MGD of treatment capacity from the R.M. Levy WTP. Water from the Levy plant supplements treated water service to eastern San Diego County. The balance of treated water supplies comes from member agency owned and operated water treatment plants. A list of all in-region water treatment plants is shown in Table 1-3.

Table 1-3. In-Region Treatment Plant Capacity

Member Agency	Water Treatment Plant	Capacity (MGD)
Escondido, city of/Vista Irrigation District	Escondido/Vista	65
Helix Water District	Levy	106
Olivenhain Municipal Water District	Olivenhain	34
Oceanside, city of	Weese	25
Poway, city of	Berglund	24
Ramona Municipal Water District	Bargar	4
San Diego, city of	Alvarado	120
San Diego, city of	Miramar	140
San Diego, city of	Lower Otay	40
San Diego County Water Authority	Twin Oaks Valley	100
San Dieguito Water District/Santa Fe Irrigation District	Badger	40
Sweetwater Authority	Perdue	30
Total In-Region Treatment Plant Capacity		**728**

1.6.4 Capital Improvement Program

The Water Authority's Capital Improvement Program (CIP) can trace its beginnings to a report approved by the Board in 1989 entitled, *The Water Distribution Plan, a Capital Improvement Program through the Year 2010.* The Water Distribution Plan included ten projects designed to increase the capacity of the aqueduct system, increase the yield from existing water treatment plants, obtain additional supplies from Metropolitan, and increase the reliability and flexibility of the aqueduct system. Since that time the Water Authority has made numerous additions to the list of projects included in its CIP as the region's infrastructure needs and water supply outlook have changed.

The current list of projects included in the CIP is based on the results of planning studies, including the 2005 UWMP and the 2002 Regional Water Facilities Master Plan. These CIP projects, which are most recently described in the Water Authority's *Adopted Multi-Year Budget, Fiscal Years 2010 and 2011*, include 47 projects valued at $3.85 billion. These 47 CIP projects are designed to meet projected water supply and delivery needs of the member agencies through 2030. The projects include a mix of new facilities that will add capacity to existing conveyance, storage, and treatment facilities, as well as repair and replace aging infrastructure. Table 1-4 provides an overview of the CIP based on the following categories:

- **Asset Management** – The primary components of the asset management projects include relining and replacing existing pipelines and updating and replacing metering facilities.

- **New Facilities** – These projects will expand the capacity of the aqueduct system, complete the projects required under the Quantification Settlement Agreement (QSA), and evaluate new supply opportunities.
- **Emergency Storage Project** – Projects remaining to be completed under the ongoing ESP include the San Vicente Dam Raise, the Lake Hodges projects, and a new pump station to extend ESP supplies to the northern reaches of the Water Authority service area.
- **Other Projects** – This category includes out-of-region groundwater storage, increased local water treatment plant capacity, and projects that mitigate environmental impacts of the CIP.

Table 1-4. CIP Cost Summary by Category

Project Category	Project Cost[1]
Asset Management	$864,443,000
New Facilities	$1,538,693,000
Emergency Storage Project	$1,266,411,000
Other Projects	$95,411,000
Subtotal – Active and Future Projects	$3,764,958,000
Completed Projects	$84,025,500
Total for Capital Improvement Program	$3,848,983,500

[1] Source: Adopted Multi-Year Budget, Fiscal Years 2010 and 2011

1.6.5 Hydroelectric Facilities

The Water Authority has long supported efforts to develop renewable energy resources that are compatible with water operations. The Water Authority's in-line conduit hydroelectric facilities at Alvarado, Miramar, and Rancho Peñasquitos are able to generate electricity from the available elevation gradient in the aqueduct system to produce an environmentally friendly, clean, and sustainable energy supply. These facilities also generate additional revenues that help offset the cost of imported water supplies. The Alvarado and Miramar facilities are currently out of service but will be evaluated for re-operation under the 2012 Regional Water Facilities Optimization and Master Plan Update. The Rancho Peñasquitos facility has been in continuous operation since 2006 and typically generates enough power to meet the needs of nearly 5,000 county households. The Water Authority's Olivenhain-Hodges facility will provide the region with 40 megawatts (MW) of energy storage, making this power supply available to meet peak demands during high energy use periods. A listing of the Water Authority's hydroelectric facilities is presented in Table 1-5.

Table 1-5. Water Authority Hydroelectric Facilities

Hydroelectric Facilities	Rated Output (MW)
Alvarado (currently out of service)	2.0
Miramar (currently out of service)	0.8
Rancho Peñasquitos	4.5
Olivenhain-Hodges Pumped Storage[1]	40.0
Total Rated Output	**47.3**

[1] Under Construction

1.6.6 2012 Regional Water Facilities Optimization and Master Plan

The 2012 Regional Water Facilities Optimization and Master Plan will update the supply and infrastructure development concepts previously proposed under the Water Authority's initial 2002 Master Plan document, which was finalized in 2003. This initial plan has served as the principal guide for all new facilities implemented by the Water Authority, including the Twin Oaks WTP, the expansion of San Vicente Reservoir to provide carryover storage, recent increases to aqueduct system capacity, and the completion of high-priority pipeline relining projects. For the 2012 Master Plan, prevailing themes will center on (1) optimizing existing regional conveyance, treatment, and storage facilities; (2) matching new infrastructure needs with the water demand and supply projections included in the 2010 Plan; and (3) developing a project prioritization strategy that assures timely and cost effective project implementation through a 2035 planning horizon.

1.7 Service Area Characteristics

The Water Authority's service area characteristics have undergone significant changes over the last several decades. Driven by an average annual population increase of 50,000 people per year, large swaths of rural land were shifted to urban uses to accommodate the growth in population. This shift in land use has resulted in the region's prominent urban and suburban character. San Diego County also has a rich history of agriculture, beginning with the large cattle ranches established in the 18th century and continuing through the diverse range of crops and products grown today. Although the total number of agricultural acres under production has declined, the region maintains a significant number of high value crops, such as cut-flowers, ornamental trees and shrubs, nursery plants, avocados, and citrus. Based on the 2009 Crop Statistics and Annual Report by the San Diego County Department of Agricultural Weights and Measures, the region has 6,687 farms – more than any other county in the nation. San Diego County agriculture is a $1.5 billion dollar per year industry, and ranks first in the state in gross value of agricultural production for flowers, foliage, and nursery products.

1.7.1 Regional Economy and Demographics

San Diego's economy was subject to two nationwide recessions in the past ten years. First, by a mild recession in 2001 – the aftermath of the dotcom bubble in which many traditional business models were abandoned in favor of business expansion before profitability. This unsustainable business approach resulted in the failure of numerous internet companies and ultimately caused the NASDAQ Composite Index to lose 78 percent of its value.

In late-2007, the national economy plunged into another recession driven by the collapse of large financial institutions, the bailout of banks by the federal government, and a downturn in the housing market. This second recession had more severe and sustained impacts on the local economy, which included reduced home prices, elevated foreclosure rates, and higher job losses. Although June 2009 marked the official end of the recession, its lingering effects are still evident in the diminished number of new housing permits issued in 2010 and double-digit unemployment rate.

However, the San Diego region has shown some resilience in part due to defense-related spending. As the home of the largest concentration of U.S. military forces in the world, San Diego has reaped the leveling effect that Defense Department spending has on undulating economic cycles. Pentagon spending is estimated to pump over $17 billion into the local San Diego economy. In the private sector, San Diego also saw the largest employment growth of the state's main biomedical clusters. Despite the economic recession, San Diego's biomedical sector experienced a 2.5 percent increase in jobs – expanding faster than the San Francisco Bay Area or Los Angeles County.

1.7.2 Climate

Climatic conditions within the county area are characteristically Mediterranean along the coast, with mild temperatures year-round. Inland area weather patterns are more extreme, with summer temperatures often exceeding 90 degrees Fahrenheit (°F) 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 percent of the region's rainfall occurs between December and March.

Variations in weather patterns affect regional short-term water requirements, causing reductions in water use during wet cycles and demand spikes during hot, dry periods. Over the last seven years, San Diego has experienced the latter event. Since 1999, local rainfall exceeded the historic annual average only twice (Figure 1-2). These predominantly dry conditions resulted in record level demands during fiscal year 2004, with total local and imported water use surpassing 715,700 AF. With record rainfall in fiscal year 2005, total demands decreased to 642,152 AF. On a monthly basis, water requirements tend to increase during the summer months when a decrease in rainfall combines with an increase in temperatures and an increase in evapotranspiration levels (Figure 1-3).

Figure 1-2

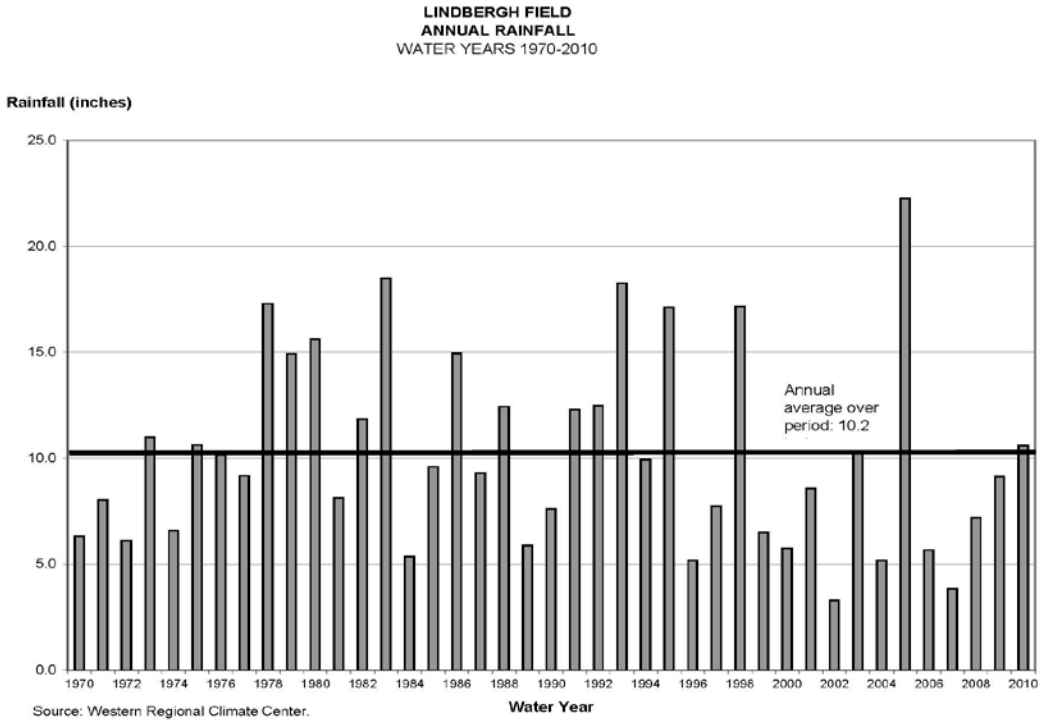
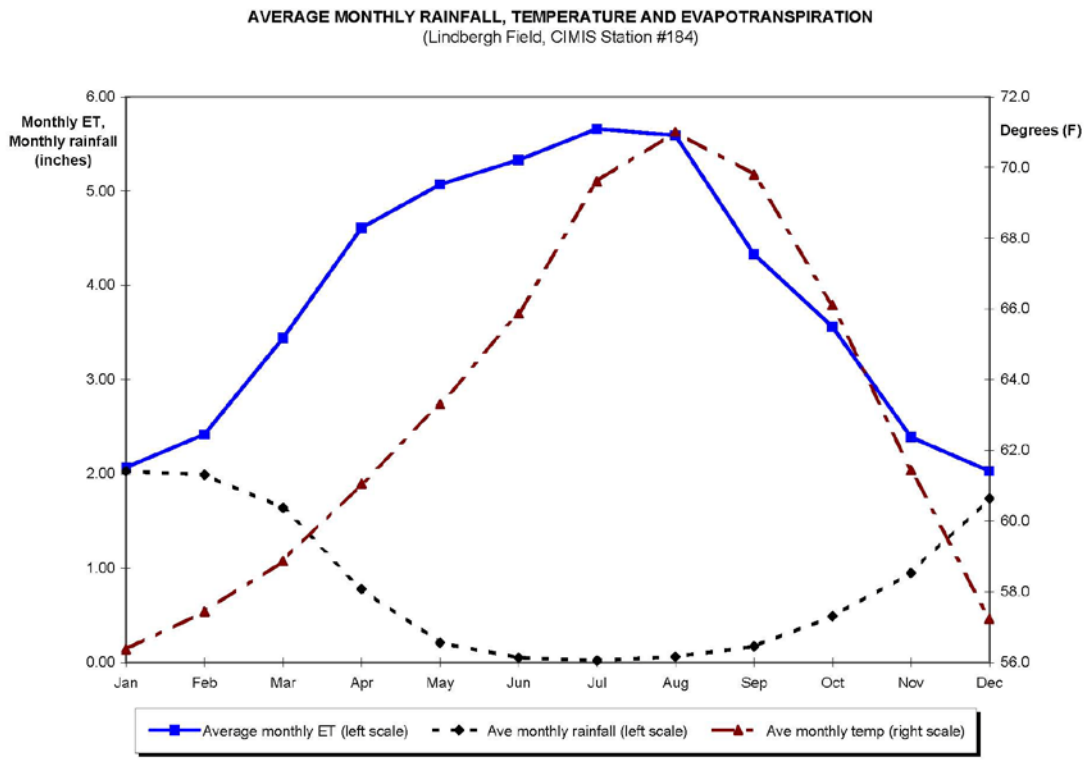


Figure 1-3
Average Monthly Variables



1.7.3 Climate Change Research Efforts and Greenhouse Gas Mitigation

This section discusses the Water Authority's efforts with regard to studies and research on climate change as well as greenhouse gas mitigation measures. The Scenario Planning process outlined in **Section 10** deals with adapting to potential supply and demand impacts due to climate change. Climate change has become an increasingly important issue to water utilities and both the state and federal legislators. Changes in weather patterns which deviate from historical cycles could significantly affect water supply planning. Irrespective of the debate associated with the sources and cause of increasing concentrations of greenhouse gasses (GHGs), research identifies potential future risks to water resources. The Water Authority recognizes the importance of adapting to climate change and being a leader in sustainability and stewardship. Since 2008, the Water Authority's business plan has included its Climate Change & Sustainability Program within the core business area. The key issues identified within this program include advocating for improvement in modeling to provide precipitation data on a local and regional scale, encouraging focused scientific research on climate change to identify the impacts on the region's water supply, and partnering with other water utilities to incorporate the impacts of climate change on water supply planning and the

development of decision support tools. The Water Authority recognizes the challenges that climate change poses to our region and is committed to proactively addressing the issue.

1.7.3.1 San Diego County Water Authority's Activities Related to Climate Change Concerns

Knowledge Sharing and Research Support

The Water Authority is an active and founding member of the Water Utility Climate Alliance (WUCA). WUCA consists of ten of the nation's largest water providers collaborating on climate change adaptation and GHG mitigation issues. As part of this effort, WUCA pursues a variety of activities on multiple fronts. WUCA monitors development of climate change-related research, technology, programs, and federal legislation. Activities to date include such things as:

- Letter of support for Western Water Assessment's continued funding as a Regional Integrated Sciences and Assessments team under the National Oceanic and Atmospheric Administration (NOAA)
- Letter of support for the 2009 Kerry-Boxer Water Utilities Mitigation and Adaptation Partnerships congressional bill addendum
- Regular communication and consultations with federal agencies on the U.S. Environmental Protection Agency's Climate Ready Water Utility Working Group
- NOAA Climate Service and January 2010 International Climate Change Forum

In addition to supporting federal and regional efforts, WUCA released a white paper entitled "Options for Improving Climate Modeling to Assist Water Utility Planning for Climate Change" in January 2010. The purpose of the paper was to assess Global Circulation Models, identify key aspects for water utility planning, and make seven initial recommendations for how climate modeling and downscaling techniques can be improved so that these tools and techniques can be more useful for the water sector.

To address water provider–specific needs, WUCA focused on how best to incorporate knowledge from the above white paper into water planning., which was more thoroughly explored in a second white paper also released January 2010 entitled "Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning." This paper assessed five known decision support tools for applicability in incorporating climate change uncertainty in water utility planning and identified additional research needs in the area of decision support methodologies. The Water Authority utilized and modified one of these decision support tools, "Scenario Planning" in its long-range planning for the 2010 Plan, which was the basis of Section 10, "Scenario Planning: Managing an Uncertain Future," below.

The Water Authority and the other member agencies of WUCA annually share individual agency actions to mitigate GHG emissions to facilitate further implementation of these programs. At a September 2009 summit at the Aspen Global Change Institute, WUCA members met with global climate modelers, along with federal agencies, academic scientists, and climate researchers to establish collaborative directions to progress climate science and modeling efforts. The Water Authority, through its membership with WUCA, continues to pursue these opportunities and partnerships with other water providers, climate scientists, federal agencies, research centers, academia, and key stakeholders.

Planned Research

The Water Authority in cooperation with the Scripps Institution of Oceanography and San Diego State University, and with partial funding from the Blasker Environmental Fund at the San Diego Foundation began a project in 2010 to better understand the uncertainties of climate change and the influence climate change may have on water supply and demand for the San Diego Region. This project will (a) provide a better understanding of the range of uncertainties of climate change and the influence that climate change will have on water supply and demand for the region, (b) improve the quantification of the likely availability of water supplies from the Sierra Nevada, (c) narrow the range of uncertainty of the impacts on the Colorado River basin and the reduction of flows under a range of climate change scenarios in the region, and (d) result in the development of municipal and rural demand models to include climatic influences – including higher temperatures, greater evaporative losses, storm-time conditions and hydrologic response – along with the evaluation of social and economic impacts of changing demand and supply in the region.

Implementation of Programs and Policies

The Water Authority has made great efforts to implement GHG mitigation programs and policies for its facilities and operations. To date, these programs and policies have focused on the following:

- Exploring water supply/energy relationships and opportunities to increase efficiencies to lower GHG emissions
- Joining the Climate Registry; the Water Authority is currently developing its baseline GHG inventory from calendar year 2009
- Reducing the number of vehicles in the fleet and replacing vehicles with hybrids when possible
- Developing solar power at three Water Authority sites, including the Twin Oaks Valley Water Treatment Plant, the Escondido Operations Center, and the San Diego Headquarters

1.7.4 Population

When the Water Authority was formed in 1944, the population within its service area was estimated at roughly 260,000 people. By 2010, Water Authority service area population reached 3.2 million, or an approximate 12-fold increase. The city of San Diego represents the largest population of any member agency, with just under 1.4 million people. The Yuima Municipal Water District has the smallest population, at approximately 1,500 people. The average population density in 2010 was 3.0 per acre, with National City having the highest density (12.0 per acre) and Yuima Municipal Water District the lowest (0.1 per acre).

The population of San Diego County is projected to increase by 844,800 people between 2010 and 2035, for a total county population in excess of 4.0 million. This change represents an average annual increase of about 33,800 people, or roughly 1.1 percent annually. These regional growth projections are based on the San Diego Association of Governments (SANDAG) 2050 Regional Growth Forecast, adopted by its Board on February 26, 2010.

Water Authority service area population projections are also based on SANDAG's 2050 Regional Growth Forecast and are presented in Table 1-6. Water Authority member agencies are projected to have varying future growth. Some, such as the Santa Fe Irrigation District and the city of Del Mar, are expected to experience relatively modest growth. Others, including the Otay Water District and the city of San Diego, anticipate sizeable increases in both population and water demand.

Table 1-6. Water Authority Service Area Population Forecast (2015–2035)

Year	Population
2015	3,271,773
2020	3,438,837
2025	3,599,952
2030	3,758,933
2035	3,906,718
Average Annual Growth	31,747

Source: SANDAG 2050 Regional Growth Forecast

Section 2
Water Demands

Demand for water in the Water Authority's service area falls into two classes of service: municipal and industrial (M&I), and agricultural demand. M&I uses currently constitute about 80 to 85 percent of regional water consumption. The remaining 15 to 20 percent of demand has historically been attributable to agricultural water use, primarily for irrigation of nurseries, groves, and crops. This section describes these use categories along with the total historic, current, and projected water demands. By 2035, total normal water demands are projected to reach 778,443 AF (including future conservation, demand associated with projected near-term annexations, and accelerated forecasted growth), which represents a 20 percent increase from the average 648,030 AF of demand that occurred over the period 2005-2010 .

2.1 Municipal and Industrial Water Demand

Total retail M&I demand encompasses a wide range of water uses that include residential demand (water used for human consumption in the home, domestic purposes, and outdoor residential landscaping) and water used for commercial, industrial, and institutional purposes.

2.1.1 Residential Demand

Residential water consumption covers both indoor and outdoor uses. Indoor water uses include sanitation, bathing, laundry, cooking, and drinking. Most outdoor water entails landscaping irrigation requirements. Other minor outdoor uses include car washing, surface cleaning, and similar activities. For single-family homes and rural areas, outdoor demands may constitute up to 60 percent of total residential use.

The estimated composition of San Diego's 2010 regional housing stock was approximately 60 percent single-family homes, 36 percent multi-family homes, and 4 percent mobile homes. Single-family residences generally contain larger landscaped areas, predominantly planted in turf, and require more water for outdoor application in comparison to other types of housing. The general characteristics of multi-family and mobile homes limit outdoor landscaping and water use, although some condominium and apartment developments do contain green belt areas.

2.1.2 Commercial and Industrial Demand

Commercial water demands generally consist of uses that are necessary for the operation of a business or institution, such as drinking, sanitation, and landscape irrigation. Major commercial water users include service industries, such as restaurants, car washes, laundries, hotels, and golf courses. Economic statistics developed by the San Diego Regional Chamber of Commerce indicate that almost half of San Diego's residents are employed in commercial (trade and service) industries.

Industrial water consumption consists of a wide range of uses, including product processing and small-scale equipment cooling, sanitation, and air conditioning. Water-intensive industrial uses in the city of San Diego, such as electronics manufacturing and aerospace manufacturing, typically require smaller amounts of water when compared to other water-intensive industries found

elsewhere in Southern California, such as petroleum refineries, smelters, chemical processors, and canneries.

The tourism industry in San Diego County affects water usage within the Water Authority's service area not only by the number of visitors, but also through expansion of service industries and attractions, which tend to be larger outdoor water users. Tourism is primarily concentrated in the summer months and affects seasonal demands and peaking. SANDAG regional population forecasts do not specifically account for tourism, but tourism is reflected in the economic forecasts and affects per capita water use.

2.2 Agricultural Water Demand

The moderate and virtually frost-free coastal and inland valley areas of the county are able to support a wide variety of subtropical crops, making the San Diego area a unique agricultural region. The introduction of relatively low-cost water supplies in the 1950's allowed significant growth to occur in this sector. Agricultural water use within the Water Authority's service area is concentrated mainly in the north county, and includes member agencies such as the Rainbow, Valley Center, Ramona, and Yuima Municipal Water Districts, the Fallbrook Public Utility District, and the city of Escondido. The primary crops grown for local, national, and international markets are avocados, citrus, cut flowers, and nursery products. Local fresh market crops and livestock are raised to a lesser extent in the Water Authority's service area.

In recent years, agriculture demand has dropped significantly due to mandatory supply allocations that resulted from drought conditions and judicial restrictions on State Water Project supply availability. Starting in calendar year 2008, member agency customers that were voluntarily receiving discounted agricultural water, were required to implement a 30 percent cutback in agricultural demand from their fiscal year 2007 baseline. To comply with the mandatory cutback, growers implemented various actions that included tree stumping and plant stock reduction. As a result, agricultural demand dropped from 98,262 AF in fiscal year 2007 to 43,515 AF in fiscal year 2010, a 55 percent decline in program agricultural demand.

2.3 Total Current and Historic Water Use

Water use in the San Diego area is closely linked to the local economy, population, and weather. 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, by the late-2000s, the combination of economic recession, Metropolitan supply allocations, implementation of member agency mandatory water use restrictions, and mild local weather culminated in a dramatic multi-year decrease in total water demand. In fiscal year 2007, water demand in the Water Authority's service area reached a record level of 741,893 AF, only to drop roughly 24 percent to 566,443 AF by fiscal year 2010. The 175,450 AF reduction in demand represents the largest volumetric decline over a three-year period in the Water Authority's history. This drop is attributable to a combination of factors, including mandatory water use restrictions, a growing conservation ethic, greater consumer price response to the retail cost of water, the national recession and high rate of home foreclosures. This period also included slightly cooler temperatures

and more normal rainfall amounts. Table 2-1 shows the historic water demand within the Water Authority's service area.

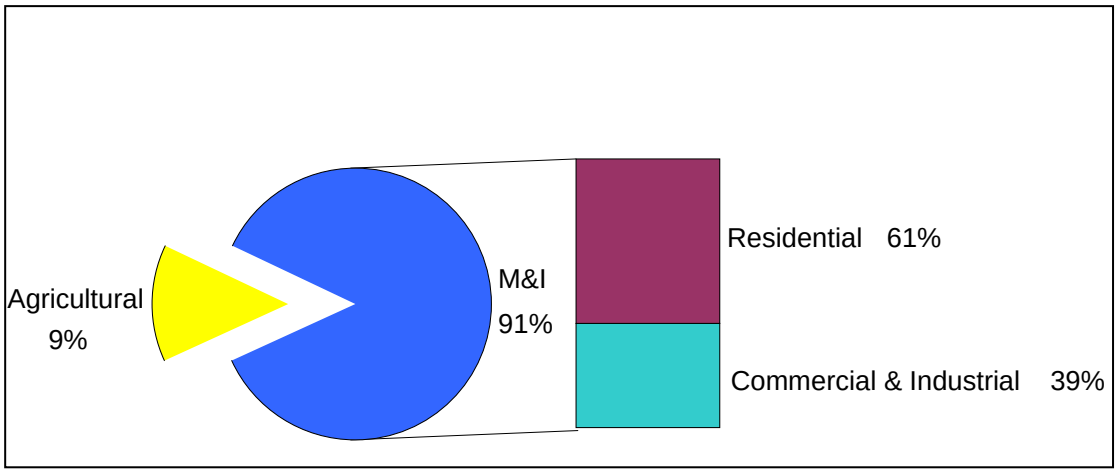
Table 2-1. Historic Water Demand within Water Authority Service Area (1995–2010)

Fiscal Year	Water Use (AF)
1995	526,053
1996	615,900
1997	621,739
1998	562,225
1999	619,409
2000	694,995
2001	646,387
2002	686,530
2003	649,622
2004	715,763
2005	642,152
2006	687,253
2007	741,893
2008	691,931
2009	643,900
2010	566,443

Source: Water Authority Annual Reports

Figure 2-1 shows the estimated relative percentages of various categories of water demand within the Water Authority's service area for fiscal year 2010. In this figure, residential demand includes single-family residential and multi-family residential.

Figure 2-1
Estimated Type of Water Use Fiscal Year 2010



2.4 Projected Water Demands

Since the mid-1990s, the Water Authority has utilized an econometric model to develop its long-range M&I demand forecasts. This computer model is based on the U.S. Army Corps of Engineers Municipal And Industrial Needs (MAIN) model, which has over a quarter of a century of practical application and is used by many cities and water agencies throughout the United States. The Water Authority's version of the model, known as CWA-MAIN, was modified by a consultant to reflect the San Diego region's unique parameters. The CWA-MAIN model relates historic water demand patterns to variables such as household income, consumer response to the price of water, and weather, to predict future M&I water demands. These datasets are compiled from various sources, including SANDAG, Water Authority member agencies, and the Scripps Institution of Oceanography. Under the terms of a 1992 memorandum of agreement between the Water Authority and SANDAG, the Water Authority utilizes SANDAG's official forecast to project consumptive water demands for the region. This coordination ensures linkage between local jurisdictions' general plans and the Water Authority's projected water demands.

In February 2010, SANDAG's Board adopted the 2050 Regional Growth Forecast for planning analysis purposes, also referred to as SANDAG Series 12 forecast. Two key refinements of the 2050 Regional Growth Forecast include an economic outlook that factors in the current recession and local jurisdictions' general/specific plan updates not completed at the time of SANDAG's last forecast. Based on these updates, SANDAG population projections for the Water Authority service area are on average about one percent higher than 2005 Plan estimates. Housing unit projections are also up - with approximately 32,000 more units forecasted by 2030 compared to SANDAG's Series 10 forecast. However, this additional housing is more heavily weighted towards multi-family units in the 2050 Regional Growth Forecast. These newly released SANDAG demographic and economic projections (i.e., housing units, household density, household size, and employment counts) were incorporated into the CWA-MAIN model. It should be noted that SANDAG does not forecast land use on Marine Corps Base Camp Pendleton (MCB Camp Pendleton). Therefore, demand projections for MCB Camp Pendleton were developed outside of the CWA-MAIN model and were based on projections provided by base staff.

In the past, M&I demands were adjusted to account for conservation savings based on projected implementation of the California Urban Water Conservation Council's Best Management Practices. Under this bottom-up approach, total forecasted conservation savings was derived from the estimated number of water-conserving devices installed. However, commencing with Water Code Section 10608 in 2009 (SBX7-7) a paradigm shift in the state's demand management philosophy occurred with the adoption of Part 2.55 of Division 6 of the Water Code. This new legislative mandate requires retail agencies to meet a 20 percent reduction in their per capita potable water use by 2020. Compliance with SBX7-7 can be through a wide range of actions such as development of recycled water supplies, retail water pricing, and traditional conservation programs. For additional information regarding SBX7-7, see **Sections 2.4.2** and **3.2**.

Agricultural demand projections were developed through a cooperative effort between Water Authority staff, its member agencies, SANDAG, County of San Diego Agricultural Weights and Measures, and the California Avocado Commission. A separate forecast model, developed as part of the 2005 Plan update, was used to project member agency level agricultural demands. Forecast driver variables include irrigated acreage within the Water Authority's service area, estimated crop type distribution, and calculated historic water use factors. SANDAG's projection of agricultural land

conversions to other land use categories, provides the long-term trend in acreage used to forecast agricultural water use. The total agricultural forecast is then separated into two categories: (1) projected demands in the Water Authority's Special Agricultural Water Rate (SAWR) program and (2) demands under the Water Authority M&I rate or agricultural demands met through local supplies. It should be emphasized that the delineation between these two categories is a rough estimate based on professional judgment and takes into account the potential future acreage in the SAWR program.

2.4.1 Projected Normal Water Demands

Table 2-2 shows projected normal year total water demand for the Water Authority service area through 2035. Baseline total regional M&I demand projections reflect historic passive conservation, MCB Camp Pendleton area demands, and an increment of demand associated with the decay of historic active conservation program savings. In addition, to fully quantify potential demands served by the Water Authority, a small increment of water use associated with known future potential annexations and accelerated forecasted growth was incorporated into the demand forecast. Beginning with the 2005 Plan, an increment of demand related to potential near-term annexations was added to the baseline M&I forecast. Estimated demands for these parcels were provided to the Water Authority by the associated member agency. However, incorporation of these demands provides no assurance of annexation. Approval by the Water Authority Board is still required before water service may be provided to these lands.

To provide for a more comprehensive planning analysis, the 2010 Plan includes water use associated with accelerated forecasted residential development in M&I demand projections. These housing units were identified by SANDAG in the course of its regional housing needs assessment, but are not yet included in existing general land use plans. The demand associated with accelerated forecasted growth is intended to account for SANDAG's land-use development currently projected to occur between 2035 and 2050, but has the potential to occur on an accelerated schedule. SANDAG estimates that general plan amendments, allowing this accelerated residential development, could occur within the planning horizon of the 2010 Plan update. Because these units are not yet included in local jurisdictions' general plans, their projected demands are incorporated at a regional level and not associated with specific member agencies.

Although Water Code Section 10631.1 requires UWMP demand projections to include separate water use estimates for low income single family and multi-family residential households, this requirement does not apply to wholesale water suppliers as documented in the Department of Water Resources, Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan - Final March 2011. As such, regional water demand projections listed in Table 2-2 represent water use estimates for all income levels included in SANDAG's 2050 Regional Growth Forecast.

Table 2-2. Total Regional Baseline Demand Forecast (Excludes Future Conservation)

	2015	2020	2025	2030	2035
Baseline M&I Demand[1,2,3]	589,776	660,588	727,787	787,429	838,716
Baseline Agricultural Demand – Program	30,358	27,164	26,531	25,928	25,324
Baseline Agricultural Demand – Full Service	25,000	22,370	21,849	21,352	20,854
Near-Term Annexations[4]	5,634	6,365	6,365	6,365	6,365
Accelerated Forecasted Growth	2,224	4,421	6,605	8,776	10,948
Total Baseline Demand Forecast	652,992	720,908	789,137	849,849	902,208

[1] Includes approximately 12,000 AF of demand for Camp Pendleton – provided by base staff.

[2] Reflects passive historic conservation savings.

[3] Includes increment of demand associated with the decay of historic active conservation program savings (2015 = 7,111 AF; 2020 = 14,221 AF; post-2020 = 21,332 AF).

[4] Known near-term annexation demands include: Escondido (314AF), Otay Ranch Village 13 and parcels East of Village 13 (2,361AF), Peaceful Valley Ranch (70AF), Sycuan Reservation (392AF), Stoddard Parcel (2AF), San Ysidro Mt. Parcel Village 17 (148AF), Viejas (2,000AF), Rincon (417AF), Meadowood Development (155AF), Pauma Ranch (76AF) and Warner Ranch/Sycamore Ranch (430AF). Including the demands for these parcels does not limit the Board's discretion to deny or approve these or other annexations not contemplated at this time.

2.4.2 SBX 7-7 – Conservation Savings Projections based on Retail Agency Compliance

SBX7-7 was enacted to require retail urban water agencies within the state to achieve a 20 percent reduction in urban per capita water use by December 31, 2020, (Water Code Section 10608.20) and report progress in meeting water use targets (Water Code Section 10608.40.) The Water Authority is a wholesale agency not directly subject to these requirements. Member agencies that serve military installations shall consider requirements under Executive Order 13423 in complying with SBX7-7. However, it is critical for planning purposes that retail compliance of SBX7-7 and corresponding demand reduction be reflected in the Water Authority's 2010 Plan. To clearly reflect retail compliance, the Water Authority is utilizing the Urban Water Use Targets, as defined in Water Code Section 10608.20(a)(1), that were calculated by each of the member agencies to determine the regional demand reduction for inclusion in the 2010 Plan. The 2010 Plan also contains the assumption that because SBX7-7 does not require an agency to identify GPCD targets beyond 2020, for planning purposes, the 2025 through 2035 GPCD targets were set at agencies' 2020 GPCD targets.

The first step in evaluating compliance with SBX7-7 is to determine member agencies' water use efficiency targets. To calculate water use efficiency targets, each agency's SBX7-7 acre-foot potable demand target is first calculated based on the GPCD targets provided by the agency and SANDAG population projections, as listed in Table 2-3. These demand targets are then subtracted from the projected baseline demands derived from the Water Authority's CWA-MAIN model to determine the water use efficiency target that must be met in order to comply with SBX7-7. The numbers are totaled in Table 2-4 to provide a regional water use efficiency target. It should be noted that water use efficiency targets were set to zero for agencies that have already met their target, where SBX7-7 demand targets exceed their projected baseline demands. Additionally, because SBX7-7 compliance

rests at the retail level, member agency demand projections exclude the increment of regional water use attributed to accelerated forecast growth. This demand increment is included in the Water Authority's regional projections for supply reliability analysis.

Table 2-3. Member Agency Water Use Efficiency Targets (AF)

	2015	2020	2025	2030	2035
Total Member Agency Baseline Demand[1]	650,768	716,487	782,532	841,073	891,260
SBX7-7 Potable Demand Target	635,622	639,949	671,949	702,673	730,256
Total Water Use Efficiency Target	-15,146	-76,538	-110,583	-138,400	-161,004

[1]Demands associated with accelerated forecasted growth were developed at a regional level; they are excluded from aggregated member agency baseline projections.

Consistent with SBX7-7 guidelines, member agency water use efficiency targets can be met through both recycled water supplies and additional conservation savings. Table 2-5 shows derivation of the net additional conservation required under SBX7-7 once member agency verifiable recycled water supplies, necessary to meet the target, are accounted for. Refer to **Section 5.4** for details on member agency water recycling projections.

Table 2-4. Member Agency Additional Water Conservation (Acre-Feet)

	2015	2020	2025	2030	2035
Total Water Use Efficiency Target	-15,146	-76,538	-110,583	-138,400	-161,004
Verifiable Recycled Water Applied to Meet Water Use Efficiency Target [1, 2]	8,409	29,754	38,529	41,312	43,673
Additional Conservation Required[3]	-6,737	-46,784	-72,054	-97,088	-117,331

[1] Excludes recycled supplies for agencies with SBX7-7 demand targets exceeding their baseline demands.
[2] Recycled supplies set equal to water use efficiency target for agencies with recycled supplies in excess of their target.
[3] Additional increment of conservation, beyond existing savings, required to meet water use efficiency target.

Table 2-6 shows the Water Authority's regional normal year water demand forecast taking into account member agency additional water conservation derived through compliance with SBX7-7.

Table 2-5. Normal Year Regional Water Demand Forecast Adjusted for Water Conservation (AF)

	2015	2020	2025	2030	2035
Total Regional Baseline Demand	652,992	720,908	789,137	849,849	902,208
Additional Conservation	-6,737	-46,784	-72,054	-97,088	-117,331
Total Baseline Demand with SBX7-7 Conservation	646,255	674,124	717,083	752,761	784,877

Figure 2-2 illustrates the forecasted trend in projected water demands over the 2015 to 2035 time period. This figure combines historic water use and forecasted normal year demands reduced by future additional conservation savings.

Figure 2-2

Regional Historic and Projected Normal Water Demands (AF)

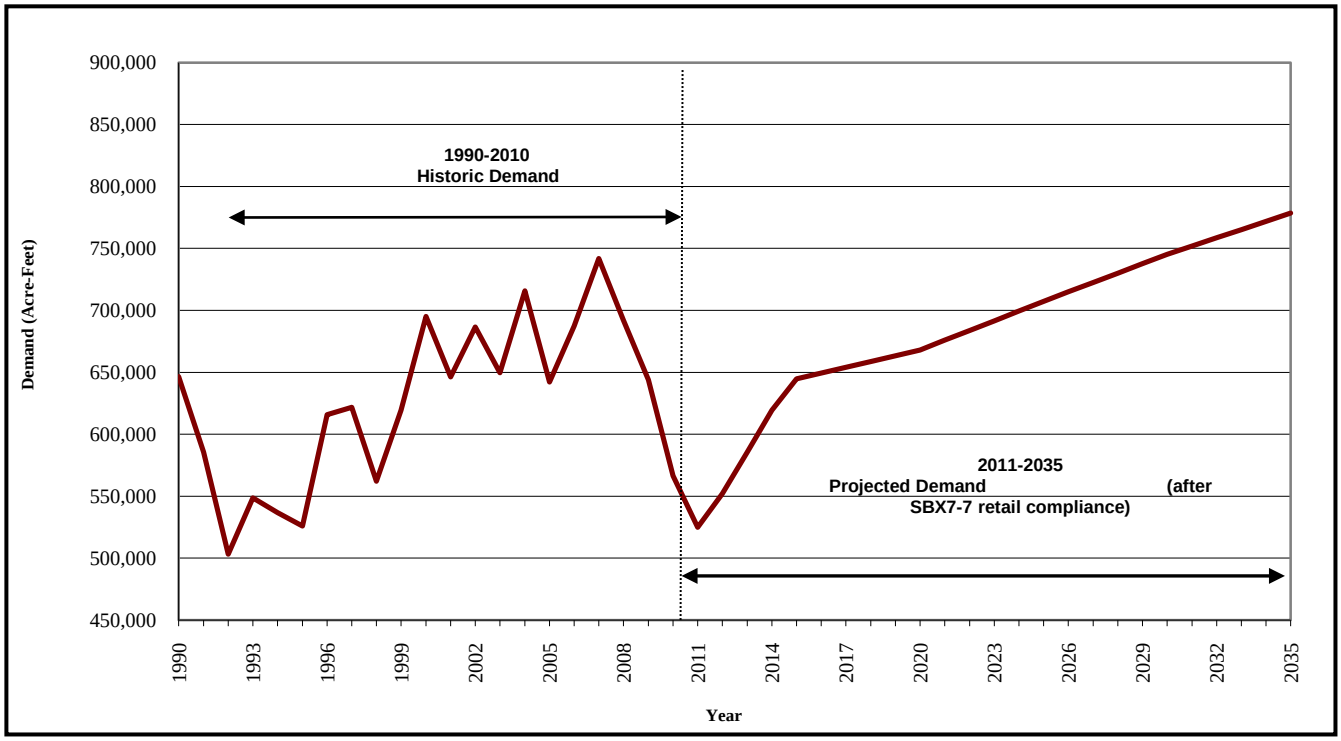


Table 2-6 shows the member agency potable SBX7-7 retail demand targets, based on retail level targets provided by the agencies, SANDAG population forecast for the member agencies and the regional estimates of SBX7-7 potable GPCD targets for each five-year increment.

Table 2-6. SBX7-7 Potable Retail Demand Targets and GPCD Targets

	2015	2020	2025	2030	2035
SBX7-7 Retail Demand Target (AF) [1]	635,622	639,949	671,949	702,673	730,256
Member Agency Population	3,271,773	3,438,837	3,599,952	3,758,933	3,906,718
Estimated Regional Member Agency Potable GPCD Target	173	167	167	167	167

[1] Demand targets based on the individual member agency GPCD target demands.

2.4.3 Projected Dry-Year Water Demands

In addition to a baseline normal demand projection, the Act also requires single dry-year and multiple dry-year demand estimates to evaluate water service reliability during dry-year events. Based on observed historic demand impacts associated with each of these events, separate approaches were taken to forecast single and multiple dry-year conditions.

To develop single dry-year projections, a demand response index formula was used to identify the historic high temperature and low rainfall weather parameters that resulted in the maximum impact. Using this index, a representative single dry-year was selected. For this forecast, the year 1989 was selected. The monthly weather patterns associated with 1989 were then substituted into the CWA-MAIN model to generate dry-year demands projections. By holding all non-weather related predictive variables constant, the model produces an annual forecast of dry-year weather-driven demand. Projected single dry-year demands are shown in Table 2-7.

Table 2-7. Single Dry-Year Regional Water Demand Forecast (AF) [Adjusted for Water Conservation]

	2015	2020	2025	2030	2035
Single Dry-Year Demand	693,182	764,217	835,817	900,104	955,484
SBX7-7 Additional Conservation Savings	-6,737	-46,784	-72,054	-97,088	-117,331
Total Demands with SBX7-7 Conservation	686,445	717,433	763,763	803,016	838,153

In accordance with the Act, agencies are also required to prepare additional dry period scenarios spanning multiple consecutive years. The major challenge in developing multiple dry-year forecasts is that persistent drier than normal weather over 24 to 36 months results in a compounding effect on rates of water use. Since the CWA-MAIN model was constructed to forecast demand for discrete 12-month periods, other statistical methods were required to develop projected water use for consecutive dry years. The modeling approach developed correlates trends in historical Water Authority deliveries with multi-year trends in observed precipitation to construct a set of consecutive dry year impact factors. In this approach, running 12-month averages of deliveries were modeled independently as a function of 24- and 36-month running averages of the ratio of observed rainfall to normal monthly precipitation. Historic mean regional weather data was then evaluated to select conditions that could be defined as the driest consecutive two- and three-year periods over the last several decades. Using the statistical model parameters and a repeat of the identified multiple dry-year weather patterns, the two and three consecutive dry-year demand projections for each five-year increment were developed. Multiple dry-year demand projections net of future conservation savings are shown in Table 2-8.

Table 2-8. Multiple Dry-Year Water Demand Forecast Including Future Conservation Savings (AF)

	2016	2017	2018
Total Estimated Demands	681,272	704,398	739,252
	2021	**2022**	**2023**
Total Estimated Demands[1]	723,243	750,714	789,043
	2026	**2027**	**2028**
Total Estimated Demands	771,896	800,620	843,062
	2031	**2032**	**2033**
Total Estimated Demands	810,482	841,975	881,781

[1] Drop in demand from year 2018 to 2021 is due to full retail compliance with SBX7-7.

2.4.4 Projected Climate Change Impact on Water Demands

Although not currently required by the Act, evaluation of potential climate change impacts on water demand represents a prudent water resources planning exercise. However, definitive projections on the timing and magnitude of climate change–initiated variations to local temperature and precipitation patterns are still forthcoming. The body of work currently available from national and international research contains a full spectrum of possible outcomes based on numerous GHG emission scenarios run through an assortment of General Circulation Models (GCMs). In the absence of research consensus, the Water Authority has adopted a qualitative evaluation approach that uses a manageable number of climate change scenarios to develop a range of potential demands.

The Water Authority's development of climate scenarios starts with the selection of representative GHG emission scenarios. Selection criterion focused on scenarios that represented a practical range of global socioeconomic development. Using this metric, two emission scenarios (Scenario B1 – lower emissions scenario and Scenario A2 – medium-high emissions scenario) were selected from the Intergovernmental Panel on Climate Change's (IPCC's) Special Report on Emissions Scenarios. Emission Scenario B1 represents a future with high levels of environmental consciousness combined with a global approach to more sustainable development that results in carbon dioxide (CO_2) concentrations of roughly 550 parts per million (ppm) by 2100, approximately 41 percent above current CO_2 concentrations. In contrast, Emission Scenario A2 is based on a differentiated world in which global economic growth is uneven and large income gaps remain between industrialized and non-industrialized parts of the world. Atmospheric CO_2 concentrations under this scenario more than double, from 391 ppm in 2011 to 850 ppm by 2100.

Next, an evaluation of GCMs was conducted to assess their strengths and weaknesses in continental weather modeling. Models were screened to evaluate their ability to effectively represent the El Niño and Pacific Decadal Oscillation events. The ability to replicate these climatological events indicates a level of fitness to forecast Pacific costal weather patterns that impact the Southern California climate. Based on this benchmark, the following GCMs were selected; CNRM-CM3 (Center National Weather Research, France), GFDL-CM2.1 (Geophysical Fluid Dynamics Laboratory, USA), NCAR-PCM1 (National Center for Atmospheric Research, USA).

Since current GCMs forecast climate at a coarse spatial resolution of 200–500 kilometers, fine-scale precipitation and temperature projections required for sub-regional water demand analysis are not readily available. To develop the necessary fine-scale climate scenarios, the Water Authority secured technical climate modeling assistance from Scripps Institution of Oceanography staff. Using the Constructed Analogues downscaling methodology, Scripps staff produced high resolution climate forecasts for the San Diego region. These downscaled climate estimates were constructed using linear combinations of historic weather patterns. The 30 most similar, previously observed weather patterns were used in a linear regression analysis to obtain precipitation and temperature estimates that best match the coarse resolution GCM patterns. The coarse-scale meteorological observations and their corresponding high resolution local historic patterns were then used to construct a climate modeling library. Using this library, a set of fine-scale (roughly 13-kilometer resolution) precipitation and temperature forecasts for 2035, 2050, and 2099 were developed for the ensemble of six climate scenarios (2 GHG x 3 GCMs).

Evaluation of the downscaled climate change scenarios indicated no dramatic shifts in seasonal patterns of precipitation for the San Diego area under either emission scenario. Additionally for reference year 2035, the end of the 2010 Plan planning horizon, mixed results were observed in the

variation of precipitation projections among the climate models. Three of the climate projections resulted in annual precipitation estimates lower than the historic average. Similarly, temperature modeling revealed no dramatic shifts in seasonal patterns, and mixed results prevailed between projected temperatures and historic averages for reference year 2035. The disagreement in short-term climate projections is not entirely unexpected given the protracted lead-time forecasted for significant build up of greenhouse gases. Over an extended timescale, the ensemble of climate scenarios converge on the direction of temperature impact – with five of the six climate scenarios indicating warmer annual average temperature conditions for 2050 and 2099.

The range of climate change impacts on Water Authority demands was calculated by substituting the six climate scenarios into the CWA-MAIN model. For reference year 2035, all but one of the climate scenarios resulted in total water use slightly higher than baseline normal weather demands. The average climate change impact on 2035 demand, across all three GCMs, ranged from 0.63 percent increase under Emission Scenario B1 to 1.8 percent increase for Emission Scenario A2. The relatively small increase in 2035 demand under all climate scenarios suggests that significant water demand impacts associated with the forecasted trend toward warmer and drier climate conditions may occur on a time-step beyond the 2010 Plan planning horizon.

2.4.5 Member Agency Demand on the Water Authority

Table 2-9 shows the Water Authority's projected water demands (sales) by member agency. Water demands were calculated using SBX7-7 compliant baseline demands for each member agency, as forecasted in Section 2.4.2, minus verifiable local supply projections. Therefore, the projected imported demands (sales) are directly tied to the success of local supply development in **Section 5**, "Member Agency Supplies," and compliance with SBX7-7 conservation savings requirements discussed in **Section 3.2**. Although at the time of adoption of the 2010 Plan the Water Authority is implementing a water supply allocation due to a drought, the forecasted sales figures in Table 2-9 do not represent member agencies' allocation of supply from the Water Authority.

Table 2-9. Member Agency Normal Year Imported Demand on the Water Authority [1,2,3,4] (AF)

Member Agency	2015	2020	2025	2030	2035
Carlsbad MWD	16,862	18,600	20,612	22,273	23,253
Del Mar, city of	1,222	1,221	1,236	1,251	1,266
Escondido, city of	23,734	21,337	22,913	23,931	24,601
Fallbrook PUD	14,140	15,047	16,338	17,528	18,318
Helix WD	33,441	32,126	33,754	35,823	37,898
Lakeside WD	4,114	4,424	4,600	4,734	5,045
Oceanside, city of	23,566	24,094	25,097	26,294	26,702
Olivenhain MWD	21,118	21,552	21,874	22,539	22,854
Otay WD	40,483	41,244	43,934	45,889	48,524
Padre Dam MWD	14,935	15,913	17,105	17,740	18,656
Pendleton, MCB Camp	850	850	850	850	850
Poway, city of	12,593	13,020	13,422	13,954	14,076

Member Agency	2015	2020	2025	2030	2035
Rainbow MWD	21,537	21,070	22,446	24,078	26,137
Ramona MWD	11,213	10,802	11,636	12,350	12,736
Rincon del Diablo MWD	3,696	5,429	6,024	6,765	7,024
San Diego, city of	201,721	221,458	237,621	249,728	260,107
San Dieguito WD	4,736	5,052	5,453	5,677	5,836
Santa Fe ID	8,738	8,093	8,426	8,704	8,919
Sweetwater Authority	8,125	3,292	3,671	4,461	5,292
Vallecitos WD	18,666	17,454	18,777	19,547	19,949
Valley Center MWD	31,467	31,394	33,367	35,351	37,531
Vista ID	16,080	15,961	16,954	17,825	20,000
Yuima MWD	2,098	2,006	2,267	2,510	2,707
Sub-Total	**535,135**	**551,415**	**588,377**	**619,805**	**648,282**
Accelerated Forecast Growth [5]	2,224	4,421	6,605	8,776	10,948
Total	**537,359**	**555,836**	**594,982**	**628,581**	**659,230**

[1] Based on SANDAG 2050 Regional Growth Forecast

[2] Includes historic and projected water conservation

[3] Includes demands associated with member agency known near-term annexations

[4] Assumes member agency implementation of verifiable local supply projections

[5] Demands associated with accelerated forecasted growth are not attributed to individual member agencies and are listed for regional planning purposes

Definitions:

ID = Irrigation District; MWD = Municipal Water District; PUD = Public Utility District; WD = Water District

Section 3
Demand Management

3.1 Introduction

Demand management, or water conservation, is an important part of the Water Authority's water supply portfolio and its diversification efforts for the San Diego region. The Water Authority's water conservation programs: (1) reduce demand for expensive, imported water; (2) demonstrate a continued commitment to the Best Management Practices and Agricultural Efficient Water Management Practices; (3) assist the Water Authority's member agencies to meet the statutory requirements of the Water Conservation Act of 2009 (SBX7-7); and (4) ensure a reliable future water supply.

As the regional wholesale supplier of water to San Diego County, the Water Authority coordinates many of the region's activities and programs to save water. The Water Authority works closely with its member agencies to implement water conservation programs, including the installation of hundreds of thousands of water-saving devices, development of a landscape auditor internship program, and development of a water budget software tool. With the active cooperation of the public and businesses, the region's water-providers are instilling a water conservation ethic in San Diego County. The Water Authority's member agencies, whose direct contact with their retail customers is crucial to implementing conservation programs, partner with the Water Authority and take a proactive approach to educate and work with their customers to save water. Since 1991, over 656,000 AF of water has been conserved through the region's conservation programs, including 65,000 AF in 2010.

3.2 Senate Bill 7 of the Seventh Extraordinary Session of 2009

SBX7-7 was enacted to require retail urban water agencies within the state to achieve a 20 percent reduction in urban per capita water use by December 31, 2020. (Water Code Section 10608.20). The Water Authority is a wholesale agency not directly subject to these requirements. However, the law requires that the Water Authority, as the wholesale supplier, support its retail member agencies' efforts to comply with SBX7-7 through a combination of regionally and locally administered active and passive water conservation measures, programs, and policies, as well as the use of recycled water. (Water Code Section 10608.36).

Examples of active measures and programs include residential and commercial water use surveys and education programs. Active water conservation management strategies cited in the Water Authority's *2015 Business Plan* include participation in Metropolitan's regional programs and coordination on behalf of the member agencies, partnerships with San Diego Gas & Electric (SDG&E) on water and energy programs, and incentives to businesses and property owners based on actual water savings. Passive water conservation management strategies cited in the business plan include programs that encourage long-term behavior change towards measurable reductions in outdoor water use; increase the landscape industry's basic knowledge regarding the interdependency

between water efficiency design, irrigation design, and maintenance; and participation on statewide, national, and industrial committees to advance behavior-based conservation strategies. Additional passive programs and policies include outreach activities, plumbing code changes, legislation, and conservation-based rate structures.

The use of these active and passive water conservation measures, programs, and policies will facilitate market transformation within the region and promote the behavioral change that is at the core of the Water Authority's long-term conservation planning. Section 5.4, "Water Recycling," includes a discussion on recycled water and its role in helping the region achieve the water use reductions required under SBX7-7.

3.3 Water Conservation Achievements

This section provides information on the Water Authority's recent achievements in water conservation. These programs and activities provide a foundation for the existing and future measures, programs, and policies discussed in Section 3.4 below that will support the member agencies' efforts to comply with the requirements of SBX7-7.

3.3.1 Grant Funding

The Water Authority supplements funding of its water conservation programs through the use of grant funding. Recently, the Water Authority was awarded private, state, local, and federal grants with a cumulative value of more than $5.4 million. Grant funding sources include the Bureau of Reclamation, DWR, and the Hans and Margaret Doe Charitable Trust. Examples of the types of programs awarded grant funding are shown in Table 3-1.

Table 3-1. Types of Programs Awarded Grant Funding

Water Budget Software Development	Water-Efficient Landscape Design CD
Landscape Water Use Evaluations	Water-Efficient "How-To" Guides
Water-Efficient Site Retrofits Assistance	Assistance For Irrigation Improvements
Landscape Auditor Internship Program	Sustainable Landscape Retrofits

3.3.2 Water Conservation Summits

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.

The first summit, held in 2006, focused on development of water conservation policies and practices for San Diego County. The desired outcome of the symposium was to increase market supply and demand for water-efficient landscaping in San Diego County. The second summit, held in 2007, urged the implementation of the many concepts for water conservation generated at the 2006 summit and focused on taking immediate action to change the public's conservation ethic.

The 2009 summit was held just before the implementation of regional mandatory water restrictions and cut backs. This "how to" summit provided attendees with the latest information on supply issues, impacts on San Diego County, best management practices (BMPs) for industries, and business opportunities and trends. The Water Authority also introduced its new regional water conservation brand, "WaterSmart," at the summit.

3.3.2.1 Blueprint for Water Conservation

In response to input from participants at the water conservation summits, the Blueprint for Water Conservation (Blueprint) was drafted in 2007 to help the Water Authority, its member agencies, and the Water Conservation Garden to comprehensively plan for and implement conservation efforts and programs. The programs were designed to incorporate the requirements and strategies of conservation-related planning documents, including the Water Authority's 2005 Plan, CUWCC's BMPs, Agricultural Efficient Water Management Practices, Assembly Bill (AB) 2717 Landscape Taskforce, and AB 1881. The Blueprint outlined strategies for saving water in landscaping, indoor uses, and agriculture, and although many of the Blueprint's key strategies and actions are complete, several elements – particularly long-term initiatives targeting outdoor water use – are still in progress.

3.3.3 Accelerated Public Sector Water Efficiency Partnership Demonstration Program

The Accelerated Public Sector Water Efficiency Partnership Demonstration Program, administered by Metropolitan, offered financial incentives to public agencies to implement immediate water efficiency measures for conservation and water recycling. In the San Diego region, the Water Authority coordinated the participation of 28 public sector agencies to participate in the program. The agencies received nearly $1 million of program funding for water efficiency improvements through device-based retrofits, audits, and recycled water hook-ups.

3.3.4 San Diego County Fair

Since the early 1990s, the Water Authority has provided water-efficient landscape exhibits, displays, and/or awards at the San Diego County Fair as a means to educate the public about water-efficient landscape practices. In the past, the Water Authority would install its own landscape exhibit; however, today the Water Authority partners with a regional botanic garden or horticultural institution on the landscape exhibit. Doing so provides a means for the Water Authority to support other influencers in the region.

In addition, the Water Authority presents a WaterSmart Landscape Award to the exhibit that best exemplifies a WaterSmart landscape through eye-catching colors, textures, and designs. The award and its monetary prize encourage landscape exhibitors to install water-efficient gardens, thus increasing the public's exposure to the beauty and potential of a WaterSmart landscape.

3.3.5 Model Water Efficient Landscape Ordinance

The Water Authority and the Conservation Action Committee (CAC) provided technical feedback to DWR on its Model Water Efficient Landscape Ordinance. In early 2007, the Water Authority tasked the CAC's Model Ordinance Group with developing a regional model for adoption by the cities in the region and the county of San Diego. In 2009, DWR updated its own model. The group's initial work

on a regional model and its feedback to DWR on the state model is credited with shaping the final ordinance. The group was comprised of stakeholders that represented various areas, including landscape architects, the county, cities, water agencies, soil experts, and landscape contractors.

3.3.6 Smart Water Application Technologies

The Water Authority is one of several water utilities throughout the United States represented on the Smart Water Application Technologies (SWAT) committee, which convenes under the auspices of the Irrigation Association. SWAT is a forum where water utility representatives engage with irrigation industry leaders to jointly identify and promote water efficient irrigation technologies on a national scale. Recent achievements include a standardized testing protocol for weather-based irrigation controllers, including the dissemination of product testing results; as well as progress with developing new protocols for emerging technologies, such as soil moisture–based controllers and other products.

3.4 Water Conservation Programs and Activities

This section provides information on the Water Authority's existing and future measures, programs, and policies to support member agency compliance with SBX7-7, as well as to ensure future water reliability for the region beyond 2020. The water conservation measures, programs, and policies are continually evaluated based on current conditions and adjusted accordingly to support member agency water conservation efforts. The region's programs and activities are funded by multiple sources, including the Water Authority's customer service charge, Metropolitan's water stewardship charge, individual retail member agency charges, and grant funding. The information below provides a description of the water conservation programs and activities being implemented in the Water Authority's service area.

3.4.1 Residential Water Conservation Incentive Programs

The Water Authority implemented its first incentive program for water conserving devices in 1991. From 1991 to 2008 financial incentives in the form of vouchers were used to encourage the replacement of water-wasting devices that would not otherwise be replaced. The program was extremely successful and resulted in the installation of over 500,000 water-efficient toilets, 80,000 high-efficiency clothes washers, and other devices that will generate lifetime water savings of over 383,000 AF.

In 2008, the Water Authority transitioned from operation of its own voucher incentive program to participation in the regional SoCal Water$mart rebate program. The regional program offers rebates for high-efficiency clothes washers, weather-based irrigation controllers, rotating nozzles, and other devices. Through the program over 22,400 high-efficiency clothes washers and 1.5 million square feet of synthetic turf was installed. The installation of these devices and others rebated through the program will generate a lifetime water savings of more than 22,000 AF.

3.4.2 Commercial, Industrial, and Institutional Water Conservation Incentives

Prior to 2008, the Water Authority managed a commercial, industrial, and institutional (CII) voucher program. In July 2008, the Water Authority transitioned from the Water Authority–managed CII Voucher Incentive Program (VIP) to Metropolitan's regional CII Save A Buck Program. Joining the Save A Buck program centralized program administration and reduced overhead costs previously incurred by the Water Authority and its member agencies. Through both the VIP and Save A Buck programs over 56,000 CII water saving devices were installed that provided 18,400 AF of water savings from 1993 to 2009. Examples of the types of CII devices available through the Save A Buck program are shown in Table 3-2.

Table 3-2. Commercial, Industrial, & Institutional Water Conservation Devices

Weather-Based Irrigation Controllers	Central Computer Irrigation Controllers
Large Rotary Nozzles	Rotating Nozzles for Pop-up Spray Nozzles
Commercial High Efficiency Toilets	Ultra Low Water Urinal and Zero Water Urinals
pH-Cooling Tower Conductivity Controllers	Cooling Tower Conductivity Controllers
Dry Vacuum Pumps	Connectionless Food Steamers
Ice-Making Machines	Water Brooms

3.4.3 Water & Energy Pilot Program

In December 2007, the California Public Utilities Commission approved a pilot program between the Water Authority and SDG&E to develop a partnership to implement specific water and energy conservation programs. As part of the pilot program, SDG&E funded the studies necessary to understand more accurately the relationship between water savings and a reduction in energy use. The period for the pilot programs and studies began in January 2008, ran for more than 18 months, and consisted of three phases.

During the first phase, the Water Authority and SDG&E designed the pilot programs. In phase two, consultants were hired to work on the pilots, begin baseline studies, and work with the Water Authority and SDG&E to ensure that the pilot programs produce useful information. In phase three, the Water Authority and SDG&E implemented the pilot programs. The results of the pilot program will be used to determine the benefits that result when water conservation efforts and energy efficiency programs are integrated into one program. Below is a brief description of each component of the pilot program.

3.4.3.1 Large Customer Audits

This component of the pilot program integrated water and energy audit services into one comprehensive audit and included implementation of recommendations on a previous large customer audit where the initial audit recommendations were not acted upon by the customer. The development and implementation of eight integrated water-energy audits for large customers were performed. Preliminary results show significant water and energy savings were achieved through both the implementation of the previous audit recommendations and implementation of the additional eight audits.

3.4.3.2 Managed Landscape

The managed landscape component documented and verified achieved water savings and related energy savings obtained through a guaranteed performance contract with the participant that was based on a pre-implementation audit and work plan. The pilot project focused on efficient use of potable water for landscapes. The pilot involved 13 sites of four acres each. Preliminary results show water savings in excess of 20 percent may be possible.

3.4.3.3 Recycled Water

The recycled water program retrofitted six sites to convert users from a potable water source to a lower energy recycled water source. The Water Authority and its member agencies identified sites with completed retrofit plans that allowed the customer to immediately switch from potable water usage to recycled water usage. Initial results show significant potable water savings for parks.

Once finalized, the results from the pilot program will be used to design future programs that target water and energy partnership opportunities.

3.4.4 Agricultural Water Management Program

Mission Resource Conservation District (Mission RCD) has been under contract to the Water Authority to operate agricultural water management services since 1990 as part of the Water Authority's Agriculture Water Management Program (AWMP). During that time, Mission RCD provided more than 1,700 audits on more than 28,000 acres of avocados, citrus, field flowers, and other fruits and ornamentals. The goal of the program is to provide technical assistance to growers to enable them to irrigate crops as efficiently as possible in order to obtain the maximum economic benefit from limited water resources.

In addition to providing technical assistance, the AWMP provides agricultural audits that include visual observations of the irrigation system, examination of soil and crop materials, pump testing, and answering the grower's questions. A written report is provided that summarizes the irrigation system's hydraulic characteristics and soil profiles, and provides recommendations to improve the overall system efficiency. Local weather data and crop water demand information is also provided. Potential yield improvements and water savings realized from improvements in irrigation efficiency are explained to the grower. Follow-up service is provided to determine if system improvements were implemented and, if not, to encourage implementation of the recommendations. Additionally, the program complies with the requirements of the Efficient Water Management Practices of the Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California.

3.4.5 Conservation Action Committee

The CAC was created in 2003 by the city of San Diego as a forum to communicate with the landscape industry and property and community managers on issues related to water efficiency. In the following years membership in the CAC increased to include additional retail water agencies. In 2006, the Water Conservation Summit expanded the CAC's purpose to include the following:

- Encourage industries, government, and communities to conserve water and develop tools, programs, and systems to promote water efficiency in the San Diego region.
- Provide a forum to exchange information regarding water efficiency.

- Promote working together for long-term solutions and success.

After the 2006 Summit, the Water Authority began to provide the CAC with administrative support and a more active role in the subcommittees. The CAC includes representation from industry, government, environmental, and community interests. Some of the CAC's and its subcommittees' recent accomplishments include the following:

- As required by AB 1881[1], developed a Regional Model Landscape Ordinance that regulatory agencies utilized as they developed their local ordinances.
- Provided detailed feedback to the state on the state's Model Landscape Ordinance with many of CAC's Ordinance Work Group's recommendations and concerns being addressed in the final document.
- Championed water-related issues at the industry association level.
- Provided feedback to water agencies related to drought ordinances and programs.

Recently, CAC membership conducted an evaluation of its goals and structure, which resulted in the following revised slate of subcommittees to better meet the needs of its membership:

- Landscape Industry Subcommittee
- Commercial, Industrial, and Institutional Subcommittee
- Nursery and Agricultural Subcommittee
- Regulation and Legislative Subcommittee
- Residential Subcommittee
- Outreach and Education Subcommittee

3.4.6 WaterSmart – A Better Way to Beautiful

At the 2006 Water Conservation Summit, a set of six strategies were drafted designed to increase market supply and demand for water-efficient landscaping in San Diego County. These strategies were later incorporated into the Blueprint. Strategy #4, Public Education, recommended development of a branding program to reinforce a common message as part of all public education, website, advertising, conservation programs, and events related to outdoor conservation. Later, the strategy was extended to include all water conservation – indoor and outdoor.

In 2010, the Water Authority officially registered the copyright for the brand's artwork. The brand identity includes a name, logo, and tagline. The logo, the visual representation of the brand, is made up of a simple flower, accentuated by a single water drop. The image promises that it only takes a small amount of water to nourish a healthy and beautiful landscape. The tagline, "A better way to beautiful," encapsulates the ultimate action and benefits of the program.

The accompanying WaterSmart website will support the better way to beautiful message and provide an important tool to educate the region about the ongoing need to use water resources wisely and efficiently in our semi-arid region without compromising beauty. Its goal is to inspire

[1] AB 1881 amended Civil Code §1353.8; repealed and added Article 10.8 (commencing with §65591) of Chapter 3, Div. 1 of Title 7 of the Government Code; added §25401.9 to the Public Resources Code; and added Article 4.5 to Chapter 8 of Div. 1 of the Water Code.

more residents and businesses to permanently reduce their outdoor water use by conveniently demonstrating there is "a better way to beautiful." It shows they can have an attractive landscape that reflects a more water-efficient lifestyle that makes sense for San Diego County, and that others in their community are making this change.

3.4.7 Landscape Auditor Internships

The Water Authority joined with regional water agencies, community colleges, and private-sector partners to implement a landscape auditor internship program to provide students in the San Diego region with career opportunities and on-the-job experience in the area of landscape services. The water agencies benefit through the training of students who are needed to meet a demand for landscape services.

Cuyamaca College administers the program and pays qualified students through a grant, and matching funds are provided by the Water Authority. Cuyamaca College works with other community colleges in the San Diego region to recruit, screen, train, and place students. The interns receive training on a web-driven water budget program that allows water agencies to communicate to their customers landscape water consumption data relative to landscape water needs. Interns also receive training in water conservation principles with an emphasis on landscape audits. Since the internship program began in June 2008, over 4,450 water budgets and landscape area measurements were developed with potential water savings of 2,200 AF.

3.4.8 Water Budgets

The water budget tool software, known locally as the WaterSmart Target, is designed to enable retail water agencies to establish water budgets for irrigation accounts and monitor performance. A water budget is a landscape water use target based on square footage and local climate conditions. The water budget is compared to actual use to gauge performance and identify savings potential.

WaterSmart Target integrates multiple applications such as a geographic information system (GIS) landscape measurement tool, consumption data import tool, water budget report function, and California Irrigation Management Information System (CIMIS) weather reads to provide a one-stop water budget engine for agencies. The 14 agencies with access to the tool collectively developed over 2,600 measurements and 1,200 budgets.

The Water Authority, in partnership with the Rincon del Diablo Municipal Water District, implemented a residential water budget pilot program that provided landscape water budgets to 250 high water use customers within the Rincon del Diablo Municipal Water District's service area. The goal of the program was to illustrate the cost-effectiveness of an integrated water budget approach on large, single-family lots. The program consisted of three phases – recruitment, audits and retrofits, and evaluation. Funding for this program was provided by Metropolitan and the Bureau of Reclamation.

3.4.9 Smart Landscape Evaluations and WaterSmart Irrigation Check-Ups

The Water Authority makes available smart landscape evaluations to assist single- and multi-family customers and businesses of participating agencies to identify indoor and outdoor water savings opportunities. Technicians review indoor fixtures and evaluate the performance of the site's

irrigation system and provide the customer with a list of recommendations to improve water efficiency, including plant alternatives and a proposed watering schedule. The service is provided at no cost to the customer.

3.4.10 Water Conservation Garden

The Water Conservation Garden opened to the public in 1999 with the goal of educating the public about the steps they can take to conserve water in the landscape. It occupies 4.5 acres adjacent to Cuyamaca College in the eastern part of the county. The Garden includes 16 different gardens and exhibits and provides school-education outreach, low-water-use classes, and community events. The Water Authority joined the Garden's Joint Powers Authority in 2001 and continues to provide support to the Garden in its efforts to promote water efficiency in the landscape sector.

3.4.11 San Diego Botanic Garden

The San Diego Botanic Garden (formally known as Quail Botanical Garden) is a well-established garden in the north-coastal area of San Diego County. For the past few years, the Water Authority supported the Botanic Garden as a corporate partner. In addition, the Water Authority and the Botanic Garden collaborated on the development of garden and school education videos as well as landscape exhibits for the San Diego County Fair. An important goal in the mission of the Botanic Garden is to promote sustainable use of natural resources. Low-water-use plants and water-saving technologies and displays make up the majority of the gardens. The Botanic Garden also provides classes on water conservation–related subjects throughout the year in an effort to reduce outdoor water use in the region.

3.4.12 California Urban Water Conservation Council

The CUWCC was created in 1991 through a Memorandum of Understanding (MOU) Regarding Urban Water Conservation in California to increase water use efficiency statewide through partnerships among urban water agencies, environmental organizations, and other private entities. The CUWCC's goals are to integrate urban water conservation BMPs into the planning and management of California's water resources to reduce long-term water demands. Some of the early programs to address the BMPs provided financial incentives to retrofit high water-use toilets with ultra-low-flush models and to distribute low-flow showerheads to consumers.

The Water Authority has been in full compliance with the Wholesaler BMP Reports since 1992. Most of the Water Authority's member agencies are signatories to the MOU and submit biennial BMP reports to show compliance with the appropriate retail water agency BMPs. As of April 2011, the CUWCC's reconfigured database is not available to agencies to report on their BMPs for the 2009 and 2010 reporting periods. In accordance with DWR's *2010 Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan*, Section E: Demand Measurement Measures and Best Management Practices, CUWCC BMP Annual Reports, the Water Authority self-certifies that it is in compliance with the MOU. **Appendix D** contains the Water Authority's BMP reports and required documentation to support self-certification for the 2009 and 2010 reporting period.

In 2007, the CUWCC actively pursued updates to the MOU, Bylaws, and BMPs. The CUWCC formed committees to evaluate and update the existing BMPs. Water Authority and member agency staff actively participated on the BMP revision committees to draft revised BMPs. In June 2010, the

CUWCC reorganized their 14 BMPs into five categories. The first two categories, utility operations and education, are "Foundational BMPs" considered to be essential water conservation activities that all agencies should implement. The remaining three categories are termed "Programmatic BMPs" and are organized into residential, CII, and landscape categories.

Additional compliance options were also added to the traditional BMP checklist approach, including a Flex Track (performance-based) and a daily per capita water use approach. Signatories are required to comply with the CUWCC BMPs through 2015. After 2015, the BMPs sunset and compliance with the SBX7-7 targets is required for retail water agencies. Table 3-3 shows the re-organization of the BMPs.

Table 3-3. Previous and Revised BMPs

Previous BMP Number and Name		Revised BMP Number and Category	
1.	Water Survey Programs for Single-Family & Multi-Family Residential Customers	3.	Residential, Programmatic
2.	Residential Plumbing Retrofit	3.	Residential, Programmatic
3.	System Water Audits, Leak Detection and Repair	1.	Utility Operations, Foundational
4.	Metering with Commodity Rates for All New Connections & Retrofit of Existing Connections	1.	Utility Operations, Foundational
5.	Large Landscape Conservation Programs and Incentives	5.	Landscape, Programmatic
6.	High-Efficiency Clothes Washing Machine Financial Incentive Programs	3.	Residential, Programmatic
7.	Public Information Programs	2.	Education – Public Information Programs, Foundational
8.	School Education Programs	2.	Education – Public Information Programs, Foundational
9.	Conservation Programs for Commercial, Industrial, and Institutional Accounts	4.	Commercial, Industrial, and Institutional; Programmatic
10.	Wholesale Agency Assistance Programs	1.	Utility Operations; Foundational
11.	Retail Conservation Pricing	1.	Utility Operations; Foundational
12.	Conservation Coordinator	1.	Utility Operations; Foundational
13.	Water Waste Prohibition	1.	Utility Operations; Foundational
14.	Residential ULFT Replacement	3.	Residential; Programmatic

In 2010 the position of Chair of the CUWCC's board of directors was held by a representative of the Water Authority. The Water Authority is also represented on many of the CUWCC's committees,

including Utility Operations, Residential, CII, Landscape, Research and Evaluation, Education, and Finance and Governance.

3.4.13 Public Outreach

In response to shortage conditions, the Water Authority launched an aggressive outreach campaign in June 2007 branded as the "20-Gallon Challenge." The outreach campaign was a multi-faceted approach to educate the community on the short- and long-term water supply challenges, specific tips to save water, and resources available to implement those changes. Tactics to achieve a targeted 56,000 AF of voluntary savings included traditional advertising, media relations, online communications, water agency relations, education curriculum and contests, government relations, and community outreach.

In addition to the activities related to the 20-Gallon Challenge, other Water Authority outreach activities include the following:

- Conducting research on the public's knowledge of water issues, attitudes towards water-efficient landscaping, and influencers.
- Developing a regional conservation brand.
- Developing a long-term implementation plan designed to change perceptions about water-efficient landscapes and spur market transformation.
- Developing a Community Associations How-To Guide for WaterSmart landscaping.
- Funding the Water Conservation Garden to provide educational classes.
- Participating in and sponsoring awards at the San Diego Flower and Garden exhibit (San Diego County Fair):
    - Creating annual landscape exhibits that showcase the beauty of water-efficient landscapes.
    - Providing landscape award to the exhibit that best exemplifies WaterSmart principles as a means to encourage exhibitors to install water-efficient landscape exhibits.
- Developing the "Gardens of Ideas" video (contracted with San Diego Botanic Garden).
- Participating in community events to provide conservation outreach.
- Sponsoring the San Diego Home and Garden Show.
- Developing and providing school education materials, presentations, and workshops to promote conservation. Examples include:
    - "Be Water Smart," a water conservation video for 4th-6th grade students.
    - K-6th grade musical assembly titled, "H_2O, Where Do You Go?" that emphasized water conservation.
    - Traveling library K–6th grade program.
        - 3rd-grade classroom presentation that covers water sources and conservation.
        - Library kiosk with interactive panels.
        - Books for participating school libraries.
    - Funding Splash Science Mobile Lab.

  - Developing and funding "Water-Wise Gardening" workshops for teachers.
  - Administering a "School Pledge Promotion."
  - Administering a youth merit patch program for scouts that teaches children about water supply and conservation.
  - Developing and funding an exhibit at the Reuben H. Fleet Science Center.
- Educating the region on various water-related subjects via a speakers' bureau.

3.5 Conclusion

Water conservation continues to play a central role in the Water Authority's efforts to maximize the reliability of the region's water supply through supply diversification. The historical achievements in water conservation discussed in Section 3.3 provide a foundation for the existing and future measures, programs, and policies outlined in Section 3.4. Moving forward, the Water Authority will support its member agencies' efforts to comply with the GPCD reductions required under SBX7-7 through various means, including a continued emphasis on behavioral change and market transformation.

Section 4
San Diego County Water Authority Supplies

4.1 Introduction

Historically, the Water Authority has relied on imported water supplies purchased from Metropolitan to meet the needs of its member agencies. Metropolitan's supplies come from two primary sources, the State Water Project (SWP) and the Colorado River. After experiencing severe shortages from Metropolitan during the 1987–1992 drought, the Water Authority began aggressively pursuing actions to diversify the region's supply sources. Comprehensive supply and facility planning over the last 18 years provided the direction for implementation of these actions.

This section provides specific documentation on the existing and projected supply sources being implemented by the Water Authority. For purposes of analysis in the 2010 Plan, supplies are separated into one of three categories: verifiable, additional planned, or conceptual. "Verifiable" projects are those with adequate documentation regarding implementation and supply utilization, and are used in the reliability assessment in Section 9, "Water Supply Reliability." "Additional planned" projects are those that either the Water Authority or member agencies are actively pursuing and currently funding, but do not rise to the level of verifiable for implementation. The additional planned projects are utilized in Section 10, "Scenario Planning – Managing an Uncertain Future," as potential strategies to manage future uncertainty planning scenarios. "Conceptual" projects are those considered to be in the pre-planning phase, where the projects have not progressed to a point where the project yield can be factored into reliability assessments or uncertainty planning for this 2010 Plan.

A Water Resources Plan developed in 1993 and updated in 1997 emphasized the development of local supplies and core water transfers. Consistent with the direction provided in the 1997 plan, the Water Authority entered into a Water Conservation and Transfer Agreement with IID, an agricultural district in neighboring Imperial County, in 1998. Through the transfer agreement, the Water Authority received 70,000 AF in 2010, with the volume increasing annually until it reaches 200,000 AF/YR in 2021. The IID Water Conservation and Transfer Agreement supply source is considered a verifiable Water Authority supply.

In 2003, as part of the execution of the QSA on the Colorado River, the Water Authority was contracted for 77,700 AF/YR of conserved water from projects to line the All-American and Coachella Canals (AAC and CC, respectively). Deliveries of this conserved water from the CC reached the region in 2007, and deliveries from the AAC reached the region in 2010. Expected supplies from the canal lining projects are considered verifiable Water Authority supplies.

To further diversify regional supplies, the Water Authority's 2005 Plan identified seawater desalination as a potential supply for meeting future demands. In keeping with the objective of the 2005 Plan, the Water Authority is pursuing the purchase of a water supply from the Carlsbad Desalination Project, a fully-permitted private desalination project at the Encina Power Station site located in the City of Carlsbad. In 2010, the Water Authority's Board of Directors approved a Term Sheet between the Water Authority and the private investor-owned company, Poseidon Resources (Poseidon), and directed staff to prepare a draft Water Purchase Agreement based on its provisions. The Carlsbad Desalination Project is considered a verifiable Water Authority supply.

In addition to the Carlsbad Desalination Project, the Water Authority is also pursuing the development of two other regional seawater desalination projects – planning efforts for a new regional desalination project located on Camp Pendleton, and the feasibility evaluation of a binational seawater desalination project in Rosarito, Mexico.

4.2 Water Authority – IID Water Conservation And Transfer Agreement

On April 29, 1998, the Water Authority signed a historic agreement with IID for the long-term transfer of conserved Colorado River water to San Diego County. The Water Authority–IID Water Conservation and Transfer Agreement (Transfer Agreement) is the largest agriculture-to-urban water transfer in United States history. Colorado River water will be conserved by Imperial Valley farmers who voluntarily participate in the program and then transferred to the Water Authority for use in San Diego County.

4.2.1 Implementation Status

On October 10, 2003, the Water Authority and IID executed an amendment to the original 1998 Transfer Agreement. This amendment modified certain aspects of the Transfer Agreement to be consistent with the terms and conditions of the QSA and related agreements. It also modified other aspects of the agreement to lessen the environmental impacts of the transfer of conserved water. The amendment was expressly contingent on the approval and implementation of the QSA, which was also executed on October 10, 2003. Section 6.2.1, "Colorado River," contains details on the QSA.

On November 5, 2003, IID filed a complaint in Imperial County Superior Court seeking validation of 13 contracts associated with the Transfer Agreement and the QSA. Imperial County and various private parties filed additional suits in Superior Court, alleging violations of the California Environmental Quality Act (CEQA), the California Water Code, and other laws related to the approval of the QSA, the water transfer, and related agreements. The lawsuits were coordinated for trial. The IID, Coachella Valley Water District, Metropolitan, the Water Authority, and state are defending these suits and coordinating to seek validation of the contracts. In January 2010, a California Superior Court judge ruled that the QSA and 11 related agreements were invalid, because one of the agreements created an open-ended financial obligation for the state, in violation of California's constitution. The QSA parties appealed this decision and are continuing to seek validation of the contracts. The appeal is currently pending in the Third District Court of Appeal. A stay of the trial court judgement has been issued during the appeal. Implementation of the transfer provisions is proceeding during litigation. For further information regarding the litigation, please contact the Water Authority's General Counsel.

4.2.2 Expected Supply

Deliveries into San Diego County from the transfer began in 2003 with an initial transfer of 10,000 AF. The Water Authority received increasing amounts of transfer water each year, according to a water delivery schedule contained in the transfer agreement. In 2010, the Water Authority received 70,000 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 IID'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 delivery cutbacks.

4.2.3 Transportation

The Water Authority entered into a water exchange agreement with Metropolitan on October 10, 2003, to transport the Water Authority–IID transfer water from the Colorado River to San Diego County. Under the exchange agreement, Metropolitan takes delivery of the transfer water through its Colorado River Aqueduct. In exchange, Metropolitan delivers to the Water Authority a like quantity and quality of water. The Water Authority pays Metropolitan's applicable wheeling rate for each acre-foot of exchange water delivered. Under the terms of the water exchange agreement, Metropolitan will make delivery of the transfer water for 35 years, unless the Water Authority and Metropolitan elect to extend the agreement another 10 years for a total of 45 years.

4.2.4 Cost/Financing

The costs associated with the transfer are financed through the Water Authority's rates and charges. In the agreement between the Water Authority and IID, the price for the transfer water started at $258/AF and increased by a set amount for the first seven years. In December 2009, the Water Authority and IID executed a fifth amendment to the water transfer agreement that sets the price per acre-foot for transfer water for calendar years 2010 through 2015, beginning at $405/AF in 2010 and increasing to $624/AF in 2015. For calendar years 2016 through 2034, the unit price will be adjusted using an agreed-upon index. The amendment also required the Water Authority to pay IID $6 million at the end of calendar year 2009 and another $50 million on or before October 1, 2010, provided that a transfer stoppage is not in effect as a result of a court order in the QSA coordinated cases. Beginning in 2035, either the Water Authority or IID can, if certain criteria are met, elect a market rate price through a formula described in the water transfer agreement.

The October 2003 exchange agreement between Metropolitan and the Water Authority set the initial cost to transport the conserved water at $253/AF. Thereafter, the price is set to be equal to the charge or charges set by Metropolitan's Board of Directors pursuant to applicable laws and regulation, and generally applicable to the conveyance of water by Metropolitan on behalf of its member agencies. The transportation charge in 2010 is $314/AF.

The Water Authority is providing $10 million to help offset potential socioeconomic impacts associated with temporary land fallowing. IID will credit the Water Authority for these funds during years 16 through 45. In 2007, the Water Authority prepaid IID an additional $10 million for future deliveries of water. IID will credit the Water Authority for this up-front payment during years 16 through 30.

As part of implementation of the QSA and water transfer, the Water Authority also entered into an environmental cost sharing agreement. Under this agreement the Water Authority is contributing a total of $64 million to fund environmental mitigation projects and the Salton Sea Restoration Fund.

4.2.5 Written Contracts or Other Proof

Appendix E contains a list of the specific written contracts, agreements, and environmental permits associated with implementation of the Water Authority–IID Transfer.

4.2.6 Existing and Future Supplies

Based on the terms and conditions in the Transfer Agreement, Table 4-1 shows the anticipated delivery schedule of the conserved transfer water in five-year increments. There is adequate documentation to demonstrate the availability of this supply, and, therefore, the supply yields shown in Table 4-1 will be included in the reliability analysis found in Section 9, "Water Supply Reliability."

Table 4-1. Existing and Projected Water Authority–IID Transfer Supplies (Normal Year – AF/YR)

2010	2015	2020	2025	2030	2035
70,000	100,000	190,000	200,000	200,000	200,000

4.3 All-American Canal and Coachella Canal Lining Projects

As part of the QSA and related contracts, the Water Authority contracted for 77,700 AF/YR of conserved water from projects that lined portions of the AAC and CC. The projects reduced the loss of water that occurred through seepage, and the conserved water is delivered to the Water Authority. This conserved water will provide the San Diego region with an additional 8.5 million AF over the 110-year life of the agreement.

4.3.1 Implementation Status

The CC lining project began in November 2004 and was completed in 2006. Deliveries of conserved water to the Water Authority began in 2007. The project constructed a 37-mile parallel canal adjacent to the CC. The AAC lining project was begun in 2005 and was completed in 2010. The lining project constructed a concrete-lined canal parallel to 24 miles of the existing AAC from Pilot Knob to Drop 3.

4.3.2 Expected Supply

The AAC lining project makes 67,700 AF of Colorado River water per year available for allocation to the Water Authority and San Luis Rey Indian water rights settlement parties. The CC lining project makes 26,000 AF of Colorado River water each year available for allocation. The 2003 Allocation Agreement provides for 16,000 AF/YR of conserved canal lining water to be allocated to the San Luis Rey Indian Water Rights Settlement Parties. The remaining amount, 77,700 AF/YR, is to be available to the Water Authority, with up to an additional 4,850 AF/YR available to the Water Authority depending on environmental requirements from the CC lining project. 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 AF/FY of that supply. According to the Allocation Agreement, IID has call rights to a portion (5,000 AF/YR) of the conserved water upon termination of the QSA for the remainder of the 110 years of the Allocation Agreement and upon satisfying certain conditions. The term of the QSA is for up to 75 years.

4.3.3 Transportation

The October 2003 Exchange Agreement between the Water Authority and Metropolitan provides for the delivery of the conserved water from the canal lining projects. The Water Authority pays Metropolitan's applicable wheeling rate for each acre-foot of exchange water delivered. In the Agreement, Metropolitan will deliver the canal lining water for the term of the Allocation Agreement (110 years).

4.3.4 Cost/Financing

Under California Water Code Section 12560 et seq., the Water Authority received $200 million in state funds for construction of the canal lining projects. In addition, $20 million was made available from Proposition 50 and $36 million from Proposition 84. The Water Authority was responsible for additional expenses above the funds provided by the state.

In accordance with the Allocation Agreement, the Water Authority is responsible for a portion of the net additional Operation, Maintenance, and Repair (OM&R) costs for the lined canals. Any costs associated with the lining projects as proposed are to be financed through the Water Authority's rates and charges.

4.3.5 Written Contracts or Other Proof

Appendix E contains a list of the specific written contracts, agreements, and environmental permits associated with implementation of the Canal Lining Projects.

4.3.6 Future Supplies

Table 4-2 shows the anticipated delivery schedule of conserved supplies from the canal lining projects in five-year increments. Adequate documentation exists to demonstrate the availability of this supply, and, therefore, the reliability analysis found in Section 9, "Water Supply Reliability," will show the supply yields presented in Table 4-2.

Table 4-2. Projected Supply From Canal Lining Projects (Normal Year – AF/YR)

	2010	2015	2020	2025	2030	2035
CC Lining Project [1]	24,000	24,000	24,000	24,000	24,000	24,000
AAC Lining Project [2]	56,200	56,200	56,200	56,200	56,200	56,200
Total:	80,200	80,200	80,200	80,200	80,200	80,200

[1] The project was completed in 2006, and deliveries started in 2007. Includes 21,500 AF + 2,500 AF environmental water deliveries.
[2] The project was completed in 2010.

4.4 Carlsbad Seawater Desalination Project

Development of seawater desalination in San Diego County will assist the region in diversifying its water resources, reduce dependence on imported supplies, and provide a new drought-proof, locally treated water supply. The Carlsbad Desalination Project (Project) is a fully-permitted seawater desalination plant and conveyance pipeline currently being developed by Poseidon, a private

investor–owned company that develops water and wastewater infrastructure. The Project, located at the Encina Power Station in Carlsbad, has been in development since 1998 and was incorporated into the 2003 Water Facilities Master Plan and the 2005 Plan. The Project has obtained all required permits and environmental clearances and, when completed, will provide a highly reliable local supply of 56,000 AF/YR for the region.

4.4.1 Implementation Status

The Project has obtained all required permits and environmental clearances, including the following:

- National Pollutant Discharge Elimination System (NPDES) Discharge Permit (Regional Water Quality Control Board)
- Conditional Drinking Water Permit (California Department of Health Services)
- State Lands Commission Lease (State Lands Commission)
- Coastal Development Permit (California Coastal Commission)

IDE Technologies, a worldwide leader in the design, construction, and operation of desalination plants, was selected by Poseidon to be the desalination process contractor for the Project.

In July 2010, the Water Authority Board approved a Term Sheet between the Water Authority and Poseidon and directed staff to prepare a Water Purchase Agreement based on its provisions. Prior to the Water Authority engaging (in 2010) as a potential purchaser of all the water produced by the Project, Poseidon was pursuing a project structure where nine local water agencies had signed water purchase agreements. Ultimately, that project structure was found to be financially infeasible and the Water Authority was asked to step into the role of purchaser of the supply. Key terms for a potential Water Purchase Agreement between the Water Authority and Poseidon include the following:

- The term of the agreement will be for 30 years once commercial operation begins, subject to early buyout provisions beginning at 10 years.
- The Water Authority will shift the risks associated with the design, permitting, financing, construction, and operation of the Project to Poseidon.
- The price for water will be based on the actual cost of production.
- There will be the option to buy the entire plant beginning 10 years after the start date for commercial operation at a price to be specified in the water purchase agreement, as well as the right to purchase the plant at the end of the 30-year water purchase agreement term for $1. This ensures eventual public ownership of the plant, securing long-term price certainty and regional public benefit from ratepayers' past investments in the plant through 30 years of water purchase payments.

The Water Authority Board is expected to consider the Water Purchase Agreement by late 2011. The Project is expected to be completed and online by early 2016.

4.4.2 Expected Supply

When completed, the Project will provide a highly reliable local supply of 56,000 AF/YR of supply for the region, available in both normal and dry hydrologic conditions.

4.4.3 Transportation

A 54-inch pipeline will be constructed to convey product water from the desalination plant 10.5 miles east to the Water Authority's Second Aqueduct. The water will be then be conveyed 5 miles north to the Water Authority's Twin Oaks Valley Water Treatment Plant facility, where it will be blended with treated imported water and subsequently distributed into the Water Authority's existing aqueduct system.

4.4.4 Cost/Financing

The Term Sheet between the Water Authority and Poseidon provides the basis for a potential purchase agreement whereby the Water Authority would purchase the entire output from the Project at a price based on the cost of production. A preliminary September 2010 unit cost estimate was $1,600/AF. The Water Authority's water purchase costs would be financed through Water Authority rates and charges. If the water purchase agreement is approved by the Water Authority Board, Poseidon plans to finance the capital cost of the Project with a combination of private equity and tax-exempt Private Activity Bonds.

4.4.5 Written Contracts or Other Proof

Appendix E contains a list of the specific written contracts, agreements, and environmental permits associated with implementation of the Carlsbad Desalination Project.

4.4.6 Future Supplies

Table 4-3 shows the anticipated delivery schedule of supplies from the Carlsbad Desalination Project in five-year increments. Adequate documentation exists to demonstrate the availability of this supply, and therefore, the reliability analysis found in Section 9, "Water Supply Reliability," will show the supply yields presented in Table 4-3.

Table 4-3. Projected Supply from Carlsbad Desalination Project (Normal Year – AF/YR)

2010	2015	2020	2025	2030	2035
--	--	56,000	56,000	56,000	56,000

4.5 Other Water Authority Seawater Desalination Efforts

4.5.1 MCB Camp Pendleton Seawater Desalination Project

In June 2009, the Water Authority, in collaboration with MCB Camp Pendleton, completed a feasibility study for a potential 50 to 150 MGD seawater desalination project on Camp Pendleton focusing on two possible seawater desalination plant sites in the southwest corner of the base near the mouth of the Santa Margarita River. The feasibility study provided an analysis on new facilities, environmental and permitting requirements, cost estimates, and implementation issues. Major

project components include: intake and discharge facilities, the seawater desalination facility, and the desalinated water conveyance system.

At a special meeting in May 2009, staff briefed the Board on the results and findings of the feasibility study and obtained Board approval to fund a new CIP project for $5.72 million to conduct further planning work for the project. A Memorandum of Understanding (MOU) between the Water Authority and MCB Camp Pendleton was executed in April 2010. The MOU would facilitate base access and defines the roles and responsibilities of the base, the Water Authority, and its consultants in conducting various technical studies for the project. A key technical issue to be investigated further is the type of seawater intake that would be best suited for this project. Hydrogeologic and marine environment studies are planned to further evaluate both subsurface and open-ocean intakes. In addition, other studies on product water conveyance and integration for the Camp Pendleton project will be performed as part of the 2012 Master Plan Update.

These studies are expected to be underway by early 2011 and completed by the end of 2012. Results from the studies will be incorporated into the Water Authority's 2012 Regional Water Facilities Optimization and Master Plan Update. The earliest online date of a potential Camp Pendleton desalination project is 2020. The Camp Pendleton desalination project is considered an additional planned project and is utilized in Section 10, "Scenario Planning – Managing an Uncertain Future," as a potential strategy to manage future uncertainty planning scenarios.

4.5.2 Rosarito Beach Binational Desalination Plant Feasibility Evaluation and Preliminary Design

The Water Authority is participating with U.S. and Mexican agencies in a binational review of potential water management and water supply programs that could benefit Colorado River water users of both countries. As part of this effort, a binational workgroup formed to study potential new water supplies recommended the evaluation and preliminary design of an initial 25 MGD (expandable to 50 MGD) seawater desalination plant that would be located at Rosarito Beach in Baja California, Mexico. U.S. water agencies, including the Water Authority, Metropolitan, Southern Nevada Water Authority (SNWA), and the Central Arizona Water Conservation District (CAWCD), have collaborated to fund a feasibility evaluation and preliminary design of the plant. The Water Authority, Metropolitan, and SNWA are each funding 30 percent of the work, with CAWCD funding the remaining 10 percent. Mexican agencies have supported the development of the project's scope of work and are expected to provide in-kind services in lieu of direct funding for the project. The Water Authority agreed to administer the consultant selection process and serve as project manager for the project.

Currently, the Rosarito Beach Desalination Project is considered a conceptual-level project. If built, product water from the plant would be available to both U.S. and Mexican water users. For U.S. water users, the water could be delivered either directly to the San Diego region, using a cross-border pipeline, or possibly by exchange, with Mexican users taking delivery of the product water and leaving an equivalent amount of Colorado River water available for U.S. users. A separate local seawater desalination project is being pursued by Otay Water District at the same location, and is described in **Section 5.5**.

The project is scheduled to be implemented in four phases, with a "go" or "no go" decision being made at the end of each phase. Existing funding was sufficient to complete the first phase of the project, which provided a feasibility evaluation of the site, assessment of water demand, and a

review of environmental permitting requirements. The first phase was competed in March 2010. The first phase confirmed that the site and the existing infrastructure were adequate to support up to a 50 MGD seawater desalination facility. The second phase of the project would confirm conceptual treatment process requirements, confirm plant size and physical layout, further assess permitting and regulatory issues, and define full-scale plant costs. The Water Authority's Board approved funding for the second phase of the study in January 2011. Additional funds would be required to complete the remaining two phases, which include development and operation of a pilot plant for various test purposes, and a preliminary design of the full-scale plant. The preliminary design would be for a 25 MGD seawater desalination plant, expandable to a 75 MGD plant.

4.6 Water Authority Dry-Year Supplies

In addition to Water Authority supplies expected during a normal water year, the Water Authority also has also invested in carryover storage supplies to assist in achieving reliability in dry year and multiple dry years, as discussed in Section 9.3, "Dry Water Year Assessment." The Water Authority's carryover storage supply program includes both in-region surface water storage and out-of-region groundwater storage in California's Central Valley. These verifiable dry-year storage supplies are described in detail in **Section 11**, "Shortage Contingency Analysis," and a list of the specific written contracts, agreements, and environmental permits associated with implementation of the carryover storage program is contained in Appendix E.

The Water Authority also successfully acquired and utilized dry-year transfers in 2009, as described in **Section 11.2.3.2**. The Water Authority's dry-year transfer program serves as a strategy to meet potential future planning uncertainties in times of shortages, indentified in **Section 10**, "Scenario Planning – Managing an Uncertain Future."

Section 5
Member Agency Supplies

5.1 Introduction

Local resources developed and managed by the Water Authority's member agencies are critical to securing a diverse and reliable supply for the region. Local projects, such as recycled water and groundwater recovery, reduce demands for imported water and often provide agencies with a drought-proof supply. This section provides general information on the local resources being developed and managed by the member agencies. These supplies include surface water, groundwater, recycled water, and desalinated seawater.

The Water Authority, working closely with its member agencies, took the following steps to update the yields anticipated from the member agencies' local supplies:

1. Provided the member agencies with the projected supply numbers included in the Water Authority's Updated 2005 Plan and requested they update the figures for their specific project(s).
2. Prepared revised projections based on input from agencies.
3. Separated the recycled water, groundwater, and seawater desalination projects into three categories: "verifiable," "additional planned," and "conceptual" projects based on the stages of development, as defined in the introduction of Section 4, "San Diego County Water Authority Supplies."
4. Presented revised supply numbers to member agencies at several meetings and requested input.
5. Distributed the administrative draft of the 2010 Plan to member agencies for their review, providing them another opportunity to review and revise the updated local supply figures prior to Water Authority Board approval.

Before 1947, the San Diego region relied on local surface water runoff in normal and wet weather years and on groundwater pumped from local aquifers during dry years when stream flows were reduced. As the economy and population grew, local resources became insufficient to meet the region's water supply needs. From the 1950s onward, the region became increasingly reliant on imported water supplies. Since 1980, a range of 5 to 36 percent of the water used within the Water Authority's service area has come from local sources, primarily from surface water reservoirs with yields that vary directly with annual rainfall. A small but growing share of local supply comes from recycled water and groundwater recovery projects, with additional local supply planned from seawater desalination. Yield from these projects are considered drought-proof since they are primarily independent of precipitation. In fiscal year 2010, total local water sources provided 11 percent of the water used in the Water Authority's service area.

5.2 Surface Water

5.2.1 Description

The regional surface water yield is supported by 25 surface reservoirs with a combined capacity of 593,490 AF. The reservoirs are located in seven of the San Diego County's nine coastal watersheds. Table 5-1 lists the 25 reservoirs in the San Diego region. The runoff in these watersheds starts at the crest of the Peninsular Range and drains into the Pacific Ocean and is mostly developed. The oldest functional reservoir in the county, Cuyamaca Reservoir, was completed in 1887.

Olivenhain Reservoir completed in 2003 is the region's newest. It is part of the Water Authority's ESP and has a storage capacity of 24,364 AF. The ESP storage capacity will add 90,100 AF and is designed to protect the region from disruptions in the water delivery system. In addition, the 2002 Regional Water Facilities Master Plan (Master Plan) identified an opportunity to augment the ESP with a carryover storage component at San Vicente. The Carryover Storage Project (CSP) is scheduled for completion in late 2012, with filling scheduled to occur within three to five years, and will provide 100,000 AF of water storage resources to buffer dry-year supply shortages. Refer to Section 11.2.3, "Water Authority Dry-Year Supplies," for additional information on carryover storage.

Table 5-1. Major San Diego County Reservoirs

Member Agency	Reservoir	Capacity (AF)
Carlsbad MWD	Maerkle	600
Escondido, city of	Dixon	2,606
Escondido, city of	Wohlford	6,506
Fallbrook PUD	Red Mountain	1,335
Helix WD	Cuyamaca	8,195
Helix WD	Jennings	9,790
Poway, city of	Poway	3,330
Rainbow MWD	Beck	625
Rainbow MWD	Morro Hill[1]	465
Ramona MWD	Ramona	12,000
San Diego, city of	Barrett	37,947
San Diego, city of	El Capitan[2]	112,807
San Diego, city of	Hodges[3]	30,251
San Diego, city of	Lower Otay	49,510
San Diego, city of	Miramar	7,185
San Diego, city of	Morena	50,207

Member Agency	Reservoir	Capacity (AF)
San Diego, city of	Murray	4,818
San Diego, city of	San Vicente	90,230
San Diego, city of	Sutherland	29,685
San Dieguito WD/Santa Fe ID	San Dieguito	883
SDCWA/Olivenhain MWD	Olivenhain	24,364
Sweetwater Authority	Loveland	25,387
Sweetwater Authority	Sweetwater	28,079
Valley Center MWD	Turner[4]	1,612
Vista ID	Henshaw	51,774
Total Capacity		590,191

= Connected to Water Authority aqueduct system.

[1] Not currently in service due to maintenance; to return online in 2012.

[2]Imported water can be delivered via San Vicente.

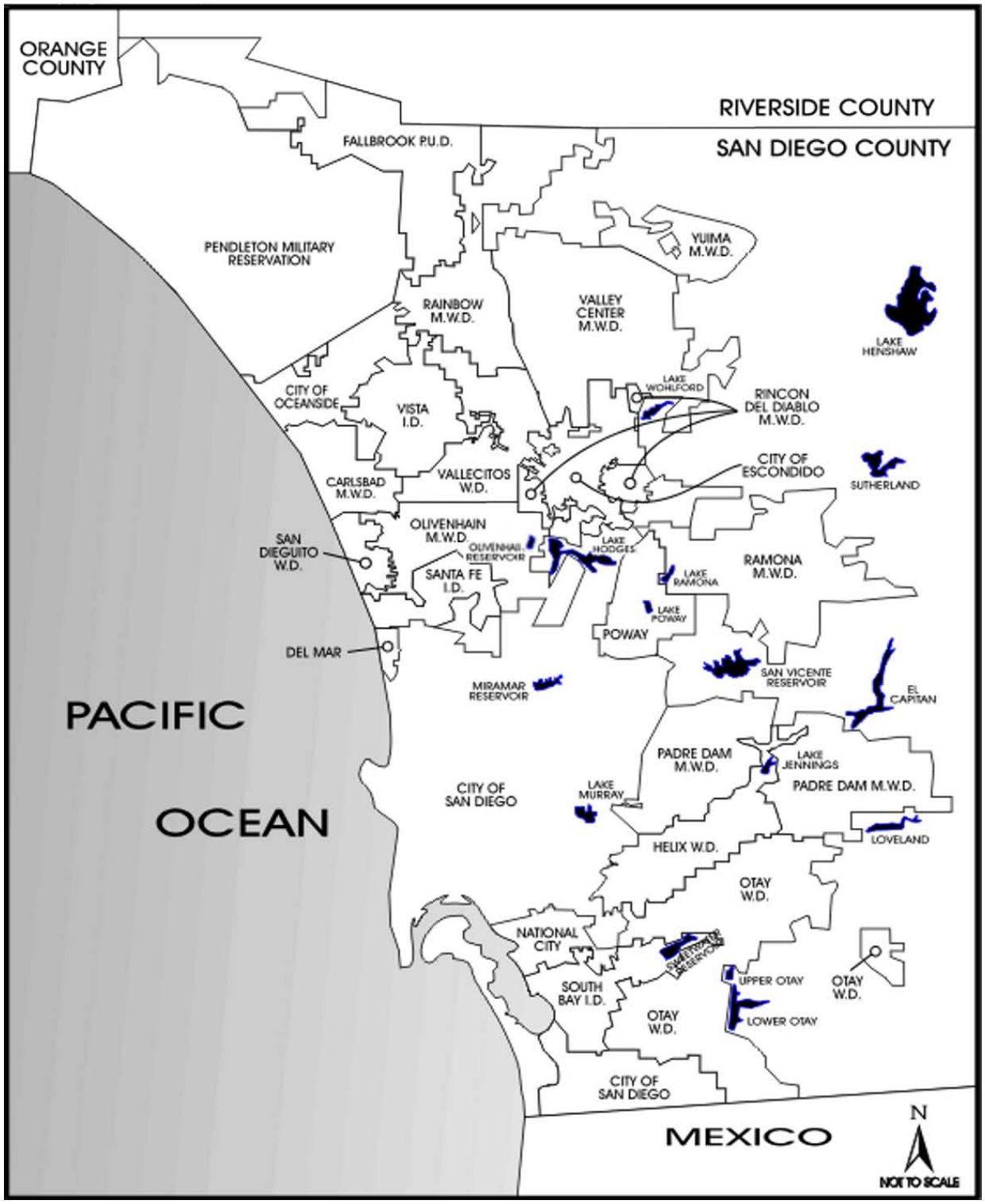
[3] System connection is projected to be in service beginning 2011 as part of the ESP.

[4] Not currently in service as a supply reservoir.

Definitions:

ID = Irrigation District; MWD = Metropolitan Water District; PUD = Public Utility District; WD = Water District

Figure 5-1
Major San Diego County Reservoirs



5.2.2 Issues

5.2.2.1 Management

The Water Authority's member agencies manage most of the region's reservoirs. The Water Authority manages the imported conveyance system to achieve the optimal use of both local and imported water resources, which includes the local reservoirs. In order to reduce the need for imported water purchases, the reservoirs are operated to maximize the use of this local supply. Local surface water supplies can also offset dry-year shortfalls in imported water. Maximizing local yield reduces losses due to evaporation and spills, but it also results in increased demands for imported water during dry years when imported water is more likely to be in short supply. Most member agencies maintain some portion of their storage capacity for emergency storage. The 2002 Master Plan identified carryover storage as necessary to supplement supplies during dry weather events and to maximize the efficient use of existing and planned infrastructure. Currently the Water Authority is operating carryover storage accounts in member agency reservoirs to attenuate the effects of any supply shortfall.

5.2.2.2 Water Quality

See Section 7, "Water Quality," for information.

5.2.3 Encouraging Optimization of Local Surface Water Reservoirs

To optimize the use of local storage, the Water Authority works with its member agencies through storage agreements and through the aqueduct operating plan. The storage agreements allow for carryover storage in member agency reservoirs and provide increased local storage, which can be used during peaks on the aqueduct system. The aqueduct operating plans coordinate imported water deliveries and optimize reservoir fill opportunities. Local yield is maximized by the member agencies that operate the reservoirs. Through the Water Authority's 2012 Regional Water Facilities Optimization and Master Plan Update (Master Plan Update) the Water Authority, in coordination with its member agencies, will model and evaluate whether other opportunities for storage optimization exist.

5.2.4 Projected Surface Water Supplies

Surface water supplies represent the largest single local resource in the Water Authority's service area. However, annual surface water yields can vary substantially due to fluctuating hydrologic cycles. Since 1980, annual surface water yields have ranged from a low of 18,000 AF to a high of 146,000 AF. Planned ESP projects are expected to increase local yield due to the more efficient use of local reservoirs; the volume has not been determined. Water Authority member agency determined average surface water yield to range from 48,206 AF per year in 2015 to 47,289 AF per year in 2035.

A list of the individual reservoirs, expected yield, and basis for the supply figure can be found in **Appendix F**, Table F-1. Table 5-2 shows the projected average surface water supply within the Water Authority's service area, and the yields are utilized in the reliability analysis included in Section 9, "Water Supply Reliability."

Specific information on the projected yields from local reservoirs is expected to be included in the member agencies' 2010 plans.

Table 5-2. Projected Surface Water Supply (Normal Year – AF/YR)

2010	2015	2020	2025	2030	2035
27,336 [1]	48,206[2]	47,940	47,878	47,542	47,289

[1] Based on fiscal year 2010 totals.

[2] Post-2015 supply adjusted downward to account for increase in Cal Am demands from City of San Diego.

5.3 Groundwater

Although opportunities are limited, groundwater is currently being used to meet a portion of the municipal water demands throughout the Water Authority's service area from MCB Camp Pendleton in the north to National City in the south. This section provides a general description of: municipal groundwater development within the Water Authority's service area, the issues associated with development of this supply, and projected agency yields. Specific information required under the Act on groundwater basins and projects is expected to be included in the member agencies' 2010 plans.

5.3.1 Description

Within the past five years, water supply agencies within the Water Authority's service area have produced an annual average of approximately 18,300 AF of potable water supplies from groundwater. This total represents production from both brackish groundwater desalination facilities and municipal wells producing groundwater not requiring desalination. It does not include production from privately owned water wells used for irrigation and domestic purposes, or several thousand acre-feet of groundwater produced annually from the Warner Basin by Vista Irrigation District, but discharged to Lake Henshaw, a surface water reservoir, then released downstream of the dam.

In addition to providing a local supply to water agencies, groundwater is also a source of supply for numerous private well owners who draw on groundwater to help meet their domestic and agriculture water needs. In the Ramona area alone, over 1,000 privately owned wells provide a supplementary source of water for Ramona MWD customers. Similar domestic uses occur throughout the Water Authority's service area. These domestic supplies help to offset demand for imported water provided by the Water Authority and its member agencies. Although the amount of groundwater pumped by private wells is significant, it cannot be accurately quantified nor estimated within the Water Authority's entire service area.

Groundwater production in the Water Authority's service area is limited by a number of factors including: the limited geographic extent of the more productive sand and gravel (alluvial) aquifers; the relatively shallow nature of most of the alluvial aquifers; lack of rainfall and groundwater recharge; and degraded water quality resulting from human activities, such as septic tank use.

Shallow and narrow river valleys filled with alluvial sand and gravel deposits are characteristic of the more productive groundwater basins in the San Diego region. Outside of these more productive aquifers, groundwater is developed from fractured crystalline bedrock and semi-consolidated

sedimentary deposits that occur throughout the region. However, yield and storage in these aquifers are limited, and the aquifers are best suited for meeting domestic water needs that do not require higher flow rates. Figure 5-2 shows the location of the principal alluvial groundwater basins within the Water Authority's service area.

Figure 5-2
Alluvial Groundwater Basins

Although groundwater supplies are less plentiful in the San Diego region than in some other areas of California, such as the Los Angeles Basin in southern California and the Central Valley in northern California, the Water Authority believes that sufficient undeveloped brackish groundwater supplies exist that could help meet a greater portion of the region's future water demand. Several agencies within the Water Authority's service area have identified potential projects that may provide several thousand to tens of thousands acre-feet of additional groundwater production in the coming years. A general summary and description of these projects is presented below.

5.3.1.1 Groundwater Extraction and Disinfection Projects

Groundwater that can be extracted and used as a potable water supply, with little more than disinfection, generally occurs outside the influence of human activities and within the upper reaches of the east–west trending watersheds. Wells producing higher quality water are operated by MCB Camp Pendleton (Santa Margarita River watershed) and the Sweetwater Water Authority (San Diego Formation aquifer). The Vista Irrigation District also operates numerous high quality extraction wells in the Warner Basin, located in the upper San Luis Rey River watershed. The water from these wells is discharged to Lake Henshaw and eventually to the San Luis Rey River where it is then diverted further downstream for use in the city of Escondido and elsewhere. The unit cost of water produced from simple groundwater extraction and disinfection projects is low and generally well below the cost of imported water. 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.

5.3.1.2 Brackish Groundwater Recovery Projects

Groundwater that is high in salts and total dissolved solids (TDS) and other contaminates, 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-MGD capacity Mission Basin Desalter and the Sweetwater Authority's existing 4.0-MGD Richard A. Reynolds Groundwater Desalination Facility are the only currently operating brackish groundwater recovery and treatment facilities within the Water Authority's service area. 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.

5.3.1.3 Groundwater Recharge and Recovery Projects

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 projects divert excess surface water supplies to percolation basins or injection wells to supplement natural rainfall runoff recharge. Captured rainfall runoff, reclaimed water, imported water, or a combination thereof, can be used to recharge groundwater basins when water levels have been lowered sufficiently by pumping. Groundwater basins can be operated similar to surface water reservoirs to supply stored water to the region if imported deliveries are limited due to high demand, or supply and facility constraints, or a combination thereof. The Fallbrook PUD and MCB Camp Pendleton, and Padre Dam MWD and Helix WD are currently exploring the feasibility of such projects.

5.3.2 Issues

Local water agencies oftentimes need to consider a multitude of issues during the planning, permitting, design, construction, and operation of a groundwater project. The issues can include dealing with hydrogeologic uncertainties, high upfront study and subsurface investigation costs, higher unit costs association with brackish groundwater recovery and treatment, project funding considerations, water rights, regulatory and environmental concerns, and possible contamination of groundwater that might occur after the project is constructed and facilities are brought online. These issues can discourage decision makers and potentially limit the amount of groundwater development in San Diego County.

The Water Authority financial assistance program, Local Investigation and Studies Assistance Program (LISA), provides funding opportunities for facility planning, feasibility investigations, preliminary engineering studies, environmental impact reports (EIRs), and research projects related to groundwater development, which will help agencies overcome some of the risks and constraints to project development.

5.3.2.1 Hydrogeologic and Environmental Impact Uncertainty

In groundwater basins that have not been recently utilized as a source of a municipal water supply by an agency and where there is a general lack of information regarding the physical nature of the aquifer materials, existing wells and groundwater production, water quality, potential impact of pumping to riparian habitat, etc. significant resources must be expended prior to determining the feasibility of a project. Subsurface exploration and field investigations are both costly and time consuming. In addition, data management and utilization generally requires the development of costly large-scale numerical models. These issues, in conjunction with financial considerations, can oftentimes dictate that groundwater projects be developed and production increased incrementally in a planned and managed fashion.

5.3.2.2 Economic and Financial Considerations

Because of the saline nature of the water and the presence of other contaminates in many of the groundwater basins in San Diego County, the cost of groundwater development will oftentimes require demineralization and brine disposal facilities, which can be costly to construct and operate.

5.3.2.3 Institutional, Legal, and Regulatory Issues

Institutional and legal issues can also impact project development. Because groundwater basins oftentimes involve multiple water agencies and/or numerous private wells and water-right holders, water rights and management authority can be issues that need to be addressed before a project progresses beyond the planning stage. However, agencies are often reluctant to initiate groundwater development projects and go beyond the feasibility study stage unless jurisdiction and water rights issues are resolved beforehand.

Uncertainty over future regulatory requirements for drinking water supplies can pose an additional barrier to project development. When developing facilities and compliance plans for groundwater development and/or groundwater recharge projects, agencies must take into account proposed or potential regulatory changes related to water quality issues. Some of the regulations for which

changes are expected over the next decade include state and federal drinking water standards and California Department of Health Services groundwater recharge regulations.

5.3.2.4 Environmental Regulatory Constraints

Issues related to the environmental impacts that could potentially result from the fluctuation of groundwater levels when large quantities of groundwater are extracted are common to many of the groundwater projects proposed within the principal alluvial aquifers in the Water Authority's service area. These issues include potential impacts on endangered species habitat and groundwater-dependent vegetation. Impacts may occur if a project results in seasonal or long-term increases in the depth of the groundwater. Although potential environmental impacts can generally be mitigated, mitigation costs can reduce the cost-effectiveness of a project.

5.3.2.5 Water Quality

See Section 7.4, "Groundwater," for additional information on water quality for groundwater supplies.

5.3.2.6 Funding

In November 2006, the Water Authority's Local Water Supply Development Program was modified to provide up to $200 per acre-foot for potable water produced from brackish or otherwise contaminated groundwater. Currently no agencies have quality for LWSD funding for groundwater projects. However, two local agencies, Sweetwater Authority and the city of Oceanside have received financial incentives from Metropolitan Water District's Groundwater Recovery Program (GRP) totaling $944,779 in fiscal year 2009 and $312,767 in fiscal year 2010.

5.3.3 Projected Groundwater Supply Yield

The Water Authority has worked closely with its member agencies to develop groundwater yield projections. The most reliable projections have been developed by considering only existing (verifiable) groundwater projects, which include planned expansions to existing projects.

Table 5-3 shows the projected annual yield from verifiable groundwater projects in five-year increments, based on projections and implementation schedules or existing projects and planned expansions provided by the member agencies. These are included in the reliability analysis found in Section 9, "Water Supply Reliability." Table F-2, Appendix F contains a list of the projects and the projected supplies.

Table 5-3. Projected Groundwater Supply (Normal Year – AF/YR)

2010	2015	2020	2025	2030	2035
20,833	22,030	26,620	27,620	28,360	28,360

An overall projected increase in groundwater production from 2015 and beyond is due primarily from the expansion of the brackish groundwater recovery and treatment project currently operated by the Sweetwater Authority. However, it should be noted that MCB Camp Pendleton's groundwater

production will decrease beginning in year 2015 due to a response to Executive Order 13423, calling for water conservation of 2 percent per year reduction on the base.

The Sweetwater Authority has completed feasibility studies and design of the expansion of its Richard A. Reynolds Facility, and is currently seeking funding for construction. The agency is also participating in studies with the United States Geological Survey (USGS) to evaluate and further develop production from the San Diego Formation aquifer. Sweetwater has completed the environmental process for the expansion project; however, the city of San Diego has filed a CEQA challenge on the EIR and the outcome of that lawsuit is still pending.

The city of Oceanside has recently completed an expansion of the capacity of its Mission Basin Desalter (6.37 MGD / 4.0 MGD expansion). However, production will remain below the capacity of the facility until new conveyance and pumping facilities, required to distribute the additional supply to additional service areas, are completed. The expected completion date for the new conveyance and pumping facilities is January 2013. The ultimate production capacity, or "safe yield" of the Mission Basin will need to be verified by continued monitoring of water levels after production capacity of the current facility is realized.

5.3.3.1 Additional Planned Projects – Groundwater

Maximizing groundwater development is critical to diversifying the region's water supply portfolio. Beyond the projections of the more reliable and verifiable projects included in Table 5-3, member agencies have also identified four additional planned projects, with an estimated total of 12,700 AF/YR of additional yield in 2035. Carlsbad MWD will utilize its groundwater rights in the Mission Basin and in the Aqua Hedionda Hydrologic Area of the Carlsbad Hydrologic Unit. Carlsbad MWD's Mission Basin/Agua Hedionda Projects are expected to yield 1,000 AF/YR by 2020, ramping up to 2,000 AF/YR by 2030. The Otay WD Rancho del Rey Well Development Project is expected to yield 500 AF/YR by 2015. The Helix Water District/Padre Dam MWD's El Monte Valley Recharge Project is projected to yield 5,000 AF/YR by the year 2020, and Fallbrook PUD/MCB Camp Pendleton's Santa Margarita Conjunctive-Use Project is projected to yield an additional 5,200 AF/YR by 2020 (for a total yield from the basin of 10,800 AF/YR.) These additional yields are considered additional planned supplies and are utilized in Section 10, "Scenario Planning – Managing an Uncertain Future," as potential strategies to manage future uncertainty planning scenarios. These additional planned projects, as well as the conceptual projects provided by the member agencies, are also included in Table F-2, **Appendix F**.

5.4 Water Recycling

One of the elements identified in the Water Authority's resource mix is the optimization of recycled water use. Every gallon of recycled water used within the region reduces the need to import or develop other water supplies. This section provides a general description of recycled water development within the Water Authority's service area, the issues associated with developing this supply, and projected regional yield. Documentation on specific existing and future recycling projects is expected to be in the 2010 plans for those agencies that include water recycling as a supply. The Water Authority coordinated the preparation of this section with its member agencies and those wastewater agencies that operate water recycling facilities within the Water Authority's service area.

5.4.1 Description

Water may be recycled for non-potable or indirect potable purposes. Non-potable recycling is the treatment and disinfection of municipal wastewater to provide a water supply suitable for non-drinking uses. Agencies in San Diego County use recycled water to fill lakes, ponds, and ornamental fountains; to irrigate parks, campgrounds, golf courses, freeway medians, community greenbelts, school athletic fields, food crops, and nursery stock; and to control dust at construction sites. Recycled water can also be used in certain industrial processes, in cooling towers and for flushing toilets and urinals in non-residential buildings. Recycled water is also being considered for street sweeping purposes.

Indirect potable reuse includes the use of multi-barrier treatment, which may include treatment technologies such as reverse osmosis and advanced oxidation, and a natural barrier, such as a groundwater basin or surface water reservoir, to render wastewater suitable for potable purposes. Several Water Authority member agencies are completing studies pertaining to potable reuse in San Diego County through groundwater recharge or reservoir augmentation.

5.4.2 Issues

Local agencies must consider a number of issues when developing recycled water projects, including economic and financial considerations; regulatory, institutional, and public acceptance issues; and water quality concerns related to unknown or perceived health and environmental risks. These issues, if unresolved, can limit the amount of recycled water use in San Diego County. The following sections discuss some of the specific challenges associated with recycled water development.

5.4.2.1 Economic and Financial Considerations

The capital-intensive cost of constructing recycled water projects and managing a dual distribution system has traditionally been a barrier to project implementation. The up-front capital costs for construction of treatment facilities and recycled water distribution systems can be high, while full market implementation is usually phased in over a number of years, resulting in very high initial unit costs that affect cash flow in the early project years.

Costs associated with converting existing water customers to non-potable recycled water use have also proved challenging. This situation is compounded by the seasonal nature of recycled water demands, a lack of seasonal storage and the lack of large industrial water users in San Diego County that can use recycled water. Projects that serve a large portion of irrigation demands, like the majority of the projects in the Water Authority's service area, often use only half of their annual production capacity due to these seasonal demand patterns. The unit costs associated with these projects tend to be higher than those of projects that serve year-round demands, since the project facilities must be sized to accommodate seasonal peaking. Projects that serve mostly irrigation demands also tend to have less stable revenue bases because irrigation demands are heavily influenced by hydrologic conditions.

Recycled water for indirect potable reuse can be stored in local reservoirs and groundwater basins. This can ensure a continuous demand and production of recycled water throughout the year making the projects more cost effective. Although indirect potable projects require a higher level of treatment that non-potable projects, these costs are offset because they do not require a dual distribution system or customer retrofits. To be economically feasible, a project's benefits must

offset or exceed its associated costs. Project benefits can take the form of: (1) revenues from the sale of recycled water; (2) increased supply reliability; (3) increased control over the cost of future water supplies; and (4) avoided water and wastewater treatment, storage, and conveyance costs. Agencies developing recycled water projects must be able to quantify these benefits in order to determine the economic feasibility of a project. In addition, financial incentives and grant funding from the Water Authority, Metropolitan, and federal and state agencies are critical to offsetting project costs and project implementation.

5.4.2.2 Regulatory

Two state agencies have primary responsibility for regulating the application and use of recycled water: the California Department of Public Health (DPH) and the California Regional Water Quality Control Board (Regional Board). Planning and implementing water recycling projects entails numerous interactions with these regulatory agencies prior to project approval.

The DPH establishes the statewide criteria for recycled water uses in Title 22 of the California Administrative Code. Under Title 22, the standards are established for each general type of use based on the potential for human contact with recycled water. The highest degree of standards for recycled water is for unrestricted body contact.

The Regional Board is charged with issuing permits and enforcing requirements for the application and use of recycled water for each recycled operation which ensures compliance with basin plan objectives and incorporates recommendations from the DPH. As part of the permit application process, applicants must demonstrate that the proposed recycled water operation will meet the ground and surface water quality objectives in the basin management plan, and will comply with Title 22 requirements. With the consent of the recycled water supplier, the Regional Board and DPH may delegate review of individual non-potable use sites to the County of San Diego Department of Environmental Health.

Coordination between the regulatory agencies responsible for monitoring development of recycled water is important, along with the development of a reasonable and consistent application of regulations. Regulatory agencies need to work more closely and cooperatively with project proponents in their efforts to satisfy the regulations and still be able to develop a much needed, cost-effective water-recycling project.

A recent regulatory development that may help expand recycled water use was the January 2011 amendments to the building standards contained in the California Code of Regulations (CCR), Title 24, Part 5, pertaining to dual plumbing design standards for use of recycled water systems inside buildings. The recent amendments established statewide standards for installing both potable and recycled water plumbing systems in commercial, retail, and office buildings; and in theaters, auditoriums, condominiums, schools, hotels, apartments, barracks, dormitories, jails, prisons, and reformatories.

Potable reuse projects require a high level of regulatory scrutiny and are currently approved on a case by case basis. Typically an expert panel is convened to look the project specifics and provide recommendations to the project proponent and DPH. While all projects will build on the knowledge and efforts obtain through past indirect potable reuse projects, local reservoir augmentation projects will be the first to be approved in the State. In 2010, the California Legislature passed AB 918 which will requires the DPH to adopt regulations for groundwater recharge and reservoir

augmentation and investigate the possibility of direct potable reuse. This will pave the way for future potable reuse projects throughout the State.

5.4.2.3 Institutional

The primary institutional issue related to the development of water recycling in San Diego County is interagency coordination, such as when the wastewater agency that produces the recycled water is not the water purveyor within the reuse area. At those times, effective communication and cooperation between both agencies regarding the distribution of recycled water and providing service to the water customer is vital and should begin early in the planning process.

These institutional arrangements require contracts and/or agreements between the parties and/or agencies involved, the terms of which must be established on a case-by-case basis. The agreements usually define the reporting and compliance responsibilities, the amount of recycled water deliveries, water pricing, and a financing plan that identifies which agency will receive the financial incentives.

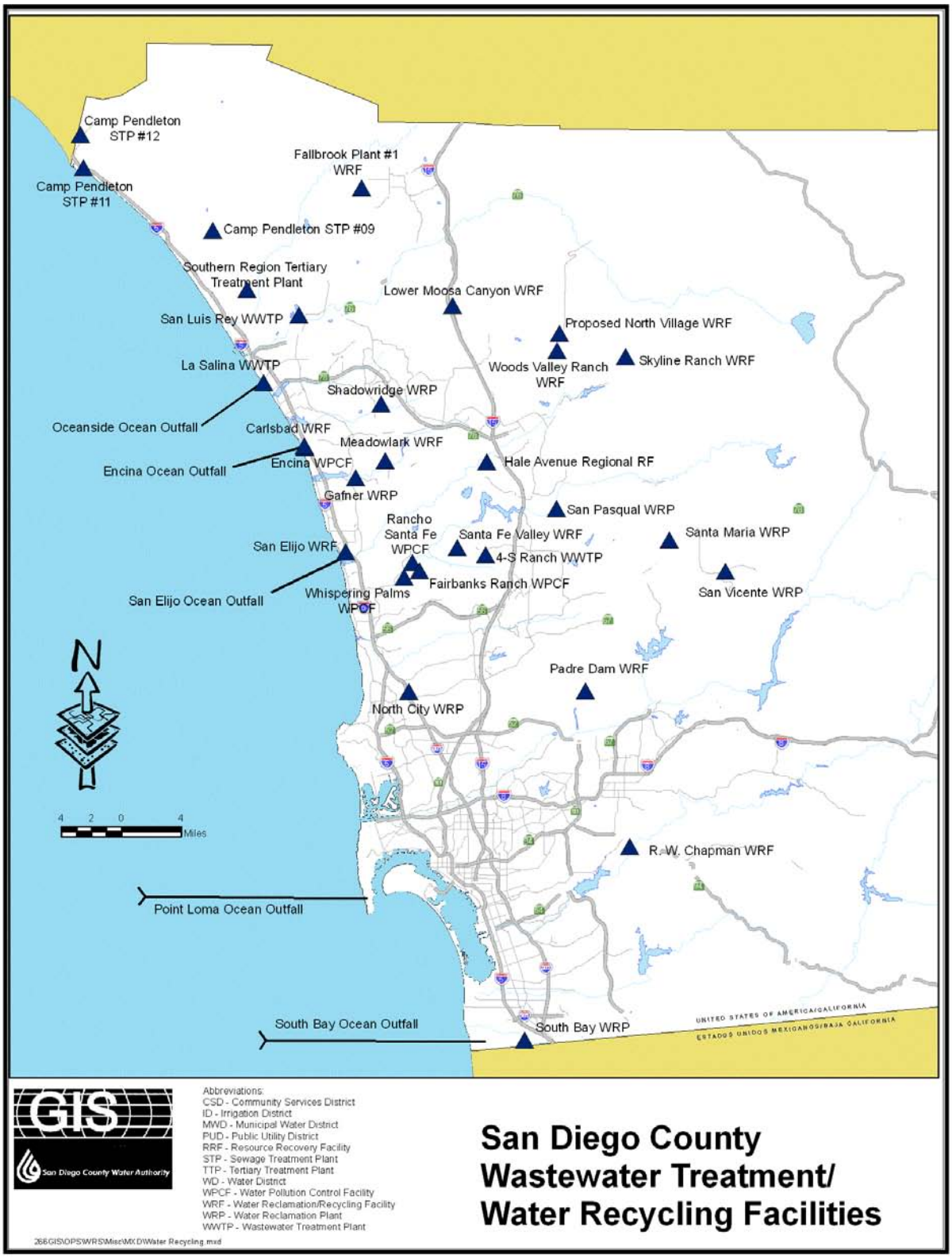
5.4.2.4 Public Acceptance

Without public acceptance, siting, financing, constructing, and operating a water-recycling project becomes increasingly difficult. For many in the public, there is a general sense of water quality and safety concerns due to a lack of understanding the water reclamation treatment process. The most successful means to obtaining public acceptance is through education and involvement. Agencies in the San Diego region have formed citizen's advisory groups and held public workshops in an effort to increase public involvement in projects, which is described in greater detail in Section 5.4.4 below. While the public has fully accepted the safety of recycled water for non-potable uses, potable reuse has had to overcome greater public acceptance hurdles. Recent impacts from drought, increased statewide experience demonstrating the safety of potable reuse projects and local support from the environmental and business communities are increasing the local public acceotance for potable reuse.

5.4.3 Wastewater Generation, Collection, Treatment, and Disposal

Approximately 300 MGD of wastewater is currently being generated, collected, treated, and disposed of within the Water Authority's service area and provides significant potential for recycled water use. Most of the large wastewater treatment plants are located along the coast for easy and convenient access to an ocean outfall. These plants serve most of the San Diego region's highly urbanized areas. Figure 5-3 identifies the location of the wastewater treatment plants and the associated outfall systems. The coastal location of the plants is not always conducive to development of recycled water. Most of the market for recycled water is located at higher elevations, making distribution systems costly. However recycled water costs could be offset by possible savings on wastewater treatment costs where those savings are available. Table F-3, **Appendix F** shows a detailed list of the wastewater treatment plants within the county, their capacities at various levels of treatment, and the type of disposal. In addition, approximately 10 to 15 MGD of wastewater within the Water Authority's service area is generated and disposed of through private systems, such as septic tanks.

Figure 5-3
Wastewater Treatment and Water Recycling Facilities



5.4.4 Encouraging Recycled Water Development

The Act requires agencies to describe in their plan the actions, including financial incentives, that agencies may take to encourage the use of recycled water. Table 5-4 summarizes the programs used by the Water Authority's member agencies. The water recycling agencies develop some of the programs, while others are developed or funded by the water providers, such as the Water Authority, Metropolitan, and state and federal agencies.

Table 5-4. Programs to Encourage Recycled Water Use

Incentive Programs Local Water Supply Development (Water Authority) Local Resources Program (Metropolitan) Local Investigations and Studies Assistance Program (Water Authority) Public Sector Water Efficiency Partnership Demonstration Program – Immediate Hookup for Potential Recycled Water Use Customers (Metropolitan)
Grants Title XVI Funding Program (US Bureau of Reclamation) Proposition 13 Planning Grants and Loans (State of California) Proposition 50 Grant (State of California)
Low Interest Loans Clean Water State Revolving Fund Program (State of California)
Long-Term Contracts to Ensure Price and Reliability
Funding Assistance to State Water Resources Control Board to fund staff position(s) to expedite water recycling projects (Water Authority**)**
Recycled Water Rate Discounts (most San Diego area water/wastewater agencies)
Public Education/Information Materials Market Development and Technical Assistance Program (Water Authority and most San Diego area water/wastewater agencies)
Regional Planning and Regulatory Assistance Regional coordination with member agencies and regulatory agencies such as DPH and the San Diego Regional Board on recycled water issues Review and comment on statewide regulatory developments and legislation to support local projects Preparation of guidelines in conjunction with member agencies, such as Decorative Water Feature Design Guide, Dual Plumbing Standard Guidelines, etc.
Administration of Recycled Water Site Supervisor Training Workshops (Water Authority in conjunction with member agencies)

5.4.4.1 Funding Programs

Another important component of a successful recycling project is securing diversified funding and establishing funding partnerships. The Water Authority has focused on providing and facilitating the acquisition of outside funding for water recycling projects.

Financial assistance programs available to San Diego County agencies include: the Water Authority's Local Water Supply Development Program, Metropolitan's Local Resources Program (LRP), the U.S. Bureau of Reclamation (USBR) Title XVI Grant Program, the State Water Resources Control Board (SWRCB) low-interest loan programs and the Integrated Regional Water Management Plan Grant Program. Together, these programs can offer funding assistance for all project phases, from initial planning and design to construction and operation. Financial assistance programs administered by the Water Authority, Metropolitan, and the USBR provided $9,508,617 to San Diego County agencies during fiscal year 2010.

Local Water Supply Development Program

The Water Authority administers the Local Water Supply Development (LWSD) Program (formerly referred to as the Recycled Water Development Fund (RWDF) Program initially adopted by the Board in April 1991), which is designed to ensure the financial feasibility of local water recycling projects during their initial years of operation. In November 2006, the LWSD Program was modified to provide up to $200 per acre-foot of recycled water and potable water produced from brackish or otherwise contaminated groundwater. In February 2008, the LWSD Program was again amended to expand eligibility to include seawater desalination projects and adopt updated program guidelines and funding principles.

To date, the Water Authority has entered into LWSD agreements with 11 water and wastewater agencies for a combined project yield of over 30,000 AF/YR. Over $22 million in Water Authority incentive funding has been awarded to program participants. In fiscal year 2010, the Water Authority provided local agencies with $3,575,093 in LWSD incentives.

Local Resources Program

Metropolitan also has a program that currently subsidizes the cost of water supply production from local projects during the initial years of operation. The Local Resources Program (LRP) provides subsidies of up to $250 AF/YR for recycled water and groundwater recovery projects. Currently, 14 water and wastewater agencies in San Diego County have agreements for Metropolitan LRP and Local Projects Program (LPP) funding. Metropolitan provided $4,169,089 in fiscal year 2009 and $3,620,756 in fiscal year 2010 from these funding sources.

In June 2010, the Water Authority filed suit against Metropolitan challenging its practice of allocating supply related expenses to the transportation rate it charges the Water Authority to wheel the Water Authority's independently obtained supplies. Following the filing of the lawsuit, Metropolitan sent a Notice of Intent to Cancel six Local Resources Program subsidy agreements that are subject to Metropolitan's 'Rate Structure Integrity' provision.

The Reclamation Wastewater and Groundwater Study and Facilities Act – Title XVI

The Title XVI Grant Program is a significant source of funding for San Diego area water recycling projects. Title XVI of Public Law (PL) 102-575, the Reclamation Wastewater and Groundwater Study

and Facilities Act, authorizes the federal government to fund up to 25 percent of the capital cost of authorized recycling projects, including the San Diego Area Water Reclamation Program, an inter-connected system of recycling projects serving the Metropolitan Sewage System service area. PL 104-266, the Reclamation Recycling and Water Conservation Act of 1996, authorized two additional projects in northern San Diego County: the North San Diego County Area Water Recycling Project and the Mission Basin Brackish Groundwater Desalting Demonstration Project. The North San Diego County project is no longer eligible to receive federal funding in that it has reached its maximum federal funding limit of $20 million per project. The Mission Basin project is nearing completion, having received a total of $2,500,000 so far. To date, San Diego agencies have been authorized to receive more than $192 million under the Title XVI grant program, including more than $4,472,000 obligated during federal fiscal year 2009. A total of $117,992,000 has been received from this funding source to date. Future authorizations and annual funding from this program are important, but could become more challenging due to current Federal budget challenges.

Clean Water State Revolving Fund/Water Recycling Grants

The SWRCB, through the Division of Financial Assistance, offers low interest financing agreements for water quality projects and water reclamation facilities. Annually, the program disburses between $200 and $300 million to eligible projects. The Clean Water State Revolving Fund (CWSRF) offers agencies a below-market interest rate that can result in substantial savings on debt service. Approximately $83 million was appropriated to the SWRCB in fiscal year 2009 for funding water recycling projects. An example of funding awarded to one of the Water Authority's member agencies was a $496,161 grant commitment to the city of San Diego for their South Bay Water Reclamation Plant. Additional funding can also be obtained through Water Recycling Grants to provide up to 25% of eligible construction costs with a maximum $5 million cap per agency. Planning grants of up to $75,000 maximum are also provided for eligible facilities planning/feasibility study costs.

Further, the Water Authority completed a Membrane Bioreactor (MBR) Study which evaluated 11 potential sites for MBR placement and coordinated the final Regional Recycled Water Study – Phase II Project Report to the SWRCB which included $701,262 in grant funding for 11 local member agency projects. In addition, matching funds were obtained from USBR for the Regional Recycled Water Study, and for an Otay Water District Groundwater Feasibility Study in the amount of $126,518.

Integrated Regional Water Management Plan Grant Funding, Propositions 50 and 84

In June 2008, the California DWR awarded a grant package for $25 million that will provide funding for 19 local projects designed to improve the San Diego region's water supply reliability, water quality, and natural resources. The San Diego-area projects are part of the 2007 San Diego Integrated Regional Water Management (IRWM) Plan, which aims to coordinate local water planning activities. The San Diego package was among a number of similar efforts state-wide that have been funded by the state under Proposition 50, a water bond measure approved by voters in 2002. An additional 70 million dollars has been dedicated to the San Diego IRWMP Region through Proposition 84. A portion of the funding will support recycled water projects, including for example, a recycled retrofit program, construction of treatment facilities at the San Elijo JPA and a north county recycled water study. Refer to Section 8, "Integrated Regional Water Management Planning," for more information.

5.4.4.2 Policies, Ordinances, and Guidance Documents

The Water Authority has adopted a number of policies, guidance documents, and a model ordinance to assist local agencies with water recycling project implementation. Many local agencies have adopted the Water Authority–sponsored ordinance, which includes provisions that typically require new development projects to install recycled water systems. The ordinance also states that where allowed by law and available in sufficient quantities, at a reasonable cost and quality, recycled water shall be the sole water supply delivered for non-potable uses.

In 2009, a guidance document was also developed by the Water Authority to provide general, regulatory guidelines for agencies and customers seeking to use recycled water in water features and fountains. The guidelines were approved by the local regulatory agencies.

5.4.4.3 Training

The Water Authority, in partnership with other water agencies, offers a half-day course designed to provide irrigation supervisors with a basic understanding of recycled water. Completion of the Recycled Water Site Supervisor Training fulfills the training requirement as mandated by regulatory authorities. The four-hour workshop provides information to designated Site Supervisors on: recycled water treatment and rules and regulations, backflow prevention and cross-connection shut-down testing and inspections, landscape irrigation fundamentals, and Site Supervisor responsibilities. At this time, more than 2,300 participants have been certified. Instructors include a certified cross-connection control specialist, a landscape/irrigation specialist, and a recycled water specialist.

5.4.4.4 Optimizing the Use of Recycled Water – Regional Perspective

In the Water Authority's service area, the Market Development and Technical Assistance Program was developed and implemented to promote the increased use of recycled water. Through this program, technical assistance and specific process recommendations through customer site inspections and site review reports were provided to local CII customers interested in connecting to local recycled water systems. The resources available to these CII customers included the use of technical experts in the fields of cooling tower operation, landscape irrigation, agronomy, cross control connection, and other related fields. For example, one biotech firm that requested a Customer Site Inspection could potentially realize a 46 AF/YR reduction in imported water demand by converting their cooling towers at a single facility.

Technical reference materials associated with the promotion of recycled water to CII and agricultural customers included the development of Information Data Sheets for the use of recycled water in cooling towers, detailed case studies, a Recycled Water Landscape Guide, and a Recycled Water Quality Template.

Through the Market Development and Technical Assistance Program, three specialty Industry Workshops were also scheduled and conducted. One was geared towards CII/bio-tech customers (focusing on cooling tower use), another was tailored for the Golf Course Superintendents Association, and another targeted landscape architects and contractors. Although local agencies take responsibility to expand and develop their respective recycled water projects the Water Authority provides regional leadership and assistance that will facilitate and expedite project completion and implementation. In support of the SWRCB call for salinity planning, the Water Authority, in cooperation with the Southern California Salinity Coalition (SCSC), hosted and coordinated a series

of stakeholder workshops and workgroup meetings to work in partnership with San Diego Regional Board staff to develop guidelines for the development of Salinity/Nutrient Management Plans. The final guidelines were approved supported by the San Diego Regional Board through a resolution adopted in November 2010. IRWMP Grant funding is being used to support the development of the plans.

To help advance Indirect Potable Reuse in the San Diego region, Water Authority staff participated in numerous stakeholder outreach and technical committees, including initially serving as a representative on both of the City of San Diego's American Assembly Workshops which resulted in the "unanimous agreement that current technology and scientific studies support the safe implementation of non-potable and indirect potable use projects." More recently, technical assistance has been provided to the city of San Diego for their efforts to approve and fund a demonstration-scale Advanced Water Purification (AWP) Facility at the North City Water Reclamation Plant for the Indirect Potable Reuse/Reservoir Augmentation Demonstration Project and to the Helix Water District and Padre Dam MWD joint El Monte Valley Groundwater Recharge and River Restoration Project. The Water Authority will continue to advocate at a State and local level for reasonable regulations that will support the safe use of recycled water for indirect potable reuse projects.

5.4.5 Projected Recycled Water Use

The Water Authority worked closely with its member agencies to determine the projected yield from existing and planned recycled water projects. Table 5-5 shows the estimated annual yield from the projects in five-year increments based on the implementation schedules provided by the member agencies and the likelihood of development. These projected supply yields will be included in the reliability analysis found in Section 9, "Water Supply Reliability." Table F-4, **Appendix F** contains a detailed list of the projects and projected supplies.

Table 5-5. Projected Recycled Water Use (Normal Year – AF/YR)

2010	2015	2020	2025	2030	2035
27,931	38,660	43,728	46,603	48,278	49,998

The increase in recycled water use shown in Table 5-5 is primarily from the expansion of existing facilities. The Olivenhain MWD will be expanding its use of recycled water from its connection with the city of San Diego's North City Water Reclamation Plant to 800 AF/YR of recycled water for customers within Olivenhain's Southeast Quadrant, which encompasses 4S Ranch, Santa Fe Valley, and the Rancho Santa Fe/Fairbanks Ranch area. Olivenhain MWD's connection from the Vallecitos Water District's Meadowlark Water Recycling Facility will ultimately provide approximately 1,000 AF/YR of recycled water to Olivenhain MWD customers.

A marked increase in the use of recycled water also stems from MCB Camp Pendleton's expanded production and use of recycled water. Through the South and North Wastewater Treatment Plants and other production plants, over 4,000 AF/YR of recycled water will be beneficially used throughout the military base by 2015.

5.4.5.1 Additional Planned Projects – Recycled Water

Maximizing recycled water development is critical to diversifying the region's water supply portfolio. Beyond the verifiable project yields included in Table 5-5 above, member agencies have also identified additional planned projects. Carlsbad MWD, Fallbrook PUD, Olivenhain MWD, Padre Dam MWD, City of Poway, City of San Diego, Santa Fe ID, and Valley Center MWD all have identified additional planned projects which are projected to yield an additional 26,383 AF/YR by 2030. These yields are considered additional planned supplies and are utilized in **Section 10**, "Scenario Planning – Managing an Uncertain Future." These additional planned projects, as well as the conceptual projects provided by the member agencies, are also included in Table F-4, **Appendix F**.

As part of the City of San Diego's effort to provide a local and sustainable water supply, the City's Water Purification Demonstration Project (WPDP) is examining the use of advanced water purification technology to provide safe and reliable water for San Diego's future, and will determine if reservoir augmentation using this purified water is a feasible option for San Diego. The WPDP is underway and will conclude in 2012. During this time, the advanced water purification facility (AWPF) will operate for approximately one year and will produce 1 MGD of purified water. A study of the San Vicente Reservoir is being conducted to test the key functions of reservoir augmentation and to determine the viability of a full-scale project. During the demonstration phase, no purified water will be sent to the reservoir. Instead the purified water will supply water to the non-potable recycled water distribution system. A summary report detailing the results of the WPDP will be provided to the Mayor and San Diego City Council. If deemed technically and economically feasible, and after City Council and Mayoral approval, a full-scale AWPF could produce approximately 15,000 AF/YR of high quality advanced treated recycled water. Helix Water District and Padre Dam MWD are completing planning of the El Monte Valley Recharge Project (indirect potable reuse through groundwater recharge) which is expected to provide 5,000 AF/YR of supply. The project is currently undergoing environmental review and design is expected to be completed by late 2012. The City of Escondido is both planning to expand its non potable water recycling program to include additional landscaping and potentially agricultural irrigation as well as incorporate a future indirect potable reuse element. Escondido is pursuing this dual path for water supply reliability and to avoid the cost of a future ocean outfall expansion associated with its discharge of secondary treated wastewater. At this point the Escondido City council has approved exploring this alternative and has incorporated this approach into their long range financial planning. As part of its plans to further expand its recycled water program, the Rincon Municipal Water District is beginning to study options for potable reuse through groundwater recharge in less urbanized portions of their service area.

5.5 Member Agency Seawater Desalination

5.5.1 Rosarito Beach Desalination Project, Otay Water District

A private developer, NSC Agua, is in the process of obtaining a contract to build a 50-MGD desalination plant next to the existing power plant in Rosarito Beach, Mexico. NSC Agua would permit, design, construct and operate the Rosarito Beach Desalination Facility. Otay Water District (Otay) would purchase excess product water of up to 20,200 AF/YR by 2015, ramping up to 38,600 AF/YR by 2035. In order to convey the purchased product water from the Rosarito plant into its service area, Otay is currently evaluating conveyance and treatment options. Otay's conveyance and

treatment project, within the U.S., would have to undergo an environmental review and permitting process once a final project description has been determined. Otay is projecting this private development project could be operational as early as 2015. The Otay project is considered an additional planned project and is utilized in Section 10 as a potential strategy to manage future uncertainty planning scenarios.

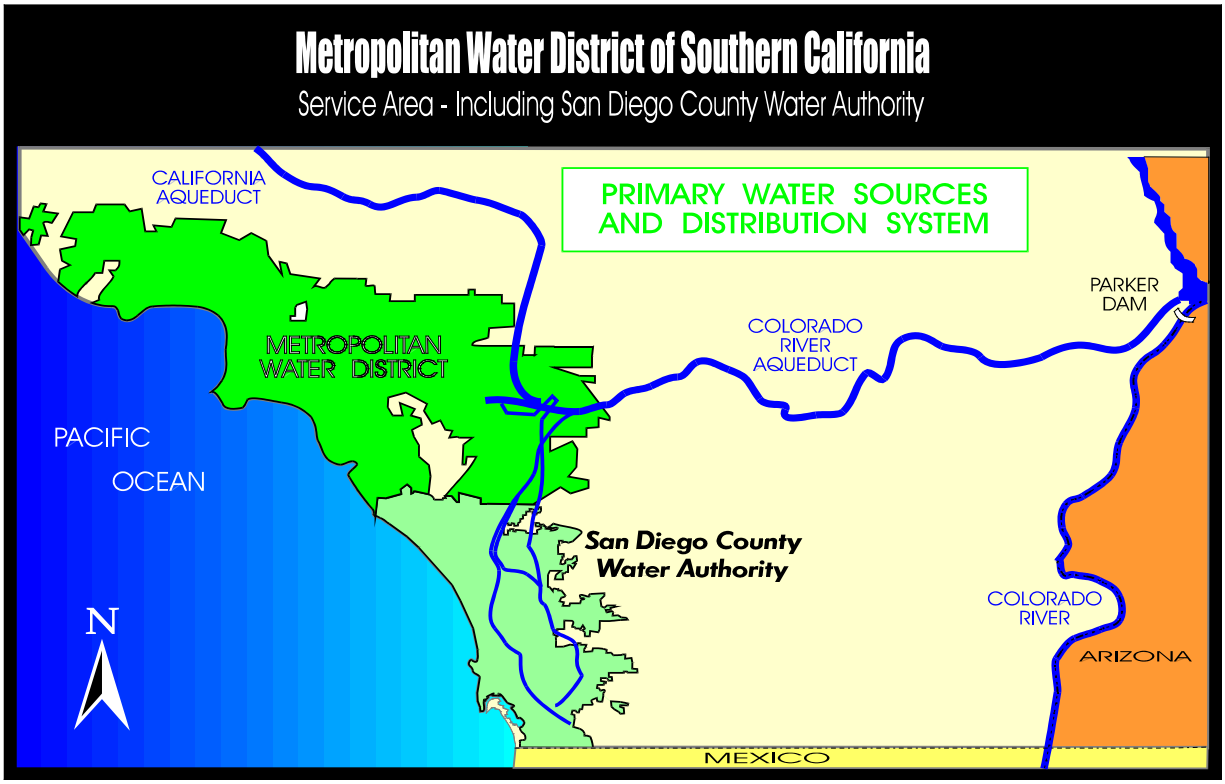
Section 6

Metropolitan Water District of Southern California

6.1 Description

The Water Authority's imported water sources include purchases from Metropolitan. Metropolitan was formed in 1928 to develop, store, and distribute supplemental water in Southern California for domestic and municipal purposes. Metropolitan supplies water to approximately 19 million people in a service area that includes portions of Ventura, Los Angeles, Orange, San Bernardino, Riverside, and San Diego counties. The Metropolitan service area, shown in Figure 6-1, covers a 70-mile-wide strip of the Southern California coastal plain, extending from the city of Oxnard on the north to the Mexican border. Close to half of the water used in this 5,200-square-mile region is supplied by Metropolitan, and about 90 percent of its population receives at least some of its water from Metropolitan. The Water Authority, one of 26 Metropolitan member agencies, is the largest in terms of purchases, purchasing 331,825 AF, or about 21 percent of all the water Metropolitan delivered in fiscal year 2010. The extent to which Metropolitan's member agencies rely upon Metropolitan supplies varies by the amount of local supplies available or their own reliability goals.

Figure 6-1
Metropolitan Service Area



6.1.1 Metropolitan Act Section 135 – Preferential Right to Water

Under Section 135 of the Metropolitan Act, each member agency has a preferential right to Metropolitan purchases. The preferential rights are determined by each agency's total historic payments to Metropolitan from property taxes, readiness-to-serve charges, and other minor miscellaneous revenue. Revenue resulting from the purchase of Metropolitan water is excluded, even though more than 81 percent of Metropolitan's revenues come from water sales.

Metropolitan member agencies' ability to exercise preferential rights was confirmed in a lawsuit filed by the Water Authority in 2001. The court decisions made clear how much water the Water Authority may count on from Metropolitan should a member agency invoke its preferential right. While the Water Authority had a preferential right to purchase 17.47 percent of Metropolitan's water as of June 30, 2010, it purchased about 21 percent of their available supply in fiscal year 2010.

In Metropolitan's 2010 Regional Urban Water Management Plan (RUWMP), Section 2.3, Metropolitan presents its supply availability at the regional level, rather than at the member agency level. The report stated that the region can provide reliable water supplies under both the single driest year and the multiple dry-year hydrologies through 2035. The report listed Metropolitan's forecasted imported water supply capabilities under normal, single driest year and multiple dry-year hydrologies through 2035, which would provide the Water Authority with adequate supplemental imported supplies in normal years and a single dry-year. In multiple dry years, under its projected preferential right formula, the Water Authority could experience shortages as shown in **Section 9.3**.

6.2 Metropolitan's Water Supplies

Metropolitan obtains its water from two sources: the CRA, which it owns and operates, and the SWP, with which Metropolitan has a water supply contract through the state of California. Figure 6-2 shows these imported water supply sources, and they are described below. In order to meet emerging challenges from dry hydrologic conditions and regulatory restrictions that limit supplies from the SWP, Metropolitan's strategy also includes utilizing its storage programs to maximize available supplies in wet years for dry years' use.

Figure 6-2
Major Water Conveyance Facilities Serving San Diego County

6.2.1 Colorado River

Metropolitan was formed to import water from the Colorado River. During the 1930s, Metropolitan built the CRA to convey this water. Metropolitan's member agencies received the first deliveries in 1941. The aqueduct is more than 240 miles long, beginning at Lake Havasu on the Arizona/California border and ending at Lake Mathews in Riverside County. The aqueduct has capacity to deliver up to 1.25 million AF/YR. Figure 6-2 shows the location of the aqueduct.

6.2.1.1 Reliability Issues

Before 1964, Metropolitan had a firm annual allocation of 1.212 million AF of Colorado River water through contracts with the U.S. Department of the Interior, which was enough to keep Metropolitan's aqueduct full. However, as a result of the U.S. Supreme Court decision in *Arizona vs. California*, Metropolitan's firm supply fell to 550,000 AF, its basic annual apportionment. Due to growth in demand from the other states and drought conditions, since 2003, Metropolitan's deliveries have been limited to its basic annual apportionment plus water resulting from unused apportionment water by other California holders of priorities 1 through 3, and transfer programs resulting from conservation with other senior water right holders.

Water availability from the Colorado River is governed by a system of priorities and water rights that has been established over many years. The Colorado River Lower Basin states (California, Arizona, and Nevada) have an annual apportionment of 7.5 million AF of water divided as follows: (1) California, 4.4 million AF; (2) Arizona, 2.8 million AF; and (3) Nevada, 300,000 AF. The 1931 Seven Party Agreement established California's priorities for water among California's contractors to use Colorado River water made available to California. The first four priorities total the 4.4 million AF/YR available to California. Metropolitan has priorities 4, 5(a), and 5(b) water listed in the Seven Party Agreement, but only priorities 1–4 of the Seven Party Agreement are within California's basic annual apportionment. Metropolitan's fourth priority of 550,000 AF is junior to that of the first three priorities, 3.85 million AF to California agricultural agencies. Water used to satisfy Metropolitan's priorities 5(a) and 5 (b) must come from unused allocations within California, Arizona, or Nevada, or from surpluses declared by the Secretary of the Interior.

6.2.1.2 Environmental Considerations

Several fish species and other wildlife species either directly or indirectly have the potential to affect Colorado River operations, thus changing power operations and the amount of water deliveries to the CRA. A number of species that are on either "endangered" or "threatened" lists under the federal and/or California Endangered Species Acts (ESAs) are present in the area of the Lower Colorado River. To address this issue, a broad-based state/federal/tribal/private regional partnership, which includes water, hydroelectric power, and wildlife management agencies in Arizona, California, and Nevada, developed a multi-species conservation plan for the main stem of the Lower Colorado River (the Lower Colorado River Multi-Species Conservation Program [MSCP]). Developed between 1996 and launched in early-2005, this 50-year plan allows Metropolitan to obtain federal and state permits for any incidental take of protected species resulting from current and future water and power operations and diversions on the Colorado River. The MSCP also covers operations of federal dams and power plants on the Colorado River.

6.2.1.3 Water Quality Considerations

Please see Section 7, "Water Quality," for information.

6.2.1.4 Current Supplies

Per the Seven Party Agreement, Metropolitan has a firm Colorado River supply of 550,000 AF from its fourth priority within California's basic apportionment of 4.4 million AF. Because Metropolitan continues to face dry hydrologic challenges coupled with increasing demands, Metropolitan relied on its fifth priority for up to 662,000 AF/YR (through unused water from holders of priorities 1 through 3, water saved by Palo Verde, or when the U.S. Secretary of Interior declares surplus or unused water by Arizona and/or Nevada), and additional supplies when the Department of Interior declared surplus flows are available. With the 2003 QSA and related agreements among the IID, the Coachella Valley Water District (CVWD), State of California, Department of Interior, Metropolitan, and the Water Authority, a plan was formalized on how California will implement water transfers and supply programs that allow California to live within the state's 4.4 million AF basic annual apportionment of Colorado River water. Since then, Metropolitan has relied on cooperative transfer programs and storage programs to increase its Colorado River water deliveries beyond its basic priority 4 water.

6.2.1.5 Quantification Settlement Agreement and Future Supplies

The Water Authority, together with CVWD, IID, and Metropolitan, entered into the QSA in October 2003. The QSA, which is in effect for 45 years (and up to 75 years), resolved longstanding disputes regarding Colorado River water use among the agencies, and established a baseline water use for IID, CVWD, and Metropolitan. This permitted the implementation of a variety of water conservation and transfer agreements, including the Water Authority's transfer agreement with IID. The QSA also provides that CVWD and Metropolitan will put aside, for the term of the agreement, a dispute over beneficial use of water by IID; and that Metropolitan would forbear consumptive use of water to permit the Secretary of Interior to satisfy the uses of the non-encompassed water delivered to holders of present perfected rights. See Section 4.2, "Water Authority – IID Water Conservation and Transfer Agreement," for more information on the QSA.

Metropolitan's Tables 2-9, 2-10, and 2-11 in its 2010 RUWMP indicate that Metropolitan's current program Colorado River Aqueduct supply target for an average (based on 1922–2004 hydrologies) and single (repeat of 1977 hydrology) or multiple dry year (based on 1990–1992 hydrology) is 1.25 million AF, the maximum Colorado River Aqueduct delivery capacity. The figure includes water management programs and IID/Water Authority transfers and conserved canal lining water conveyed by the aqueduct.

6.2.2 State Water Project

The SWP is owned by the State of California and is operated by the DWR. Metropolitan has a take-or-pay supply contract with the State of California and is entitled to take about 48 percent of available SWP water through its Long-Term SWP Water Supply Contract (Table A allocation). The project stretches more than 600 miles, from Lake Oroville in the north to Lake Perris in the south. Water is stored at Lake Oroville and released when needed into the Feather River, which flows into the Sacramento River and to the Sacramento–San Joaquin River Delta (Delta). The Delta is the largest estuary on the United States' west coast and is also home to an agricultural industry, recreation and

fishing, and provides the means by which to deliver water from Northern California to the south. In the north Delta, water is pumped into the North Bay Aqueduct for delivery to Napa and Solano counties. In the south Delta, water is diverted into the SWP's Banks Pumping Plant, where it is lifted into the 444-mile-long California Aqueduct. Some of this water flows into the South Bay Aqueduct to serve areas in Alameda and Santa Clara counties. The remainder flows southward to cities and farms in central and southern California. In the winter, when demands are lower, water is stored at the San Luis Reservoir located south of the Delta. SWP facilities provide drinking water to 23 million Californians and 755,000 acres of irrigated farmland. Figure 6-2 shows the California Aqueduct.

6.2.2.1 Reliability Issues

The reliability of SWP supplies is limited by both the level of SWP supply development and pumping restrictions due to state and federal environmental regulations and hydrology. When approved by the voters in the 1960s, the SWP was planned to deliver 4.2 million AF to 32 contracting agencies. Subsequent contract amendments reduced total contracted deliveries to 4.13 million AF and the number of contracting agencies to 29. Metropolitan's contracted entitlement is 1,911,500 AF. Metropolitan's original long-term water supply contract for 2,011,500 AF was amended as part of the 2003 QSA. Effective in 2005, the amendment resulted in an exchange agreement among CVWD, Desert Water Agency (DWA), and Metropolitan. The exchange agreement provides for the transfer of 88,100 AF of Metropolitan's Table A amounts to CVWD and 11,900 AF of Metropolitan's Table A amounts to DWA. When voters approved construction of the SWP in 1960, state planners did not expect the full amount of contracted water to be needed for at least the first 20 years of the project. As a result, the planners anticipated that the facilities needed to produce the full contracted amount would be constructed over time as demands on the system increased. However, decisions about these additional facilities were repeatedly deferred as public attitudes and environmental regulations changed and costs increased. New state and federal environmental laws put some potential water supply sources off limits to development. More stringent water quality standards adopted by the SWRCB to protect the San Francisco Bay/Sacramento–San Joaquin River Delta have reduced the amount of water available for diversion. Environmental challenges to the SWP operations also resulted in the issuance of new biological opinions, which led to pumping restrictions that further reduced SWP exports. At the same time, California's population and water demand continued to grow.

Since 2006, a voluntary collaboration of state, federal and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties began development of the Bay Delta Conservation Plan (BDCP). The purpose of the BDCP is to restore and protect Delta water supply, water quality, and ecosystem health within a stable regulatory environment. A parallel effort, the Delta Habitat Conservation and Conveyance Program (DHCCP) is in process, and is the state government's mechanism for achieving the BDCP's goals.

In November 2009, the state Legislature passed a package of bills that established in state policy the co-equal goals of water supply reliability and environmental restoration in the Delta. The bills also provided a governance structure for the Delta and required the preparation of a Delta Plan to guide the process of achieving the co-equal goals and outline a plan to restore listed species. The Delta Stewardship Council, an independent state agency, is required to develop the Delta Plan by January 1, 2012. In order for the BDCP to be incorporated into the Delta plan and for public funds to be made available for public restoration benefits, the BDCP must also be approved by the California Department of Fish and Game (CDFG) as a Natural Community Conservation Plan (NCCP). If unsuccessful,

operational constraints likely will continue until a long-term solution to the problems in the Delta is implemented.

DWR's *2009 State Water Project Delivery Reliability Report* updated DWR's estimate of the current and future water delivery reliability of the SWP. The 2009 report showed that future deliveries will be further impacted by significant restrictions due to operational requirements contained in federal biological opinions and forecasted effects of climate change, which is changing the hydrologic conditions of the state. The 2009 report projected that the primary component of the annual SWP deliveries will be less, when compared to the preceding 2007 report, where the 2007 report incorporated interim and less restrictive operational requirements established by federal Judge Oliver Wanger in 2007. For current conditions, the dominant factor for the SWP's reductions is the restrictive operational requirements contained in the federal biological opinions. For future conditions, it is the restrictive operational requirements coupled with the forecasted effects of climate change. Metropolitan's SWP deliveries projection listed in its RUWMP are based on DWR's *Draft 2009 Report,* which is substantially the same as the final report. For dry, below-normal conditions, Metropolitan also developed its Central Valley storage and transfer programs to increase its supply capabilities.

In developing its supply capabilities, Metropolitan assumed a new Delta conveyance as fully operational by 2022 and would return supply reliability similar to 2005 conditions, prior to supply regulatory restrictions imposed. In terms of water supply impacts, Metropolitan identified regulatory restrictions water costs of over one million AF between both the SWP and the federal Central Valley Project in 2010.

6.2.2.2 Environmental Considerations

In recent years, actions taken to protect the ecosystem of the Bay-Delta have placed additional restrictions on SWP operations. The Bay-Delta is the largest estuary on the west coast and supports more than 750 plant and animal species. However, 150 years of human activity, dating back to 19th century gold mining, has taken its toll on the Bay-Delta ecosystem and the fish that live there.

Numerous factors contribute to the degradation of the Bay-Delta ecosystem and the decline of Delta fisheries, such as habitat loss, water diversions, non-point source pollution, over-fishing, and the introduction of nonnative species. Regulatory protection efforts have nevertheless tended to focus on the operations of the SWP and the federal Central Valley Project (CVP). The restrictions began in 2007, when Federal Court Judge Oliver Wanger, acting in a case filed two years earlier, invalidated the Biological Opinion (BiOp) for the Delta smelt and imposed an injunction that limited the time during which water could be pumped out of the Delta. The judge imposed restrictions on pumping to protect the Delta smelt, while new BiOps were being prepared. During the spring of 2008, Judge Wanger also invalidated the federal government's BiOps with respect to salmon and steelhead in the Sacramento River. In December 2008, the U.S. Fish and Wildlife Service (USFWS) issued a new BiOp for the Delta smelt. This BiOp imposed operating restrictions that were even more severe than those imposed by the judge. Metropolitan and other State Water Contractors filed separate lawsuits in federal district court challenging the BiOp.

On June 4, 2009, the National Oceanic and Atmospheric Administration National Marine Fisheries Service issued a BiOp intended to protect spring- and winter-run Chinook salmon, Central Valley steelhead, green sturgeon, and Southern Resident killer whales. This action placed additional restrictions on SWP and CVP operations. By the spring of 2010, Judge Wanger granted a preliminary

injunction against the federal government's implementation of pumping restrictions under the salmon BiOp. The judge said that the federal government had not properly taken into account the impact the restrictions would have on people in the Central Valley and had not justified the need for imposing the harshest restrictions within the range stated in the biological opinion. Shortly thereafter, as with the salmon ruling, Jusge Wanger found that water officials must consider impacts on humans along with the delta smelt. He also found that water users made convincing arguments that the federal government's science did not prove that increased pumping from the delta imperiled the smelt. Deliveries estimated for DWR's *2009 Report* are reduced by the operational restrictions of the biological opinions issued by the USFWS in December 2008 and the National Marine Fisheries Service in June 2009 governing the SWP and Central Valley Project operations.

On December 14, 2010, Judge Wanger issued a decision in the Delta Smelt consolidated lawsuits. He granted a number of the State Water Contractors', CVP Contractors', and other plaintiffs' motions for summary judgment, while denying others. On the whole, the decision invalidates the federal government's biological opinions on the Delta smelt and lessens the resulting restrictions on water supply to the state and federal water contractors. It is expected that Judge Wanger will most likely call a remedies hearing, at which the water contractor plaintiffs and the federal defendants will work to agree on a new set of restrictions based on the decision. There are still hearings to be held on the biological opinion regarding salmon. In addition, another lawsuit by environmentalist organizations is challenging the federal government's decision not to list the longfin smelt as endangered. Should the federal government lose that lawsuit, the restrictions on pumping to protect the longfin smelt may erase any gains in water supply resulting from the Wanger decision.

6.2.2.3 Water Quality Considerations

Please see Section 7, "Water Quality," for information.

6.2.2.4 Current Supplies

Metropolitan's SWP supplies are projected using DWR's *Draft 2009 State Water Project Delivery Reliability Report*. The reliability report presents current DWR estimates of the amount of water deliveries for current (as of 2009) and 20 years in the future conditions. The estimates incorporate restrictions on SWP and CVP operations in accordance with the biological opinions of the USFWS and National Marine Fishery Service issued on December 15, 2008, and June 4, 2009, respectively. Under the reliability report, the delivery estimates for the SWP for current conditions as percentage of maximum Table A amounts are 7 percent under a single dry-year (1977) condition, which is equivalent to 134,000 AF, and 60 percent under long-term average conditions, which is equivalent to 1.15 million AF. In dry, below-normal conditions caused by dry hydrologic conditions and regulatory restrictions, Metropolitan developed additional supplies from Central Valley storage and transfer programs.

6.2.2.5 Future Supplies

Metropolitan's 2010 RUWMP indicates that Metropolitan's SWP target for a dry year (based on 1977 hydrology) is 522,000 AF in 2015, 601,000 AF in 2020, and 651,000 AF in 2025. The 2010 RUWMP also estimates that in the 2030–2035 period, Metropolitan's annual supply range from the SWP will be between 609,000 and 610,000 AF. This figure includes Central Valley transfer and storage program supplies conveyed by the aqueduct. The 2010 RUWMP estimates that the SWP will be

capable of serving between 1.55 million to 1.73 million AF to Metropolitan from 2015 through 2035 in an average year.

6.2.3 Storage Management Programs

Metropolitan relies on water in storage to augment at times limited imported supplies. It manages its storage portfolio by storing water during wet years to meet the region's needs during critical droughts caused by varied hydrologic conditions and SWP pumping restrictions imposed to protect endangered or threatened fish species. Metropolitan's likelihood of having adequate supply capability before environmental issues that caused Delta pumping restrictions are addressed to meet projected demands, without implementing the Water Supply Allocation Plan (WSAP), is largely dependent on its storage resources. The principles that guide the management of supply and storage are based on the framework established in the Water Surplus and Drought Management (WSDM) Plan, and is being further refined through the WSAP update process. Currently, Metropolitan has about 30 storage programs in operation that provide flexibility to meet delivery requirements. The storage accounts include groundwater and surface storage programs and facilities, within and outside of Metropolitan's service area. Metropolitan's dry-year storage portfolio has the potential to store more than 5 million AF.

Metropolitan's 2010 RUWMP indicates that the in-region storage and transfer program target for a dry year (based on 1977 hydrology) is 685,000 AF in 2015, 931,000 AF in 2020, and 1,076,000 AF in 2025. The 2010 RUWMP also estimates that in the 2030–2035 period, Metropolitan's annual supply range from the SWP will be 964,000 and 830,000 AF, respectively. The 2010 RUWMP estimates that the in-region storage and transfer program will be capable of serving between 830,000 AF and 964,000 AF to Metropolitan from 2015 through 2035 in an average year.

Section 8
Integrated Regional Water Management Planning

IRWM planning involves the coordination and integration of water planning activities occurring within a defined region to improve and maintain the reliability of the region's water supply. IRWM planning recognizes that water supplies, water quality, and natural resources are connected and, as such, focuses on projects that produce multiple benefits in those areas. IRWM planning typically involves both governmental and non-governmental stakeholders.

Both the 2005 and 2009 State Water Plan Updates identify the expansion of IRWM as one of two "initiatives for reliable water supplies." As the 2009 Update states, "Integrated regional water management enables regions to implement strategies appropriate for their own needs and helps them become more self-sufficient." Through voter-approved bond measures – Proposition 50 in 2002 and Proposition 84 in 2006 – the state has made available up to $1.5 billion to support IRWM planning and implementation in various regions of California.

The Water Authority, the city of San Diego, and the county of San Diego joined together in 2005 to form a Regional Water Management Group (RWMG), which defined the San Diego IRWM planning region as the portion of San Diego County that is tributary to coastal waters (Figure 8-1). The RWMG then worked with a regional advisory committee to write the first San Diego IRWM Plan, which was approved in 2007 by the Water Authority Board, the San Diego City Council, and the San Diego County Board of Supervisors. DWR formally accepted the plan in 2009. Preparation of the San Diego Region's IRWM Plan was required for the San Diego planning region to apply for state funding. It also formed the foundation of long-term IRWM planning in the region. For detailed information on the San Diego IRWM Plan, visit the plan's website: http://www.rmcwater.com/clients/sdirwmp/home.html.

Figure 8-1
San Diego IRWM Planning Region

In 2008, DWR awarded a $25 million IRWM grant to the San Diego planning region. The funding is supporting 19 projects listed in the San Diego IRWM Plan that, in total, benefit the entire region. Project sponsors include the Water Authority and seven of its member agencies. All of the projects are designed to provide multiple benefits. Almost $18 million of the requested funding was designated for projects that had as their primary objective "water supply diversity." Nine of the projects, which received a total of $5.9 million, included water quality protection as one of their objectives.

Proposition 84 allocated $1 billion to DWR to support IRWM planning and implementation in California. An amount of $91 million is earmarked for the San Diego Funding Area, which comprises the planning regions for San Diego, South Orange County, and the Upper Santa Margarita River Watershed. According to a memorandum of understanding adopted by the three planning regions in 2009, the San Diego region will receive approximately 78 percent of this amount. The San Diego RWMG intends to use this funding as it becomes available to implement more projects listed in the San Diego IRWM Plan.

The San Diego RWMG also received a Proposition 84 funding grant to update the 2007 San Diego IRWM Plan so that it complies with new state guidelines and requirements. The update will expand the scope of the San Diego IRWM program to include land-use planning, integrated flood management, and the program's relationship with the San Diego Regional Water Quality Control

Board. As part of the Plan update, the San Diego RWMG also intends to support salt and nutrient management planning in the region to protect water quality.

The San Diego IRWM Program supports the UWMP by promoting regional planning and supporting projects that aim to increase water supply reliability and improve surface water and groundwater quality. IRWM planning and funding will help to make possible water supply projects in the areas of seawater desalination, recycled water, local surface water, and groundwater, all of which are identified in this 2010 Plan as part of the region's projected mix of water resources. The IRWM Program also supports water conservation, another key element of the 2010 Plan.

El Capitan watershed project

Wetlands construction project at Safari Park – San Diego Zoo

Section 7
Water Quality

The Act requires that the 2010 Plan include information, to the extent practicable, on the quality of existing supply sources and the manner in which water quality affects water supply reliability. A significant task for the Water Authority is to protect the water quality of the water passing through its delivery system and communicating water quality changes to its member agencies. This section summarizes water quality issues associated with supplies serving the San Diego region. Information on Colorado River and SWP supplies came in part from Metropolitan's final 2010 RUWMP (November 2010).

Water agencies treat all water to meet stringent state and federal drinking water standards before delivering it to customers. However, source water of poor quality will make it increasingly expensive and difficult to meet those standards.

7.1 Colorado River

The Colorado River is the primary source of the Water Authority's imported water supply. High salinity levels, uranium, and perchlorate contamination represent the primary areas of concern with the quality of Colorado River supplies. Managing the watershed of the Colorado River has been the most effective method for controlling these elements of concern.

7.1.1 Salinity

The salts in the Colorado River System are indigenous and pervasive, mostly resulting from saline sediments in the basin that were deposited in prehistoric marine environments. They are easily eroded, dissolved, and transported into the river system. Agricultural development and water diversions over the past 50 years increase the already high naturally occurring levels of TDS.

Water imported via the CRA has a TDS averaging around 650 mg/l during normal water years. During the high water flows of 1983–1986, salinity levels in the CRA dropped to a historic low of 525 mg/l. However, during the 1987–1990 drought, higher salinity levels returned. During an extreme drought, CRA supplies could exceed 900 mg/l. High TDS in water supplies leads to high TDS in wastewater, which lowers the usefulness of the water and increases the cost of recycled water. (Refer to Section 7.5 for details on salinity impacts to water recycling.) In addition to the link between water supply and water quality, high levels of TDS in water supplies can damage water delivery systems and home appliances.

To reduce the affects of high TDS levels on water supply reliability, Metropolitan approved a highly successful Salinity Management Policy in April 1999. One of the policy goals is to blend Colorado River supplies with lower-salinity water from the SWP to achieve delivered water salinity levels less than 500 mg/l TDS. In addition, to fostering interstate cooperation on this issue, the seven basin states formed the Colorado River Basin Salinity Control Forum (Forum). To lower TDS levels in Colorado River supplies, the Forum develops programs designed to prevent a portion of the abundant salt supply from moving into the river system. The Colorado River Basin Salinity Control

Program targets the interception and control of non-point sources, such as surface runoff, as well as wastewater and saline hot springs.

7.1.2 Perchlorate

Perchlorate is used as the main component in solid rocket propellant, and it can also be found in some types of munitions and fireworks. Perchlorate and other perchlorate salts are readily soluble in water, dissociating into the perchlorate ion, which does not readily interact with the soil matrix or degrade in the environment. The primary human health concern related to perchlorate is its effects on the thyroid. Perchlorate has been detected at low levels in Metropolitan's CRA water supply.

Because of the growing concerns over perchlorate levels in drinking water, in 2002 Metropolitan adopted a Perchlorate Action Plan. Objectives include expanded monitoring and reporting programs and continued tracking of remediation efforts in the Las Vegas Wash. Metropolitan has been conducting monthly monitoring of Colorado River supplies. The source of the perchlorate that originates in the Las Vegas Wash is most likely from a chemical manufacturing site located in Henderson, Nevada. The Nevada Department of Environmental Protection manages a comprehensive groundwater remediation program in the Henderson area. As of December 2004, the amount of perchlorate entering the Colorado River system from Henderson has been reduced from approximately 1,000 pounds per day (lb/day) to less than 90 lb/day.

7.1.3 Uranium

Naturally occurring uranium has always been present in Colorado River water and has always been under the California Maximum Contaminant Level (MCL) of 20 picocuries per liter (pCi/l). The risks to water quality have primarily come from upstream mining in Moab, Utah and other potential mining sites in the west. Currently the U.S. Department of Energy (DOE) is working to remove and dispose of mine tailings and improve groundwater quality on the Colorado River Watershed near Moab. The expected completion of this cleanup is between 2019 and 2025. Current levels are below MCL and can be treated by regional water treatment plants.

7.1.4 Nutrients

The Colorado River system has historically been low in nutrients, but with population growth in the watershed nutrients are still a concern. Metropolitan is involved with upstream entities along the lower Colorado River to enhance wastewater management to control nutrient loading, especially phosphorus. The Colorado River's low nutrient level has been important for blending with SWP water to reduce the nutrient level delivered to retail agencies.

7.1.5 Arsenic

Arsenic is another naturally occurring element that is being monitored by drinking water agencies. The state detection level for purposes of reporting is 2 micrograms per liter (µg/l), and the MCL for domestic water supplies is 10 µg/l. Between 2001 and 2008, arsenic levels in Colorado River water have ranged from not detected to 3.5 µg/l. Increasing coagulant doses at water treatment plants can reduce arsenic levels for retail deliveries.

7.2 State Water Project

The quality of SWP water as a drinking water source is affected by a number of factors, most notably seawater intrusion and agricultural drainage from peat soil islands in the Delta. SWP water contains relatively high levels of bromide and total organic carbon, two elements that are of particular concern to drinking water agencies. Bromide and total organic carbon combine with chemicals used in the water treatment process to form disinfection byproducts that are regulated under the federal Safe Drinking Water Act (SDWA). Wastewater discharges from cities and towns surrounding the Delta also add salts and pathogens to Delta water, and they influence its suitability for drinking and recycling.

The 2000 Record of Decision (ROD) adopted by CALFED states that CALFED will either achieve water quality targets at Clifton Court Forebay and drinking water intakes in the south and central Delta, or it will achieve an "equivalent level of public health protection using a cost-effective combination of alternative source waters, source control, and treatment technologies."

Actions to protect Delta fisheries have exacerbated existing water quality problems by forcing the SWP to shift its diversions from the springtime to the fall, when salinity and bromide levels are higher. Closure of the Delta Cross-Channel gates to protect migrating fish has also degraded SWP water quality by reducing the flow of higher quality Sacramento River water to the SWP pumps at critical times.

7.2.1 Total Organic Carbon and Bromide

Total organic carbon and bromide are naturally occurring but are elevated due to agricultural drainage and seawater intrusion as water moves through the delta. The concern with both total organic carbon and bromide is that they form disinfection byproducts (DBPs) when treated with disinfectants such as chlorine. Some DBPs have been identified and are regulated under SDWA; there are others that are not yet identified. The potential adverse health effects may not be fully understood, but associations with certain cancers, reproductive and developmental effects are of significant concern. Water agencies began complying with new regulation to protect against the risk of DBP exposure in January 2002 under the Disinfection Byproducts (D/DBP) rule Stage 1. The U. S. Environmental Protection Agency (EPA) promulgated the Stage 2 D/DBP rule in January 2006, which has made compliance more challenging. CALFED's Bay-Delta Program calls for a wide array of actions to improve Bay-Delta water quality, which remains the best method for controlling these elements of concern in the drinking water supply.

7.2.2 Nutrients

SWP supplies have significantly higher nutrient levels over the Colorado River supplies. Elevated levels of nutrients can increase nuisance algal and aquatic weed growth, which in turn affects taste and odor in product water and can reduce filter run times at WTPs. Nutrient rich soils in the Delta, agricultural drainage, and wastewater discharges are primary sources of nutrient loading to the SWP. Water agencies receiving delta water have been engaged in efforts to minimize the effects of nutrient loading from Delta wastewater plants. Taste and odor complaints due to Delta nutrients are dependent on the blend of imported water delivered through Metropolitan. Metropolitan developed a program to provide early warning of algae-related problems, taste, and odor events to best mange water quality in the system.

7.2.3 Salinity

Water supplies from the SWP have significantly lower TDS levels than the Colorado River, averaging 250 mg/l in water supplied through the East Branch and 325 mg/l on the West Branch. Because of this lower salinity, Metropolitan blends SWP water with high salinity CRA water to reduce the salinity levels of delivered water. However, both the supply and the TDS levels of SWP water can vary significantly in response to hydrologic conditions in the Sacramento–San Joaquin watersheds.

The TDS levels of SWP water can also vary widely over short periods of time. These variations reflect seasonal and tidal flow patterns, and they pose an additional problem to blending as a management tool to lower the higher TDS from the CRA supply. For example, in the 1977 drought, the salinity of SWP water reaching Metropolitan increased to 430 mg/l, and supplies became limited. During this same event, salinity at the Banks pumping plant exceeded 700 mg/l. Under similar circumstances, Metropolitan's 500 mg/l salinity objectives could only be achieved by reducing imported water from the CRA. Thus, it may not be possible to maintain both salinity standards and water supply reliability unless salinity levels of source supplies can be reduced.

The CALFED Bay-Delta Program's Environmental Impact Statement/Environmental Impact Report (EIS/EIR), Technical Appendix, July 2000 Water Quality Program Plan, identified targets that are consistent with TDS objectives in Article 19 of the SWP Water Service Contract: a ten-year average of 220 mg/l and a maximum monthly average of 440 mg/l. These objectives were set in the 1960s when Metropolitan expected to obtain a greater proportion of its total supplies from the SWP. Because of reductions in expected SWP deliveries, Metropolitan's Board believes that this standard is no longer appropriate, so it has adopted a statement of needs from the Bay-Delta. Under the drinking water quality and salinity targets element, the Board states its need "to meet Metropolitan's 500 mg/l salinity-by blending objective in a cost-effective manner while minimizing resource losses and ensuring the viability of recycling and groundwater management programs."

7.2.4 Arsenic

Between 2001 and 2008, arsenic levels in SWP water have ranged from not detected to 4.0 µg/l. Increasing coagulant doses at water treatment plants can reduce arsenic levels for retail deliveries. Groundwater storage programs in the SWP appear to provide the greatest risk of arsenic contamination; therefore, a pilot arsenic treatment facility is being tested by one of the groundwater partners.

7.3 Surface Water

The region's water quality is influenced by a variety of factors depending on its source. As stated above, waters from the Colorado River and from Northern California are vulnerable to a number of contributors to water quality degradation. Regional surface and groundwater are primarily vulnerable to increasing urbanization in the watershed, agriculture, recreational uses, wildlife, and fires.

Historically, regional surface water quality has been considered good to excellent. Water quality can vary with imported water inflows and surface water contamination. Source water protection is considered a key element in regional water quality. The Water Authority and its member agencies

are working together to improve watershed awareness and management. Currently, the most significant water quality issue that affects the public is algae blooms, which can create taste and odor problems.

In San Diego County, the California Department of Public Health (CDPH) has primacy over the implementation of the SDWA. The SDWA regulates source water protection to ensure public health through the multiple barrier approach, an approach that anticipates that the public will participate in source water protection. Member agencies in the Water Authority's service area that have surface water have a good, long-standing, working relationship with CDPH.

A similar requirement from EPA calls for utilities to complete a Source Water Assessment (SWA). Information collected in SWAs is used to evaluate changes in potential sources of contamination and to help determine if more protection measures are needed. EPA requires utilities to complete an SWA that uses information collected in the sanitary surveys. The SWA is also used to evaluate the vulnerability of water sources to contamination and also helps determine whether more protective measures are needed.

Source water protection is fundamentally important to all of California. The CDPH requires large utilities delivering surface water to complete a Watershed Sanitary Survey every five years to examine possible sources of drinking water contamination. The survey includes suggestions for how to protect water quality at the source.

The monitoring of key constituents in source waters is critical in helping to identify constituents that should be controlled at the source and to determine the best ways to operate the water system so as to improve the quality of water delivered to the consumer. The effect of urban runoff on receiving water quality is a recognized problem.

To address the issues associated with surface water quality, the Water Authority, the city of San Diego, and the county of San Diego have formed a Regional Water Management Group to coordinate development of an IRWM for the San Diego region. An important element in the IRWM is to protect and enhance the region's local surface water quality. As part of this process, projects will be identified and implemented to assist in watershed protection, and thereby, protect the quality of surface water supplies.

One of the key objectives of the IRWM is to reduce sources of pollutants and environmental stressors. This objective targets water management strategies that directly address pollution management and include: agricultural land stewardship, pollution prevention, urban land use planning, urban runoff management, and watershed management and planning. The IRWM stresses the need to attain the region's water quality standards by managing runoff from all sources within the region through the watershed management framework. (Refer to Section 8, "Integrated Regional Water Management Planning for more information.)

7.4 Groundwater

Two water quality parameters that can affect reliability of groundwater resources in San Diego County are contamination from high salinity levels and Methyl Tertiary Butyl Ether (MTBE).

7.4.1 Salinity

Increased TDS in groundwater basins occurs either when basins near the ocean are over drafted, leading to seawater intrusion, or when agricultural and urban return flows add salts to the basins. Much of the water used for agricultural or urban irrigation infiltrates into the aquifer, so where high TDS irrigation water is used or where the water transports salts from overlying soil, the infiltrating water will increase the salinity of the aquifer. Using this resource requires costly demineralization projects. (Refer to Section 5.3, "Groundwater," for discussion on groundwater recovery projects.)

To protect the quality of these basins, the Regional Board often places restrictions on the salinity levels of water used for basin recharge or for irrigation of lands overlying the aquifers. Where these restrictions are in place, water reuse and aquifer recharge may be restricted, or expensive mitigation measures may be required.

7.4.2 Methyl Tertiary Butyl Ether

MTBE was the primary oxygenate in virtually all the gasoline historically used in California. In January 2004, the Governor's executive order to remove MTBE from gasoline became effective, and now ethanol is the primary oxygenate. Relative to other organic compounds, MTBE is very soluble in water and has low affinity for soil particles, thus allowing the chemical to move quickly in the groundwater. MTBE is also resistant to chemical and microbial degradation in water, making treatment more difficult than the treatment of other gasoline components.

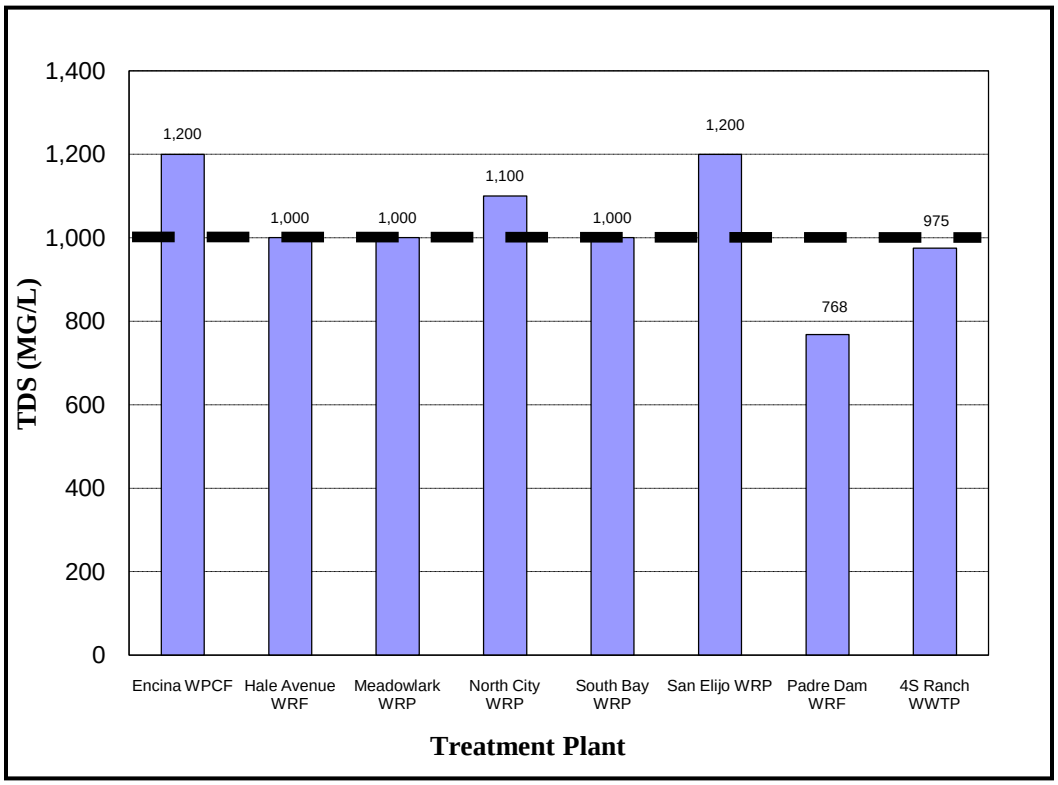
MTBE presents a significant potential problem to local groundwater basins. Leaking underground storage tanks and poor fuel-handling practices at local gas stations may provide a large source of MTBE. Improved underground storage tank requirements and monitoring, and the phase-out of MTBE as a fuel additive, has decreased the likelihood of MTBE groundwater problems in the future.

7.5 Recycled Water

Water quality, as it pertains to high salinity supplies, is a significant implementation issue for recycled water projects. High TDS source water poses a special problem for water recycling facilities because conventional treatment processes are designed to remove suspended particles, but not dissolved particles. TDS removal, or demineralization, requires an advanced treatment process, which can increase project costs significantly.

Residential use of water typically adds 200 to 300 mg/l of TDS to the wastewater stream. Self-regenerating water softeners can add another pound of salt per day per unit. Infiltration of brackish groundwater into sewer lines can also cause an increase in TDS. If an area receives a water supply with TDS of more than 700 mg/l, and residents add 300 mg/l or more through normal use, the recycling facility will produce recycled water with a TDS concentration of 1,000 mg/l or higher. Figure 7-1 shows the average TDS at several of the existing and projected water recycling treatment plants. In general, TDS concentrations over 1,000 mg/l become problematic for irrigation and industrial reuse customers. This problem greatly limits the potential uses and marketability of recycled water, particularly for agricultural purposes, because certain crops and nursery stock are sensitive to irrigation water with TDS levels exceeding 1,000 mg/l.

Figure 7-1
Treatment Plant Average Effluent TDS (mg/l)



7.6 Seawater Desalination

The feedwater source for the proposed regional seawater desalination project at the Encina Power Station in Carlsbad is the Pacific Ocean. The salinity of the Pacific Ocean in San Diego County is fairly stable, with a TDS concentration around 34,000 mg/l. To address TDS concentrations at this level, the desalination facility will use a reverse osmosis (RO) membrane treatment process to reduce the TDS to less than 350 mg/l, resulting in approximately 99 percent removal of TDS and a supply that meets drinking water standards.

Prior to the RO process, the feedwater will be pretreated to remove suspended solids, including organic material. The RO process will then remove the dissolved solids. Next, the product water will be post-treated to prevent corrosion in the distribution system and improve the aesthetic quality of the water. This process generally involves adding alkalinity to the treated water. The final step, a disinfection process, provides a disinfection residual in the treated water.

A single-pass RO process of seawater generally results in about 50 percent recovery of treated water. The remaining 50 percent is discharged as concentrate, with about twice the salinity of the original feedwater. The concentrate will be diluted to avoid negative impacts to the marine environment from the elevated salinity levels at the point of discharge.

Section 7
Water Quality

The Act requires that the 2010 Plan include information, to the extent practicable, on the quality of existing supply sources and the manner in which water quality affects water supply reliability. A significant task for the Water Authority is to protect the water quality of the water passing through its delivery system and communicating water quality changes to its member agencies. This section summarizes water quality issues associated with supplies serving the San Diego region. Information on Colorado River and SWP supplies came in part from Metropolitan's final 2010 RUWMP (November 2010).

Water agencies treat all water to meet stringent state and federal drinking water standards before delivering it to customers. However, source water of poor quality will make it increasingly expensive and difficult to meet those standards.

7.1 Colorado River

The Colorado River is the primary source of the Water Authority's imported water supply. High salinity levels, uranium, and perchlorate contamination represent the primary areas of concern with the quality of Colorado River supplies. Managing the watershed of the Colorado River has been the most effective method for controlling these elements of concern.

7.1.1 Salinity

The salts in the Colorado River System are indigenous and pervasive, mostly resulting from saline sediments in the basin that were deposited in prehistoric marine environments. They are easily eroded, dissolved, and transported into the river system. Agricultural development and water diversions over the past 50 years increase the already high naturally occurring levels of TDS.

Water imported via the CRA has a TDS averaging around 650 mg/l during normal water years. During the high water flows of 1983–1986, salinity levels in the CRA dropped to a historic low of 525 mg/l. However, during the 1987–1990 drought, higher salinity levels returned. During an extreme drought, CRA supplies could exceed 900 mg/l. High TDS in water supplies leads to high TDS in wastewater, which lowers the usefulness of the water and increases the cost of recycled water. (Refer to Section 7.5 for details on salinity impacts to water recycling.) In addition to the link between water supply and water quality, high levels of TDS in water supplies can damage water delivery systems and home appliances.

To reduce the affects of high TDS levels on water supply reliability, Metropolitan approved a highly successful Salinity Management Policy in April 1999. One of the policy goals is to blend Colorado River supplies with lower-salinity water from the SWP to achieve delivered water salinity levels less than 500 mg/l TDS. In addition, to fostering interstate cooperation on this issue, the seven basin states formed the Colorado River Basin Salinity Control Forum (Forum). To lower TDS levels in Colorado River supplies, the Forum develops programs designed to prevent a portion of the abundant salt supply from moving into the river system. The Colorado River Basin Salinity Control

Program targets the interception and control of non-point sources, such as surface runoff, as well as wastewater and saline hot springs.

7.1.2 Perchlorate

Perchlorate is used as the main component in solid rocket propellant, and it can also be found in some types of munitions and fireworks. Perchlorate and other perchlorate salts are readily soluble in water, dissociating into the perchlorate ion, which does not readily interact with the soil matrix or degrade in the environment. The primary human health concern related to perchlorate is its effects on the thyroid. Perchlorate has been detected at low levels in Metropolitan's CRA water supply.

Because of the growing concerns over perchlorate levels in drinking water, in 2002 Metropolitan adopted a Perchlorate Action Plan. Objectives include expanded monitoring and reporting programs and continued tracking of remediation efforts in the Las Vegas Wash. Metropolitan has been conducting monthly monitoring of Colorado River supplies. The source of the perchlorate that originates in the Las Vegas Wash is most likely from a chemical manufacturing site located in Henderson, Nevada. The Nevada Department of Environmental Protection manages a comprehensive groundwater remediation program in the Henderson area. As of December 2004, the amount of perchlorate entering the Colorado River system from Henderson has been reduced from approximately 1,000 pounds per day (lb/day) to less than 90 lb/day.

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Naturally occurring uranium has always been present in Colorado River water and has always been under the California Maximum Contaminant Level (MCL) of 20 picocuries per liter (pCi/l). The risks to water quality have primarily come from upstream mining in Moab, Utah and other potential mining sites in the west. Currently the U.S. Department of Energy (DOE) is working to remove and dispose of mine tailings and improve groundwater quality on the Colorado River Watershed near Moab. The expected completion of this cleanup is between 2019 and 2025. Current levels are below MCL and can be treated by regional water treatment plants.

7.1.4 Nutrients

The Colorado River system has historically been low in nutrients, but with population growth in the watershed nutrients are still a concern. Metropolitan is involved with upstream entities along the lower Colorado River to enhance wastewater management to control nutrient loading, especially phosphorus. The Colorado River's low nutrient level has been important for blending with SWP water to reduce the nutrient level delivered to retail agencies.

7.1.5 Arsenic

Arsenic is another naturally occurring element that is being monitored by drinking water agencies. The state detection level for purposes of reporting is 2 micrograms per liter (µg/l), and the MCL for domestic water supplies is 10 µg/l. Between 2001 and 2008, arsenic levels in Colorado River water have ranged from not detected to 3.5 µg/l. Increasing coagulant doses at water treatment plants can reduce arsenic levels for retail deliveries.

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The quality of SWP water as a drinking water source is affected by a number of factors, most notably seawater intrusion and agricultural drainage from peat soil islands in the Delta. SWP water contains relatively high levels of bromide and total organic carbon, two elements that are of particular concern to drinking water agencies. Bromide and total organic carbon combine with chemicals used in the water treatment process to form disinfection byproducts that are regulated under the federal Safe Drinking Water Act (SDWA). Wastewater discharges from cities and towns surrounding the Delta also add salts and pathogens to Delta water, and they influence its suitability for drinking and recycling.

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Actions to protect Delta fisheries have exacerbated existing water quality problems by forcing the SWP to shift its diversions from the springtime to the fall, when salinity and bromide levels are higher. Closure of the Delta Cross-Channel gates to protect migrating fish has also degraded SWP water quality by reducing the flow of higher quality Sacramento River water to the SWP pumps at critical times.

7.2.1 Total Organic Carbon and Bromide

Total organic carbon and bromide are naturally occurring but are elevated due to agricultural drainage and seawater intrusion as water moves through the delta. The concern with both total organic carbon and bromide is that they form disinfection byproducts (DBPs) when treated with disinfectants such as chlorine. Some DBPs have been identified and are regulated under SDWA; there are others that are not yet identified. The potential adverse health effects may not be fully understood, but associations with certain cancers, reproductive and developmental effects are of significant concern. Water agencies began complying with new regulation to protect against the risk of DBP exposure in January 2002 under the Disinfection Byproducts (D/DBP) rule Stage 1. The U. S. Environmental Protection Agency (EPA) promulgated the Stage 2 D/DBP rule in January 2006, which has made compliance more challenging. CALFED's Bay-Delta Program calls for a wide array of actions to improve Bay-Delta water quality, which remains the best method for controlling these elements of concern in the drinking water supply.

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SWP supplies have significantly higher nutrient levels over the Colorado River supplies. Elevated levels of nutrients can increase nuisance algal and aquatic weed growth, which in turn affects taste and odor in product water and can reduce filter run times at WTPs. Nutrient rich soils in the Delta, agricultural drainage, and wastewater discharges are primary sources of nutrient loading to the SWP. Water agencies receiving delta water have been engaged in efforts to minimize the effects of nutrient loading from Delta wastewater plants. Taste and odor complaints due to Delta nutrients are dependent on the blend of imported water delivered through Metropolitan. Metropolitan developed a program to provide early warning of algae-related problems, taste, and odor events to best mange water quality in the system.

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The TDS levels of SWP water can also vary widely over short periods of time. These variations reflect seasonal and tidal flow patterns, and they pose an additional problem to blending as a management tool to lower the higher TDS from the CRA supply. For example, in the 1977 drought, the salinity of SWP water reaching Metropolitan increased to 430 mg/l, and supplies became limited. During this same event, salinity at the Banks pumping plant exceeded 700 mg/l. Under similar circumstances, Metropolitan's 500 mg/l salinity objectives could only be achieved by reducing imported water from the CRA. Thus, it may not be possible to maintain both salinity standards and water supply reliability unless salinity levels of source supplies can be reduced.

The CALFED Bay-Delta Program's Environmental Impact Statement/Environmental Impact Report (EIS/EIR), Technical Appendix, July 2000 Water Quality Program Plan, identified targets that are consistent with TDS objectives in Article 19 of the SWP Water Service Contract: a ten-year average of 220 mg/l and a maximum monthly average of 440 mg/l. These objectives were set in the 1960s when Metropolitan expected to obtain a greater proportion of its total supplies from the SWP. Because of reductions in expected SWP deliveries, Metropolitan's Board believes that this standard is no longer appropriate, so it has adopted a statement of needs from the Bay-Delta. Under the drinking water quality and salinity targets element, the Board states its need "to meet Metropolitan's 500 mg/l salinity-by blending objective in a cost-effective manner while minimizing resource losses and ensuring the viability of recycling and groundwater management programs."

7.2.4 Arsenic

Between 2001 and 2008, arsenic levels in SWP water have ranged from not detected to 4.0 µg/l. Increasing coagulant doses at water treatment plants can reduce arsenic levels for retail deliveries. Groundwater storage programs in the SWP appear to provide the greatest risk of arsenic contamination; therefore, a pilot arsenic treatment facility is being tested by one of the groundwater partners.

7.3 Surface Water

The region's water quality is influenced by a variety of factors depending on its source. As stated above, waters from the Colorado River and from Northern California are vulnerable to a number of contributors to water quality degradation. Regional surface and groundwater are primarily vulnerable to increasing urbanization in the watershed, agriculture, recreational uses, wildlife, and fires.

Historically, regional surface water quality has been considered good to excellent. Water quality can vary with imported water inflows and surface water contamination. Source water protection is considered a key element in regional water quality. The Water Authority and its member agencies

are working together to improve watershed awareness and management. Currently, the most significant water quality issue that affects the public is algae blooms, which can create taste and odor problems.

In San Diego County, the California Department of Public Health (CDPH) has primacy over the implementation of the SDWA. The SDWA regulates source water protection to ensure public health through the multiple barrier approach, an approach that anticipates that the public will participate in source water protection. Member agencies in the Water Authority's service area that have surface water have a good, long-standing, working relationship with CDPH.

A similar requirement from EPA calls for utilities to complete a Source Water Assessment (SWA). Information collected in SWAs is used to evaluate changes in potential sources of contamination and to help determine if more protection measures are needed. EPA requires utilities to complete an SWA that uses information collected in the sanitary surveys. The SWA is also used to evaluate the vulnerability of water sources to contamination and also helps determine whether more protective measures are needed.

Source water protection is fundamentally important to all of California. The CDPH requires large utilities delivering surface water to complete a Watershed Sanitary Survey every five years to examine possible sources of drinking water contamination. The survey includes suggestions for how to protect water quality at the source.

The monitoring of key constituents in source waters is critical in helping to identify constituents that should be controlled at the source and to determine the best ways to operate the water system so as to improve the quality of water delivered to the consumer. The effect of urban runoff on receiving water quality is a recognized problem.

To address the issues associated with surface water quality, the Water Authority, the city of San Diego, and the county of San Diego have formed a Regional Water Management Group to coordinate development of an IRWM for the San Diego region. An important element in the IRWM is to protect and enhance the region's local surface water quality. As part of this process, projects will be identified and implemented to assist in watershed protection, and thereby, protect the quality of surface water supplies.

One of the key objectives of the IRWM is to reduce sources of pollutants and environmental stressors. This objective targets water management strategies that directly address pollution management and include: agricultural land stewardship, pollution prevention, urban land use planning, urban runoff management, and watershed management and planning. The IRWM stresses the need to attain the region's water quality standards by managing runoff from all sources within the region through the watershed management framework. (Refer to Section 8, "Integrated Regional Water Management Planning for more information.)

7.4 Groundwater

Two water quality parameters that can affect reliability of groundwater resources in San Diego County are contamination from high salinity levels and Methyl Tertiary Butyl Ether (MTBE).

7.4.1 Salinity

Increased TDS in groundwater basins occurs either when basins near the ocean are over drafted, leading to seawater intrusion, or when agricultural and urban return flows add salts to the basins. Much of the water used for agricultural or urban irrigation infiltrates into the aquifer, so where high TDS irrigation water is used or where the water transports salts from overlying soil, the infiltrating water will increase the salinity of the aquifer. Using this resource requires costly demineralization projects. (Refer to Section 5.3, "Groundwater," for discussion on groundwater recovery projects.)

To protect the quality of these basins, the Regional Board often places restrictions on the salinity levels of water used for basin recharge or for irrigation of lands overlying the aquifers. Where these restrictions are in place, water reuse and aquifer recharge may be restricted, or expensive mitigation measures may be required.

7.4.2 Methyl Tertiary Butyl Ether

MTBE was the primary oxygenate in virtually all the gasoline historically used in California. In January 2004, the Governor's executive order to remove MTBE from gasoline became effective, and now ethanol is the primary oxygenate. Relative to other organic compounds, MTBE is very soluble in water and has low affinity for soil particles, thus allowing the chemical to move quickly in the groundwater. MTBE is also resistant to chemical and microbial degradation in water, making treatment more difficult than the treatment of other gasoline components.

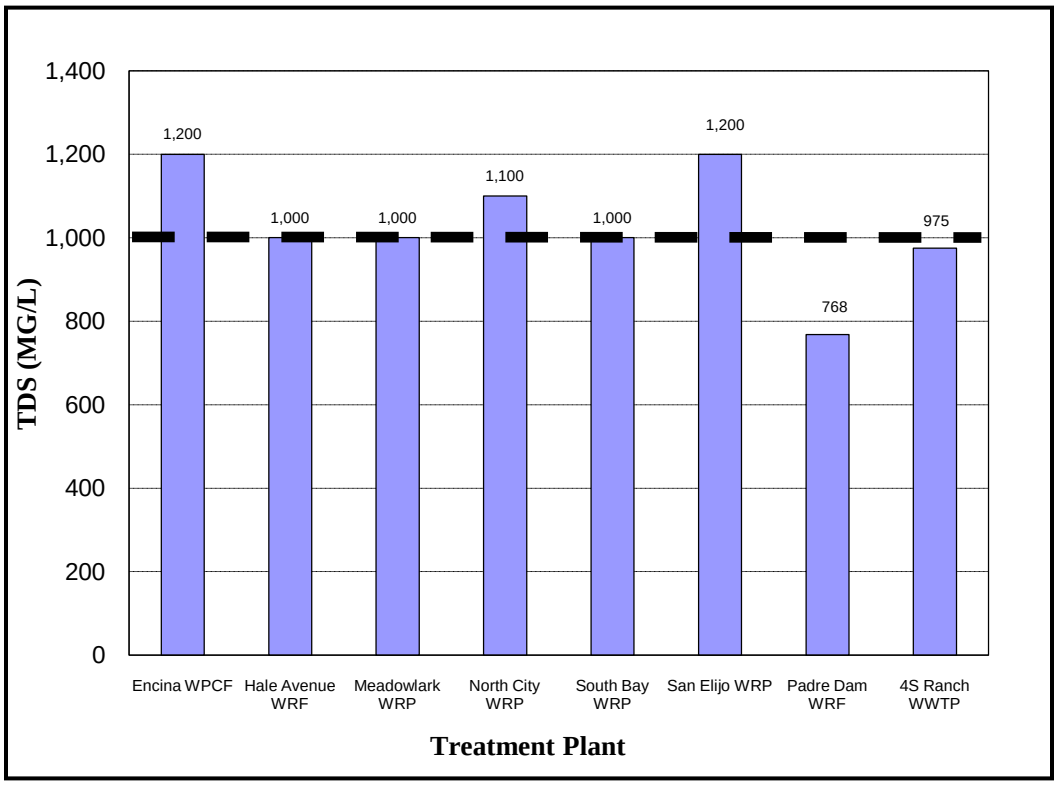
MTBE presents a significant potential problem to local groundwater basins. Leaking underground storage tanks and poor fuel-handling practices at local gas stations may provide a large source of MTBE. Improved underground storage tank requirements and monitoring, and the phase-out of MTBE as a fuel additive, has decreased the likelihood of MTBE groundwater problems in the future.

7.5 Recycled Water

Water quality, as it pertains to high salinity supplies, is a significant implementation issue for recycled water projects. High TDS source water poses a special problem for water recycling facilities because conventional treatment processes are designed to remove suspended particles, but not dissolved particles. TDS removal, or demineralization, requires an advanced treatment process, which can increase project costs significantly.

Residential use of water typically adds 200 to 300 mg/l of TDS to the wastewater stream. Self-regenerating water softeners can add another pound of salt per day per unit. Infiltration of brackish groundwater into sewer lines can also cause an increase in TDS. If an area receives a water supply with TDS of more than 700 mg/l, and residents add 300 mg/l or more through normal use, the recycling facility will produce recycled water with a TDS concentration of 1,000 mg/l or higher. Figure 7-1 shows the average TDS at several of the existing and projected water recycling treatment plants. In general, TDS concentrations over 1,000 mg/l become problematic for irrigation and industrial reuse customers. This problem greatly limits the potential uses and marketability of recycled water, particularly for agricultural purposes, because certain crops and nursery stock are sensitive to irrigation water with TDS levels exceeding 1,000 mg/l.

Figure 7-1
Treatment Plant Average Effluent TDS (mg/l)



7.6 Seawater Desalination

The feedwater source for the proposed regional seawater desalination project at the Encina Power Station in Carlsbad is the Pacific Ocean. The salinity of the Pacific Ocean in San Diego County is fairly stable, with a TDS concentration around 34,000 mg/l. To address TDS concentrations at this level, the desalination facility will use a reverse osmosis (RO) membrane treatment process to reduce the TDS to less than 350 mg/l, resulting in approximately 99 percent removal of TDS and a supply that meets drinking water standards.

Prior to the RO process, the feedwater will be pretreated to remove suspended solids, including organic material. The RO process will then remove the dissolved solids. Next, the product water will be post-treated to prevent corrosion in the distribution system and improve the aesthetic quality of the water. This process generally involves adding alkalinity to the treated water. The final step, a disinfection process, provides a disinfection residual in the treated water.

A single-pass RO process of seawater generally results in about 50 percent recovery of treated water. The remaining 50 percent is discharged as concentrate, with about twice the salinity of the original feedwater. The concentrate will be diluted to avoid negative impacts to the marine environment from the elevated salinity levels at the point of discharge.

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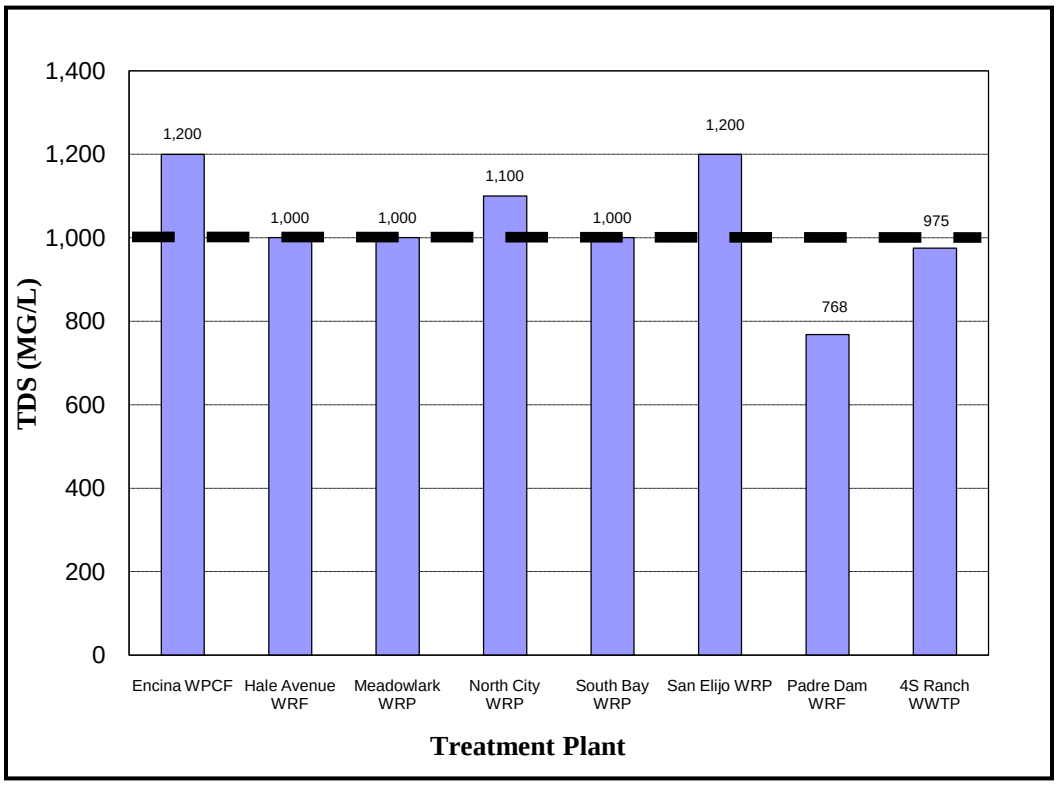
Figure 7-1
Treatment Plant Average Effluent TDS (mg/l)



7.6 Seawater Desalination

The feedwater source for the proposed regional seawater desalination project at the Encina Power Station in Carlsbad is the Pacific Ocean. The salinity of the Pacific Ocean in San Diego County is fairly stable, with a TDS concentration around 34,000 mg/l. To address TDS concentrations at this level, the desalination facility will use a reverse osmosis (RO) membrane treatment process to reduce the TDS to less than 350 mg/l, resulting in approximately 99 percent removal of TDS and a supply that meets drinking water standards.

Prior to the RO process, the feedwater will be pretreated to remove suspended solids, including organic material. The RO process will then remove the dissolved solids. Next, the product water will be post-treated to prevent corrosion in the distribution system and improve the aesthetic quality of the water. This process generally involves adding alkalinity to the treated water. The final step, a disinfection process, provides a disinfection residual in the treated water.

A single-pass RO process of seawater generally results in about 50 percent recovery of treated water. The remaining 50 percent is discharged as concentrate, with about twice the salinity of the original feedwater. The concentrate will be diluted to avoid negative impacts to the marine environment from the elevated salinity levels at the point of discharge.

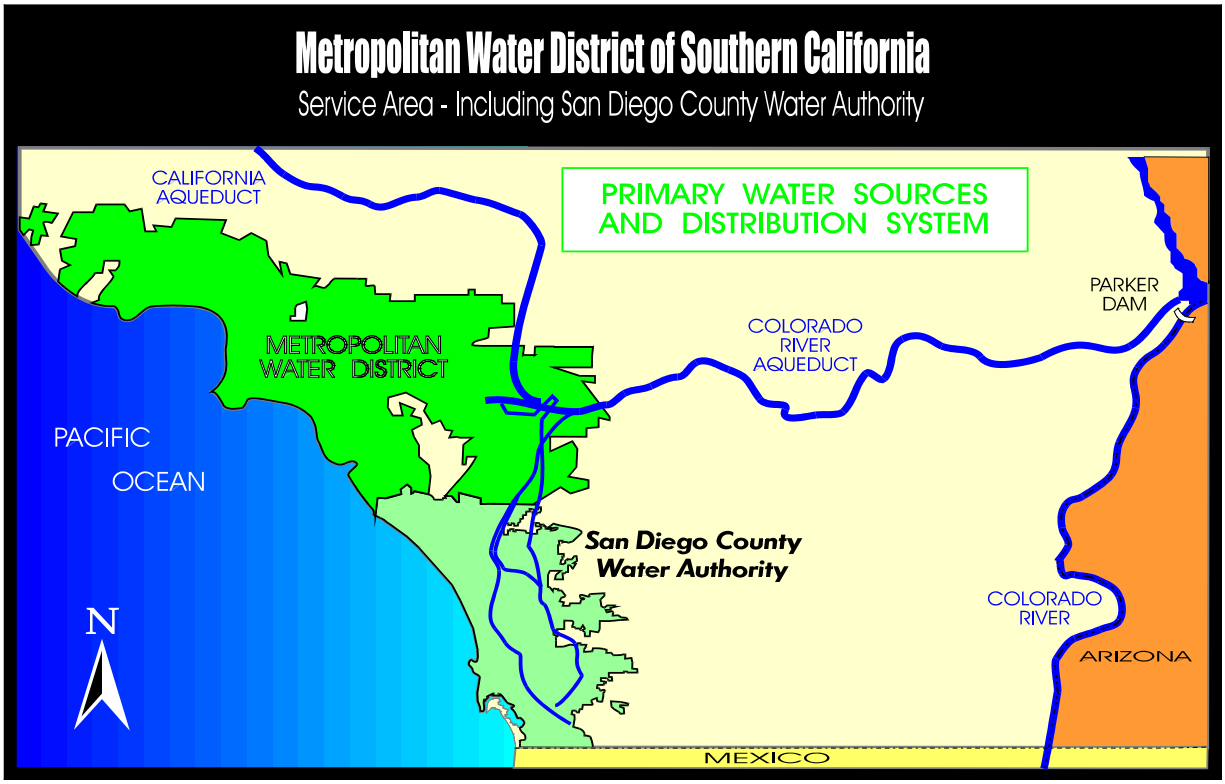
Section 6

Metropolitan Water District of Southern California

6.1 Description

The Water Authority's imported water sources include purchases from Metropolitan. Metropolitan was formed in 1928 to develop, store, and distribute supplemental water in Southern California for domestic and municipal purposes. Metropolitan supplies water to approximately 19 million people in a service area that includes portions of Ventura, Los Angeles, Orange, San Bernardino, Riverside, and San Diego counties. The Metropolitan service area, shown in Figure 6-1, covers a 70-mile-wide strip of the Southern California coastal plain, extending from the city of Oxnard on the north to the Mexican border. Close to half of the water used in this 5,200-square-mile region is supplied by Metropolitan, and about 90 percent of its population receives at least some of its water from Metropolitan. The Water Authority, one of 26 Metropolitan member agencies, is the largest in terms of purchases, purchasing 331,825 AF, or about 21 percent of all the water Metropolitan delivered in fiscal year 2010. The extent to which Metropolitan's member agencies rely upon Metropolitan supplies varies by the amount of local supplies available or their own reliability goals.

Figure 6-1
Metropolitan Service Area



6.1.1 Metropolitan Act Section 135 – Preferential Right to Water

Under Section 135 of the Metropolitan Act, each member agency has a preferential right to Metropolitan purchases. The preferential rights are determined by each agency's total historic payments to Metropolitan from property taxes, readiness-to-serve charges, and other minor miscellaneous revenue. Revenue resulting from the purchase of Metropolitan water is excluded, even though more than 81 percent of Metropolitan's revenues come from water sales.

Metropolitan member agencies' ability to exercise preferential rights was confirmed in a lawsuit filed by the Water Authority in 2001. The court decisions made clear how much water the Water Authority may count on from Metropolitan should a member agency invoke its preferential right. While the Water Authority had a preferential right to purchase 17.47 percent of Metropolitan's water as of June 30, 2010, it purchased about 21 percent of their available supply in fiscal year 2010.

In Metropolitan's 2010 Regional Urban Water Management Plan (RUWMP), Section 2.3, Metropolitan presents its supply availability at the regional level, rather than at the member agency level. The report stated that the region can provide reliable water supplies under both the single driest year and the multiple dry-year hydrologies through 2035. The report listed Metropolitan's forecasted imported water supply capabilities under normal, single driest year and multiple dry-year hydrologies through 2035, which would provide the Water Authority with adequate supplemental imported supplies in normal years and a single dry-year. In multiple dry years, under its projected preferential right formula, the Water Authority could experience shortages as shown in **Section 9.3**.

6.2 Metropolitan's Water Supplies

Metropolitan obtains its water from two sources: the CRA, which it owns and operates, and the SWP, with which Metropolitan has a water supply contract through the state of California. Figure 6-2 shows these imported water supply sources, and they are described below. In order to meet emerging challenges from dry hydrologic conditions and regulatory restrictions that limit supplies from the SWP, Metropolitan's strategy also includes utilizing its storage programs to maximize available supplies in wet years for dry years' use.

Figure 6-2
Major Water Conveyance Facilities Serving San Diego County

6.2.1 Colorado River

Metropolitan was formed to import water from the Colorado River. During the 1930s, Metropolitan built the CRA to convey this water. Metropolitan's member agencies received the first deliveries in 1941. The aqueduct is more than 240 miles long, beginning at Lake Havasu on the Arizona/California border and ending at Lake Mathews in Riverside County. The aqueduct has capacity to deliver up to 1.25 million AF/YR. Figure 6-2 shows the location of the aqueduct.

6.2.1.1 Reliability Issues

Before 1964, Metropolitan had a firm annual allocation of 1.212 million AF of Colorado River water through contracts with the U.S. Department of the Interior, which was enough to keep Metropolitan's aqueduct full. However, as a result of the U.S. Supreme Court decision in *Arizona vs. California*, Metropolitan's firm supply fell to 550,000 AF, its basic annual apportionment. Due to growth in demand from the other states and drought conditions, since 2003, Metropolitan's deliveries have been limited to its basic annual apportionment plus water resulting from unused apportionment water by other California holders of priorities 1 through 3, and transfer programs resulting from conservation with other senior water right holders.

Water availability from the Colorado River is governed by a system of priorities and water rights that has been established over many years. The Colorado River Lower Basin states (California, Arizona, and Nevada) have an annual apportionment of 7.5 million AF of water divided as follows: (1) California, 4.4 million AF; (2) Arizona, 2.8 million AF; and (3) Nevada, 300,000 AF. The 1931 Seven Party Agreement established California's priorities for water among California's contractors to use Colorado River water made available to California. The first four priorities total the 4.4 million AF/YR available to California. Metropolitan has priorities 4, 5(a), and 5(b) water listed in the Seven Party Agreement, but only priorities 1–4 of the Seven Party Agreement are within California's basic annual apportionment. Metropolitan's fourth priority of 550,000 AF is junior to that of the first three priorities, 3.85 million AF to California agricultural agencies. Water used to satisfy Metropolitan's priorities 5(a) and 5 (b) must come from unused allocations within California, Arizona, or Nevada, or from surpluses declared by the Secretary of the Interior.

6.2.1.2 Environmental Considerations

Several fish species and other wildlife species either directly or indirectly have the potential to affect Colorado River operations, thus changing power operations and the amount of water deliveries to the CRA. A number of species that are on either "endangered" or "threatened" lists under the federal and/or California Endangered Species Acts (ESAs) are present in the area of the Lower Colorado River. To address this issue, a broad-based state/federal/tribal/private regional partnership, which includes water, hydroelectric power, and wildlife management agencies in Arizona, California, and Nevada, developed a multi-species conservation plan for the main stem of the Lower Colorado River (the Lower Colorado River Multi-Species Conservation Program [MSCP]). Developed between 1996 and launched in early-2005, this 50-year plan allows Metropolitan to obtain federal and state permits for any incidental take of protected species resulting from current and future water and power operations and diversions on the Colorado River. The MSCP also covers operations of federal dams and power plants on the Colorado River.

6.2.1.3 Water Quality Considerations

Please see Section 7, "Water Quality," for information.

6.2.1.4 Current Supplies

Per the Seven Party Agreement, Metropolitan has a firm Colorado River supply of 550,000 AF from its fourth priority within California's basic apportionment of 4.4 million AF. Because Metropolitan continues to face dry hydrologic challenges coupled with increasing demands, Metropolitan relied on its fifth priority for up to 662,000 AF/YR (through unused water from holders of priorities 1 through 3, water saved by Palo Verde, or when the U.S. Secretary of Interior declares surplus or unused water by Arizona and/or Nevada), and additional supplies when the Department of Interior declared surplus flows are available. With the 2003 QSA and related agreements among the IID, the Coachella Valley Water District (CVWD), State of California, Department of Interior, Metropolitan, and the Water Authority, a plan was formalized on how California will implement water transfers and supply programs that allow California to live within the state's 4.4 million AF basic annual apportionment of Colorado River water. Since then, Metropolitan has relied on cooperative transfer programs and storage programs to increase its Colorado River water deliveries beyond its basic priority 4 water.

6.2.1.5 Quantification Settlement Agreement and Future Supplies

The Water Authority, together with CVWD, IID, and Metropolitan, entered into the QSA in October 2003. The QSA, which is in effect for 45 years (and up to 75 years), resolved longstanding disputes regarding Colorado River water use among the agencies, and established a baseline water use for IID, CVWD, and Metropolitan. This permitted the implementation of a variety of water conservation and transfer agreements, including the Water Authority's transfer agreement with IID. The QSA also provides that CVWD and Metropolitan will put aside, for the term of the agreement, a dispute over beneficial use of water by IID; and that Metropolitan would forbear consumptive use of water to permit the Secretary of Interior to satisfy the uses of the non-encompassed water delivered to holders of present perfected rights. See Section 4.2, "Water Authority – IID Water Conservation and Transfer Agreement," for more information on the QSA.

Metropolitan's Tables 2-9, 2-10, and 2-11 in its 2010 RUWMP indicate that Metropolitan's current program Colorado River Aqueduct supply target for an average (based on 1922–2004 hydrologies) and single (repeat of 1977 hydrology) or multiple dry year (based on 1990–1992 hydrology) is 1.25 million AF, the maximum Colorado River Aqueduct delivery capacity. The figure includes water management programs and IID/Water Authority transfers and conserved canal lining water conveyed by the aqueduct.

6.2.2 State Water Project

The SWP is owned by the State of California and is operated by the DWR. Metropolitan has a take-or-pay supply contract with the State of California and is entitled to take about 48 percent of available SWP water through its Long-Term SWP Water Supply Contract (Table A allocation). The project stretches more than 600 miles, from Lake Oroville in the north to Lake Perris in the south. Water is stored at Lake Oroville and released when needed into the Feather River, which flows into the Sacramento River and to the Sacramento–San Joaquin River Delta (Delta). The Delta is the largest estuary on the United States' west coast and is also home to an agricultural industry, recreation and

fishing, and provides the means by which to deliver water from Northern California to the south. In the north Delta, water is pumped into the North Bay Aqueduct for delivery to Napa and Solano counties. In the south Delta, water is diverted into the SWP's Banks Pumping Plant, where it is lifted into the 444-mile-long California Aqueduct. Some of this water flows into the South Bay Aqueduct to serve areas in Alameda and Santa Clara counties. The remainder flows southward to cities and farms in central and southern California. In the winter, when demands are lower, water is stored at the San Luis Reservoir located south of the Delta. SWP facilities provide drinking water to 23 million Californians and 755,000 acres of irrigated farmland. Figure 6-2 shows the California Aqueduct.

6.2.2.1 Reliability Issues

The reliability of SWP supplies is limited by both the level of SWP supply development and pumping restrictions due to state and federal environmental regulations and hydrology. When approved by the voters in the 1960s, the SWP was planned to deliver 4.2 million AF to 32 contracting agencies. Subsequent contract amendments reduced total contracted deliveries to 4.13 million AF and the number of contracting agencies to 29. Metropolitan's contracted entitlement is 1,911,500 AF. Metropolitan's original long-term water supply contract for 2,011,500 AF was amended as part of the 2003 QSA. Effective in 2005, the amendment resulted in an exchange agreement among CVWD, Desert Water Agency (DWA), and Metropolitan. The exchange agreement provides for the transfer of 88,100 AF of Metropolitan's Table A amounts to CVWD and 11,900 AF of Metropolitan's Table A amounts to DWA. When voters approved construction of the SWP in 1960, state planners did not expect the full amount of contracted water to be needed for at least the first 20 years of the project. As a result, the planners anticipated that the facilities needed to produce the full contracted amount would be constructed over time as demands on the system increased. However, decisions about these additional facilities were repeatedly deferred as public attitudes and environmental regulations changed and costs increased. New state and federal environmental laws put some potential water supply sources off limits to development. More stringent water quality standards adopted by the SWRCB to protect the San Francisco Bay/Sacramento–San Joaquin River Delta have reduced the amount of water available for diversion. Environmental challenges to the SWP operations also resulted in the issuance of new biological opinions, which led to pumping restrictions that further reduced SWP exports. At the same time, California's population and water demand continued to grow.

Since 2006, a voluntary collaboration of state, federal and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties began development of the Bay Delta Conservation Plan (BDCP). The purpose of the BDCP is to restore and protect Delta water supply, water quality, and ecosystem health within a stable regulatory environment. A parallel effort, the Delta Habitat Conservation and Conveyance Program (DHCCP) is in process, and is the state government's mechanism for achieving the BDCP's goals.

In November 2009, the state Legislature passed a package of bills that established in state policy the co-equal goals of water supply reliability and environmental restoration in the Delta. The bills also provided a governance structure for the Delta and required the preparation of a Delta Plan to guide the process of achieving the co-equal goals and outline a plan to restore listed species. The Delta Stewardship Council, an independent state agency, is required to develop the Delta Plan by January 1, 2012. In order for the BDCP to be incorporated into the Delta plan and for public funds to be made available for public restoration benefits, the BDCP must also be approved by the California Department of Fish and Game (CDFG) as a Natural Community Conservation Plan (NCCP). If unsuccessful,

operational constraints likely will continue until a long-term solution to the problems in the Delta is implemented.

DWR's *2009 State Water Project Delivery Reliability Report* updated DWR's estimate of the current and future water delivery reliability of the SWP. The 2009 report showed that future deliveries will be further impacted by significant restrictions due to operational requirements contained in federal biological opinions and forecasted effects of climate change, which is changing the hydrologic conditions of the state. The 2009 report projected that the primary component of the annual SWP deliveries will be less, when compared to the preceding 2007 report, where the 2007 report incorporated interim and less restrictive operational requirements established by federal Judge Oliver Wanger in 2007. For current conditions, the dominant factor for the SWP's reductions is the restrictive operational requirements contained in the federal biological opinions. For future conditions, it is the restrictive operational requirements coupled with the forecasted effects of climate change. Metropolitan's SWP deliveries projection listed in its RUWMP are based on DWR's *Draft 2009 Report,* which is substantially the same as the final report. For dry, below-normal conditions, Metropolitan also developed its Central Valley storage and transfer programs to increase its supply capabilities.

In developing its supply capabilities, Metropolitan assumed a new Delta conveyance as fully operational by 2022 and would return supply reliability similar to 2005 conditions, prior to supply regulatory restrictions imposed. In terms of water supply impacts, Metropolitan identified regulatory restrictions water costs of over one million AF between both the SWP and the federal Central Valley Project in 2010.

6.2.2.2 Environmental Considerations

In recent years, actions taken to protect the ecosystem of the Bay-Delta have placed additional restrictions on SWP operations. The Bay-Delta is the largest estuary on the west coast and supports more than 750 plant and animal species. However, 150 years of human activity, dating back to 19th century gold mining, has taken its toll on the Bay-Delta ecosystem and the fish that live there.

Numerous factors contribute to the degradation of the Bay-Delta ecosystem and the decline of Delta fisheries, such as habitat loss, water diversions, non-point source pollution, over-fishing, and the introduction of nonnative species. Regulatory protection efforts have nevertheless tended to focus on the operations of the SWP and the federal Central Valley Project (CVP). The restrictions began in 2007, when Federal Court Judge Oliver Wanger, acting in a case filed two years earlier, invalidated the Biological Opinion (BiOp) for the Delta smelt and imposed an injunction that limited the time during which water could be pumped out of the Delta. The judge imposed restrictions on pumping to protect the Delta smelt, while new BiOps were being prepared. During the spring of 2008, Judge Wanger also invalidated the federal government's BiOps with respect to salmon and steelhead in the Sacramento River. In December 2008, the U.S. Fish and Wildlife Service (USFWS) issued a new BiOp for the Delta smelt. This BiOp imposed operating restrictions that were even more severe than those imposed by the judge. Metropolitan and other State Water Contractors filed separate lawsuits in federal district court challenging the BiOp.

On June 4, 2009, the National Oceanic and Atmospheric Administration National Marine Fisheries Service issued a BiOp intended to protect spring- and winter-run Chinook salmon, Central Valley steelhead, green sturgeon, and Southern Resident killer whales. This action placed additional restrictions on SWP and CVP operations. By the spring of 2010, Judge Wanger granted a preliminary

injunction against the federal government's implementation of pumping restrictions under the salmon BiOp. The judge said that the federal government had not properly taken into account the impact the restrictions would have on people in the Central Valley and had not justified the need for imposing the harshest restrictions within the range stated in the biological opinion. Shortly thereafter, as with the salmon ruling, Jusge Wanger found that water officials must consider impacts on humans along with the delta smelt. He also found that water users made convincing arguments that the federal government's science did not prove that increased pumping from the delta imperiled the smelt. Deliveries estimated for DWR's *2009 Report* are reduced by the operational restrictions of the biological opinions issued by the USFWS in December 2008 and the National Marine Fisheries Service in June 2009 governing the SWP and Central Valley Project operations.

On December 14, 2010, Judge Wanger issued a decision in the Delta Smelt consolidated lawsuits. He granted a number of the State Water Contractors', CVP Contractors', and other plaintiffs' motions for summary judgment, while denying others. On the whole, the decision invalidates the federal government's biological opinions on the Delta smelt and lessens the resulting restrictions on water supply to the state and federal water contractors. It is expected that Judge Wanger will most likely call a remedies hearing, at which the water contractor plaintiffs and the federal defendants will work to agree on a new set of restrictions based on the decision. There are still hearings to be held on the biological opinion regarding salmon. In addition, another lawsuit by environmentalist organizations is challenging the federal government's decision not to list the longfin smelt as endangered. Should the federal government lose that lawsuit, the restrictions on pumping to protect the longfin smelt may erase any gains in water supply resulting from the Wanger decision.

6.2.2.3 Water Quality Considerations

Please see Section 7, "Water Quality," for information.

6.2.2.4 Current Supplies

Metropolitan's SWP supplies are projected using DWR's *Draft 2009 State Water Project Delivery Reliability Report*. The reliability report presents current DWR estimates of the amount of water deliveries for current (as of 2009) and 20 years in the future conditions. The estimates incorporate restrictions on SWP and CVP operations in accordance with the biological opinions of the USFWS and National Marine Fishery Service issued on December 15, 2008, and June 4, 2009, respectively. Under the reliability report, the delivery estimates for the SWP for current conditions as percentage of maximum Table A amounts are 7 percent under a single dry-year (1977) condition, which is equivalent to 134,000 AF, and 60 percent under long-term average conditions, which is equivalent to 1.15 million AF. In dry, below-normal conditions caused by dry hydrologic conditions and regulatory restrictions, Metropolitan developed additional supplies from Central Valley storage and transfer programs.

6.2.2.5 Future Supplies

Metropolitan's 2010 RUWMP indicates that Metropolitan's SWP target for a dry year (based on 1977 hydrology) is 522,000 AF in 2015, 601,000 AF in 2020, and 651,000 AF in 2025. The 2010 RUWMP also estimates that in the 2030–2035 period, Metropolitan's annual supply range from the SWP will be between 609,000 and 610,000 AF. This figure includes Central Valley transfer and storage program supplies conveyed by the aqueduct. The 2010 RUWMP estimates that the SWP will be

capable of serving between 1.55 million to 1.73 million AF to Metropolitan from 2015 through 2035 in an average year.

6.2.3 Storage Management Programs

Metropolitan relies on water in storage to augment at times limited imported supplies. It manages its storage portfolio by storing water during wet years to meet the region's needs during critical droughts caused by varied hydrologic conditions and SWP pumping restrictions imposed to protect endangered or threatened fish species. Metropolitan's likelihood of having adequate supply capability before environmental issues that caused Delta pumping restrictions are addressed to meet projected demands, without implementing the Water Supply Allocation Plan (WSAP), is largely dependent on its storage resources. The principles that guide the management of supply and storage are based on the framework established in the Water Surplus and Drought Management (WSDM) Plan, and is being further refined through the WSAP update process. Currently, Metropolitan has about 30 storage programs in operation that provide flexibility to meet delivery requirements. The storage accounts include groundwater and surface storage programs and facilities, within and outside of Metropolitan's service area. Metropolitan's dry-year storage portfolio has the potential to store more than 5 million AF.

Metropolitan's 2010 RUWMP indicates that the in-region storage and transfer program target for a dry year (based on 1977 hydrology) is 685,000 AF in 2015, 931,000 AF in 2020, and 1,076,000 AF in 2025. The 2010 RUWMP also estimates that in the 2030–2035 period, Metropolitan's annual supply range from the SWP will be 964,000 and 830,000 AF, respectively. The 2010 RUWMP estimates that the in-region storage and transfer program will be capable of serving between 830,000 AF and 964,000 AF to Metropolitan from 2015 through 2035 in an average year.

Section 8
Integrated Regional Water Management Planning

IRWM planning involves the coordination and integration of water planning activities occurring within a defined region to improve and maintain the reliability of the region's water supply. IRWM planning recognizes that water supplies, water quality, and natural resources are connected and, as such, focuses on projects that produce multiple benefits in those areas. IRWM planning typically involves both governmental and non-governmental stakeholders.

Both the 2005 and 2009 State Water Plan Updates identify the expansion of IRWM as one of two "initiatives for reliable water supplies." As the 2009 Update states, "Integrated regional water management enables regions to implement strategies appropriate for their own needs and helps them become more self-sufficient." Through voter-approved bond measures – Proposition 50 in 2002 and Proposition 84 in 2006 – the state has made available up to $1.5 billion to support IRWM planning and implementation in various regions of California.

The Water Authority, the city of San Diego, and the county of San Diego joined together in 2005 to form a Regional Water Management Group (RWMG), which defined the San Diego IRWM planning region as the portion of San Diego County that is tributary to coastal waters (Figure 8-1). The RWMG then worked with a regional advisory committee to write the first San Diego IRWM Plan, which was approved in 2007 by the Water Authority Board, the San Diego City Council, and the San Diego County Board of Supervisors. DWR formally accepted the plan in 2009. Preparation of the San Diego Region's IRWM Plan was required for the San Diego planning region to apply for state funding. It also formed the foundation of long-term IRWM planning in the region. For detailed information on the San Diego IRWM Plan, visit the plan's website: http://www.rmcwater.com/clients/sdirwmp/home.html.

Figure 8-1
San Diego IRWM Planning Region

In 2008, DWR awarded a $25 million IRWM grant to the San Diego planning region. The funding is supporting 19 projects listed in the San Diego IRWM Plan that, in total, benefit the entire region. Project sponsors include the Water Authority and seven of its member agencies. All of the projects are designed to provide multiple benefits. Almost $18 million of the requested funding was designated for projects that had as their primary objective "water supply diversity." Nine of the projects, which received a total of $5.9 million, included water quality protection as one of their objectives.

Proposition 84 allocated $1 billion to DWR to support IRWM planning and implementation in California. An amount of $91 million is earmarked for the San Diego Funding Area, which comprises the planning regions for San Diego, South Orange County, and the Upper Santa Margarita River Watershed. According to a memorandum of understanding adopted by the three planning regions in 2009, the San Diego region will receive approximately 78 percent of this amount. The San Diego RWMG intends to use this funding as it becomes available to implement more projects listed in the San Diego IRWM Plan.

The San Diego RWMG also received a Proposition 84 funding grant to update the 2007 San Diego IRWM Plan so that it complies with new state guidelines and requirements. The update will expand the scope of the San Diego IRWM program to include land-use planning, integrated flood management, and the program's relationship with the San Diego Regional Water Quality Control

Board. As part of the Plan update, the San Diego RWMG also intends to support salt and nutrient management planning in the region to protect water quality.

The San Diego IRWM Program supports the UWMP by promoting regional planning and supporting projects that aim to increase water supply reliability and improve surface water and groundwater quality. IRWM planning and funding will help to make possible water supply projects in the areas of seawater desalination, recycled water, local surface water, and groundwater, all of which are identified in this 2010 Plan as part of the region's projected mix of water resources. The IRWM Program also supports water conservation, another key element of the 2010 Plan.

El Capitan watershed project

Wetlands construction project at Safari Park – San Diego Zoo

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Section 9
Water Supply Reliability

Under the Act, every UWMP must include an assessment of the reliability of water supply reliability. The water supply and demand assessment must compare the total projected water use with the expected water supply over the next 20 years in 5-year increments. This reliability assessment is required for normal, single dry-year and multiple dry water years. The assessment contained in the 2010 Plan projects reliability through the next 25 years. In addition to the expected, verifiable mix of resources utilized in the reliability assessment, additional planned resources, which have not yet achieved the same level of certainty, have also been identified by the Water Authority and its member agencies. This section presents a summary of the water demands and supplies within the Water Authority's service area along with the reliability assessment and discussion on additional planned supplies.

9.1 Development of Projected Water Resources Mix

In summary, development of the projected mix of resources to meet future demands is based on the following factors:

I. Local agency information on projected water recycling, groundwater, and surface water (discussed in Section 5);

II. Retail compliance with SBX7-7 conservation targets (Section 2)

III. Board approvals taken in regard to continued supply availability:

   a. Adoption of Water Authority's 2008 Strategic Plan with Key Result Area 1 – Water Supply Diversification

   b. Agreement between IID and the Water Authority for Transfer of Conserved Water, and other related agreements (Section 4.1);

   c. Allow the agreement related to the ACC and CC Lining Projects, and other related agreements (Section 4.2);

   d. A water supply contract consistent with the Term Sheet between Poseidon Resources and the Water Authority regarding development of a regional seawater desalination plant located in Carlsbad, CA (Section 4.3);

   e. Inclusion of the San Vicente Dam Raise and Carryover Storage Project in Water Authority's CIP (Section 11.2.3); and

   f. Agreements and actions related to out-of-region groundwater banking program.

9.2 Normal Water Year Assessment

Table 9-1 shows the normal year assessment, summarizing the total water demands for the Water Authority through the year 2035 along with the supplies necessary to meet demands under normal

conditions. Section 2 contains a discussion of the normal year water demands in the Water Authority's service area. If Metropolitan, the Water Authority and member agency supplies are developed as planned, along with achievement of the SBX7-7 retail conservation target, no shortages are anticipated within the Water Authority's service area in a normal year through 2035. As part of preparation of their 2010 Plan, Metropolitan staff identified the Water Authority's demands on Metropolitan, which are shown to be adequate to cover the supplemental need identified in Table 9.1. The member agency level data was not included in their 2010 Plan, but provided by Metropolitan to their member agencies separately and the Water Authority's data is included in Appendix I.

Table 9-1. Normal Water Year Supply and Demand Assessment (AF/YR)[1]

	2015	2020	2025	2030	2035
Water Authority Supplies					
IID Water Transfer	100,000	190,000	200,000	200,000	200,000
ACC and CC Lining Projects	80,200	80,200	80,200	80,200	80,200
Proposed Regional Seawater Desalination	0	56,000	56,000	56,000	56,000
Sub-Total	180,200	326,200	336,200	336,200	336,200
Member Agency Supplies					
Surface Water	48,206	47,940	47,878	47,542	47,289
Water Recycling	38,660	43,728	46,603	48,278	49,998
Groundwater	11,710	11,100	12,100	12,840	12,840
Groundwater Recovery	10,320	15,520	15,520	15,520	15,520
Sub-Total	108,896	118,288	122,101	124,180	125,647
Metropolitan Water District Supplies	357,159	229,636	258,782	292,381	323,030
Total Projected Supplies	**646,255**	**674,124**	**717,083**	**752,761**	**784,877**
Total Demands w/ SBX7-7 Conservation	646,255	674,124	717,083	752,761	784,877

[1] Normal water year demands based on 1960 – 2008 hydrologies.

9.3 Dry Water Year Assessment

In addition to a normal water year assessment, the Act requires an assessment to compare supply and demands under single dry and multiple dry water years over the next 20 years, in five-year increments. Section 2 describes the derivation of the dry water year demands. Table 9-2 shows the single dry-year assessment. The projected groundwater and surface water yields shown in the table are based on historic 1990 supplies during the 1987-1992 drought years. The supplies available from projected recycling and groundwater recovery projects are assumed to experience little, if any, reduction in a dry-year. The Water Authority's existing and planned supplies from the IID transfer, canal lining projects, and seawater desalination are also considered "drought-proof" supplies as discussed in Section 4. For this single dry-year assessment, it was assumed that Metropolitan would have adequate supplies in storage and would not be allocating supplies. With the previous years leading up to the single dry-year being wet or average hydrologic conditions, Metropolitan should

have adequate supplies in storage to cover potential shortfalls in core supplies and would not need to allocate.

Table 9-2. Single Dry Water Year Supply and Demand Assessment Five Year Increments (AF/YR)

	2015	2020	2025	2030	2035
Water Authority Supplies					
IID Water Transfer	100,000	190,000	200,000	200,000	200,000
ACC and CC Lining Projects	80,200	80,200	80,200	80,200	80,200
Proposed Regional Seawater Desalination	0	56,000	56,000	56,000	56,000
Sub-Total	**180,200**	**326,200**	**336,200**	**336,200**	**336,200**
Member Agency Supplies					
Surface Water	17,932	17,932	17,932	17,932	17,932
Water Recycling	38,660	43,728	46,603	48,278	49,998
Groundwater	9,977	9,977	9,977	9,977	9,977
Groundwater Recovery	10,320	15,520	15,520	15,520	15,520
Sub-Total	**76,889**	**87,157**	**90,032**	**91,707**	**93,427**
Metropolitan Supplies	**429,356**	**304,076**	**337,531**	**375,109**	**408,526**
Total Projected Supplies	**686,445**	**717,433**	**763,763**	**803,016**	**838,153**
Total Demands w/ SBX7-7 Conservation	686,445	717,433	763,763	803,016	838,153

If Metropolitan, the Water Authority and member agency supplies are developed as planned, along with achievement of the SBX7-7 retail conservation target, no shortages are anticipated within the Water Authority's service area in a single dry-year through 2035.

In accordance with the Act, Tables 9-3, 9-4, 9-5, and 9-6 show the multiple dry water year assessments in five-year increments. The member agencies' surface and groundwater yields shown in these tables are reflective of supplies available during the 1987-92 drought, in years 1990, 1991 and 1992. The Water Authority supplies consist of yield from the IID transfer, canal lining projects, and Carlsbad Seawater Desalination project.

For the multi dry-year reliability analysis, the conservative planning assumption is that Metropolitan will be allocating supplies to its member agencies. By assuming allocations in this reliability assessment, it allows the Water Authority to analyze how storage supplies could be utilized and the likelihood of shortages. Currently Metropolitan allocates supplies through its Water Supply Allocation Plan. Because it is uncertain in the future how Metropolitan will allocate supplies to its member agencies, the analysis in the tables assumes they are allocated based on preferential right to Metropolitan supplies. As discussed in Section 6.1.1, Section 135, Preferential Right to Purchase Water, is included in Metropolitan's Act and allows a Metropolitan member agency to acquire for use within the agency supplies based on preferential rights at any time.

Table 9-3. Multiple Dry Water Year Supply and Demand Assessment Five-Year Increments (AF/YR) – 2016–2018

	2016	2017	2018
Member Agency Supplies	78,943	93,408	112,499
Water Authority Supplies	236,200	236,200	266,200
Metropolitan Allocation (Preferential Right)	322,661	323,350	324,100
Total Estimated Core Supplies w/o Storage Takes	637,804	652,958	702,799
Total Demands w/ SBX7-7 Conservation	681,272	704,398	739,252
Potential Supply (Shortage) or Surplus *(Difference between Supplies and Demands)*	(43,468)	(51,440)	(36,453)
Utilization Carryover Supplies	43,468	40,000	30,000
Total Projected Core Supplies w/ Utilization of Carryover Storage Supplies	681,272	692,958	732,799
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	0	(11,440)	(6,453)

Table 9-4. Multiple Dry Water Year Supply and Demand Assessment Five-Year Increments (AF/YR) – 2021–2023

	2021	2022	2023
Member Agency Supplies	87,732	100,719	118,331
Water Authority Supplies	336,200	336,200	336,200
Metropolitan Allocation (Preferential Right)	326,697	327,671	328,695
Total Estimated Core Supplies w/o Storage Takes	750,629	764,590	783,226
Total Demands w/ SBX7-7 Conservation	723,243	750,714	789,043
Potential Supply (Shortage) or Surplus *(Difference between Supplies and Demands)*	27,386	13,876	(5,817)
Utilization Carryover Supplies	0	0	5,817
Total Projected Core Supplies w/ Utilization of Carryover Storage Supplies	750,629	764,590	789,043
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	27,386	13,876	0

Table 9-5. Multiple Dry Water Year Supply and Demand Assessment Five-Year Increments (AF/YR) – 2026–2028

	2026	2027	2028
Member Agency Supplies	90,367	103,114	120,486
Water Authority Supplies	336,200	336,200	336,200
Metropolitan Allocation (Preferential Right)	332,058	333,272	334,532
Total Estimated Core Supplies w/o Storage Takes	758,625	772,586	791,218
Total Demands w/ SBX7-7 Conservation	771,896	800,620	843,062
Potential Supply (Shortage) or Surplus *(Difference between Supplies and Demands)*	(13,271)	(28,034)	(51,844)
Utilization Carryover Supplies	13,271	28,034	40,000
Total Projected Core Supplies w/ Utilization of Carryover Storage Supplies	771,896	800,620	831,218
Remaining Potential Surplus Supply, or (Shortage) that will be handled through Management Actions	0	0	(11,844)

Table 9-6. Multiple Dry Water Year Supply and Demand Assessment Five-Year Increments (AF/YR) – 2031–2033

	2031	2032	2033
Member Agency Supplies	92,051	104,807	122,188
Water Authority Supplies	336,200	336,200	336,200
Metropolitan Allocation (Preferential Right)	338,575	340,009	341,486
Total Estimated Core Supplies w/o Storage Takes	766,826	781,016	799,874
Total Demands w/ SBX7-7 Conservation	810,482	841,975	881,781
Potential Supply (Shortage) or Surplus *(Difference between Supplies and Demands)*	(43,656)	(60,959)	(81,907)
Utilization Carryover Supplies	43,656	40,000	30,000
Total Projected Core Supplies w/ Utilization of Carryover Storage Supplies	810,482	821,016	829,874
Remaining Potential Surplus Supply, or (Shortage) that will be Offset through Management Actions	0	(20,959)	(51,907)

The Water Authority's annual preferential right percentage of Metropolitan supplies is estimated through 2035 and total Metropolitan dry-year supplies available for allocation are estimated to be 1,800,000 AF. This total supply assumes reduced deliveries from the State Water Project and Colorado River Aqueduct along with limited storage supplies. For reference, during the fiscal year 2010 allocation period, Metropolitan allocated approximately 1,890,000 AF of supplies to its member agencies.

Under the specific parameters assumed in the multi dry-year analysis, some level of shortage could potentially be experienced, as shown in Tables 9-3, 9-4, 9-5 and 9-6. Shortages occur in the early years primarily because the IID transfer supplies have not yet fully ramped up to 200,000AF/YR

maximum deliveries. The shortages occurring in the later years are due primarily to increasing water demands due to growth within the region.

As discussed in Section 11.2.3, the Water Authority has invested in carryover storage supply capacity, which can be utilized in dry-years to improve reliability. The carryover storage investment includes both surface water storage in San Vicente Reservoir and out-of-region groundwater storage in California's central valley, for a total of approximately 170,000 AF of storage capacity available by 2012, when the San Vicente Dam raise is scheduled for completion. Once completed, it will take three to five years to fill the reservoir.

As described in Section 11.2.3, there are a number of factors to consider when determining the utilization of carryover supplies to reduce or eliminate shortages. The storage take amount should be handled on a case-by-case basis, considering such items as, current demand trends, core supply availability, hydrologic conditions, and storage supply available for withdrawal. These factors will vary depending upon the situation. For the analysis in the 2010 Plan, it was assumed the carryover storage supplies would be full going into the dry-year period. In determining the amount to utilize, the analysis takes into account the take capacity of the groundwater banking program (approximately 12,000AF/YR) and uses general guidelines that approximately one third of the carryover supplies available in storage will be utilized in one year. Utilizing only a portion of available storage supplies avoids depletion of storage reserves, thereby making water available for potential ongoing or future shortages. The supplies taken from carryover storage will be considered a Water Authority regional supply to be combined with Water Authority's core supplies and any potential dry-year transfers.

In years where shortages may still occur, after utilization of carryover storage, additional regional shortage management measures, consistent with the Water Authority's Water Shortage and Drought Response Plan (described in Section 11.2.2), will be taken to fill the supply shortfall. These measures could include securing dry-year transfers, which the Water Authority successfully acquired and utilized during the recent shortage period. (Description of the Water Authority's dry-year transfer program is included in Section 11.2.3.). In addition to dry-year supplies, extraordinary conservation, achieved through voluntary or mandatory water-use restrictions, could also assist in managing shortages. A description of the savings achieved during the 2007-2011 shortage period is described in Section 11.2.1. As discussed in the following section, the amount of savings achieved through extraordinary conservation measures could be limited due to demand hardening, especially following compliance with SBX7-7 conservation savings.

9.3.1 Demand Hardening

It should be emphasized that the amount of extraordinary conservation savings expected to be achieved through mandatory measures, such as water-use restrictions, could be less than that experienced in the current and previous shortage periods. This is due to the concept known as demand hardening. Demand hardening diminishes the ability or willingness of a customer to reduce demands during shortages as a result of having implemented long-term conservation measures. Responsiveness to drought pricing and general price increases will diminish because remaining essential uses are less responsive to price. The required reduction levels through SBX7-7 compliance will reduce customer discretionary demands and create less flexibility in the managing of demand during shortages. This will increase the importance of acquiring supplemental dry-year supplies to eliminate or reduce potential supply shortages. Long-term permanent conservation

savings is critical to ensuring water is used most efficiently and for achieving the SBX7-7 conservation compliance targets. Due to potential demand hardening, resulting from SBX7-7, shortage management measures such as water-use restrictions and drought pricing may not be as effective in the future in achieving necessary savings to help reduce the supply gap.

9.4 Reliability of Supply

The above sections identify the diverse mix of resources planned to meet future demands in both a normal and dry-year. Implementation of this regional resource mix will require development of projects and programs by the Water Authority, its member agencies, and Metropolitan. The Water Authority coordinated with its member agencies and Metropolitan during preparation of the 2010 Plan on the future demands and supplies projected for the region. The steps being taken by the member agencies and Metropolitan to develop supplies are addressed in their respective urban water management plans. Section 4 contains the steps taken and remaining actions necessary to develop and maintain the Water Authority supplies.

Key to long-term reliability will be the monitoring of supplies and demands in order to make necessary modifications to the core and dry-year resources identified in the normal and dry-year resource mixes. The Water Authority Board will monitor reliability of existing supplies and development of identified future supplies through the Annual Supply Report and five year updates to the UWMP.

The Act requires that, for any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, that the agency describe, to the extent practicable, plans to replace that source with alternative sources or water demand management measures. As stated throughout the 2010 Plan, the Water Authority and its member agencies are planning to develop a diverse supply of resources. The unavailability of any one supply source will be buffered because of the diversity of the supplies: the region is not reliant on a single source. To replace or supplement an existing supply, the Water Authority could take steps to increase development of transfers or seawater desalination. Member agencies could also further maximize development of recycled water, groundwater, and seawater desalination. In order to adequately plan for potential supply uncertainties and identify alternative sources, the 2010 Plan contains a scenario planning process described in Section 10.

9.5 Additional Planned Supply Projects

The mix of current and future supplies is developed jointly between the Water Authority and its member agencies. The mix of supplies is being represented in two ways. Verifiable supplies are those supplies identified by the Water Authority or member agencies as having achieved a level of certainty in their planning and implementation where California Environmental Quality Act has been satisfied, permits are in hand or contracts have been executed. Verifiable supplies are included in water supply assessments and verifications prepared by retail water agencies and used by the cities and county in their land use decisions regarding available water supplies for growth under SB 221 and SB 610. Those projects with adequate documentation regarding implementation and supply utilization, or existing projects already planned for expansion, were considered for inclusion in the assessments discussed in Sections 9.2 and 9.3. Additional planned supplies are those that have not

yet achieved the same level of certainty as the verifiable supplies, but have progressed to a point where the Water Authority or a member agency has taken significant financial actions to pursue the project.

These additional planned supplies are important to the region for a number of reasons. The Water Authority and member agencies must continue to strive to develop cost-effective local resources that can further diversify the region's supplies and reduce demands for imported water from Metropolitan. They provide objectives for the region to work towards by resolving any funding, regulatory, and other constraints associated with implementation. The additional planned projects are considered potential supply management strategies in the scenario planning process described in Section 10. Figures 9-1, 9-2, and 9-3 show the existing, verifiable, and planned water supplies for recycled water, groundwater, and seawater desalination.

The specific local recycled water and brackish groundwater projects included in the figures are listed in Tables F-2 and F-4, respectively, in **Appendix F**. The total seawater desalination additional planned supplies are a combination of Otay Water District's proposed Bi-National Seawater Desalination project (25,000AF/YR) and the Water Authority's proposed Camp Pendleton Seawater Desalination facility (56,000AF/YR). Refer to Sections 4 and 5 for additional information on the derivation of the verifiable and additional planned supply figures.

Figure 9-1
Recycled Water Supply – Existing, Verifiable, and Planned (AF)

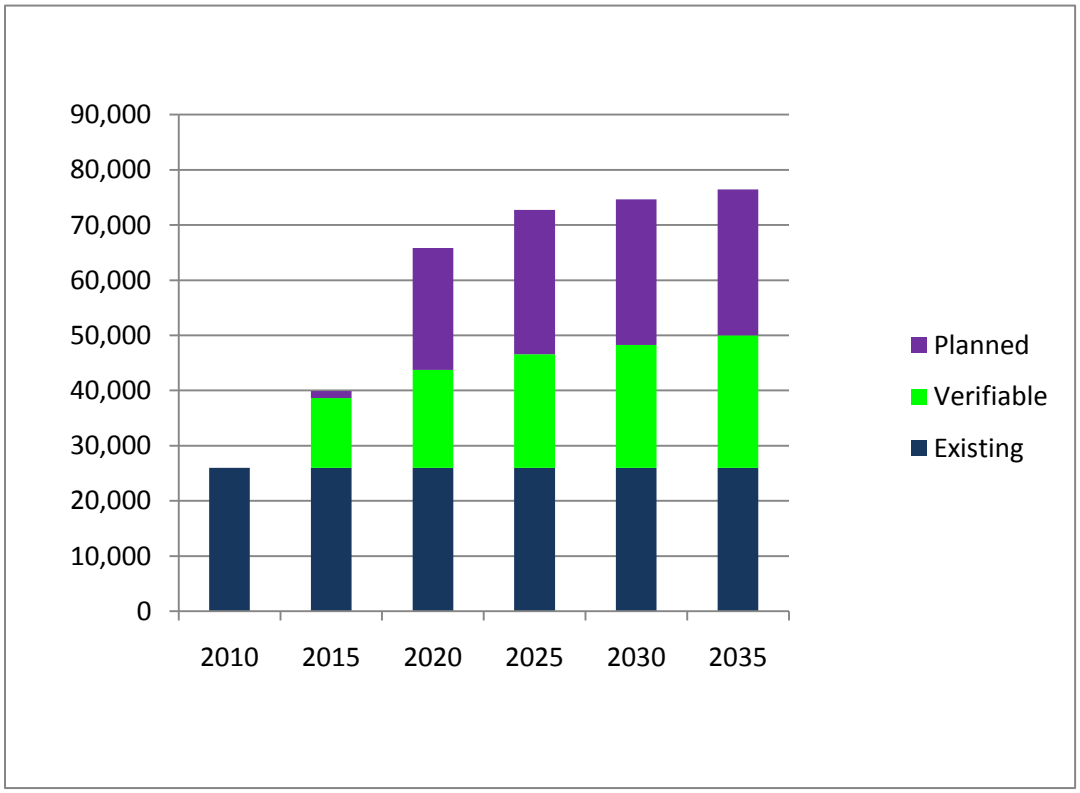


Figure 9-2
Brackish Groundwater Recovery – Existing, Verifiable, and Planned (AF)

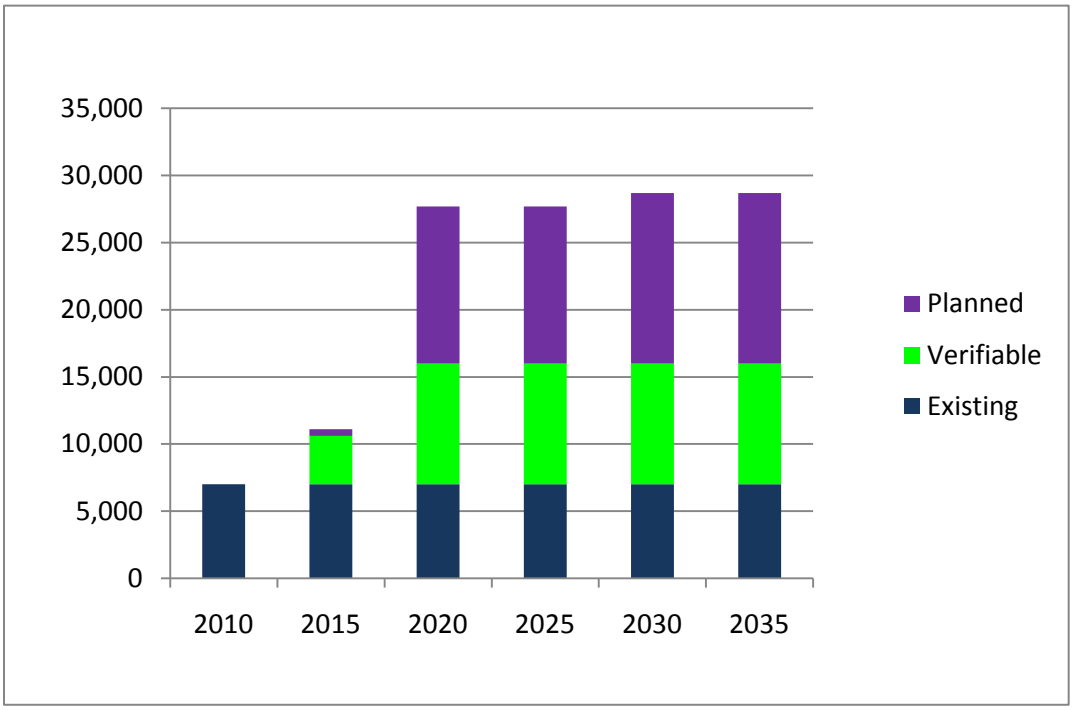
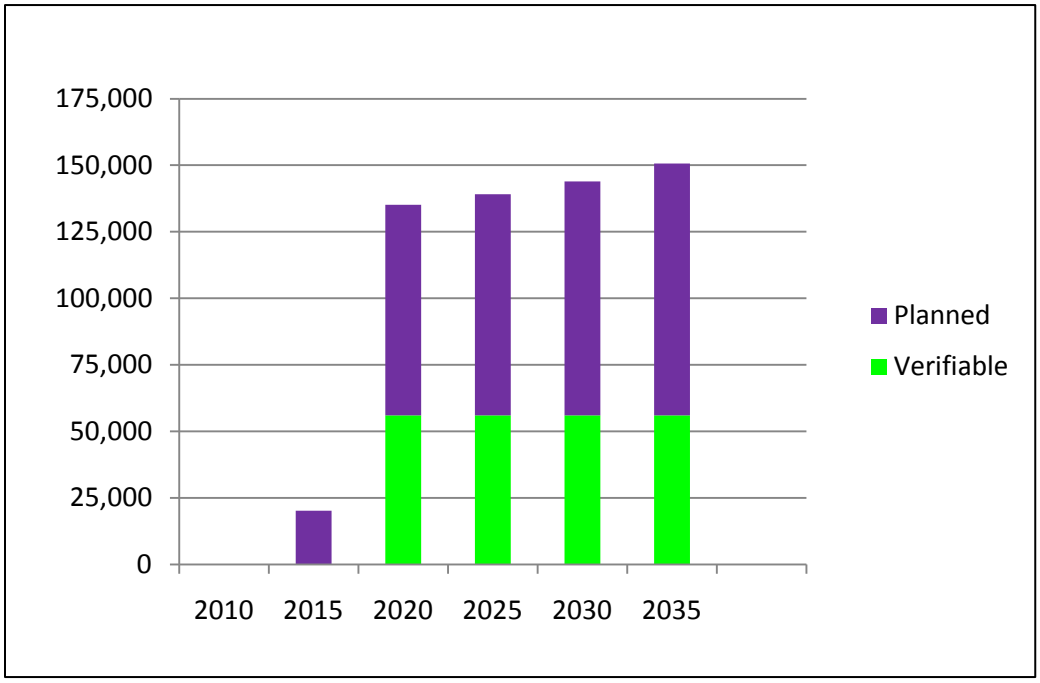


Figure 9-3
Seawater Desalination – Existing, Verifiable, and Planned (AF)



Section 10
Scenario Planning – Managing an Uncertain Future

The Water Authority's water supply reliability assessment can be found in **Section 9**. The Act also requires that, for any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, that the agency describe to the extent practicable, plans to replace that source with alternative sources or water demand management measures.

In order to adequately assess the reliability of the region's future resource mix and plan for potential uncertainties of the water supply sources, the 2010 Plan update incorporates a traditional scenario planning process. The process assesses potential risks associated with implementation of the projected resource mix and identifies management strategies to help deal with the uncertainties. A procedure to track development of supply sources to determine when and if potential adaptive management strategies may be needed is also included.

A list of the primary source documents that were utilized to prepare this section is included in Section 10.3. One of foundational documents used as a resource in selecting the traditional scenario planning process is the 2010 Water Utility Climate Alliance Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning. (2010 WUCA Report)

10.1 Traditional Scenario Planning Process

There are various decision support planning methods available to planners that incorporate uncertainty and risk assessment into water planning. Traditional scenario planning was selected for the 2010 Plan based primarily on the following factors:

- Used for uncertainty analysis specific to water resources/water utility planning;
- Develops a small but wide ranging set of future scenarios to test and make planning decisions more robust;
- Highly transparent, easily implemented with medium level of development by internal staff, outside expertise not required;
- Does not require extensive computer power, can accommodate changes in assumptions, inputs and objectives;
- Uses concepts familiar to stakeholders, improves understanding and communicability, and avoids the 'black box' issue.

A summary of the basic steps for the 2010 Plan scenario planning process are listed below:

1. Define the focal issue or central question for the process that will be assessed and ultimately answered through the process;
2. Identify the projected water resource supply mix;
3. Identify critical uncertainties that could influence implementation of the mix;

4. Formulate potential scenarios based on the critical uncertainties;
5. Identify common strategies to manage the scenarios; and
6. Establish key tracking metrics that evaluate the status of supply sources in the projected resource mix and whether adaptive management strategies are required to ensure continued reliability.

A Water Authority internal scenario planning team was formed to provide input into the process. The group consisted of representatives from the General Manager's office as well as the Water Resources Department, Conservation Program, Metropolitan Program, and Colorado River Program. They provided expertise to the process, assisting in development of the focal issue (central question) along with identifying the critical uncertainties and management strategies.

Each of the steps taken and the results from the process are described in the remainder of this Section.

10.1.1 Definition of the Focal Issue or Central Question

The focal issue or central question to be assessed and ultimately answered through the scenario planning process is:

> In this climate of supply uncertainty and scarcity, how will the Water Authority and its member agencies adaptively provide water supply reliability over the next 20 years?

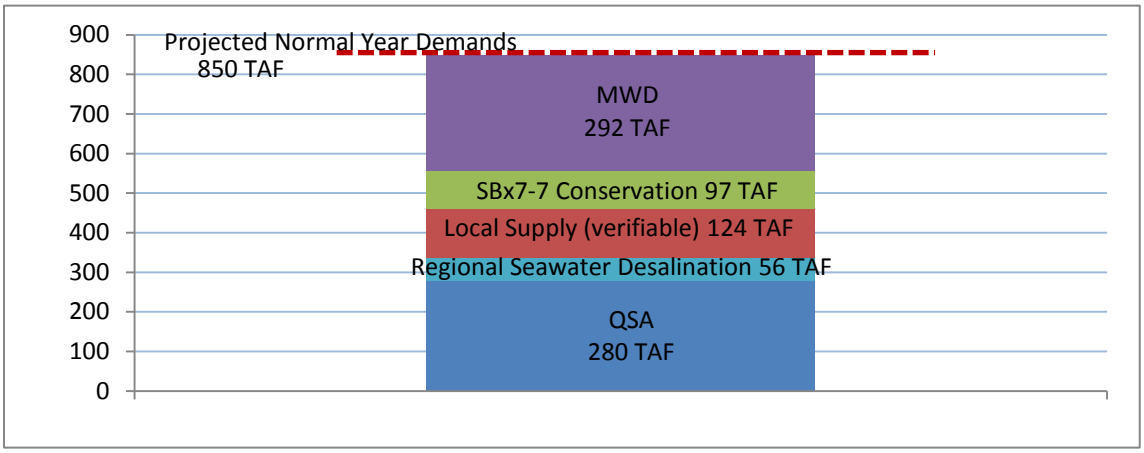
10.1.2 Identify Projected Water Resource Mix

As discussed in Section 9, in coordination with the member agencies, a projected resource mix to meet future demands was generated in five-year increments. For the scenario planning process the projected mix in 2030 was selected for evaluation in order to capture long-term supply planning. The normal weather resource mix in 2030 is based on the following factors:

- Member agency implementation of additional projected verifiable water recycling, and brackish groundwater recovery projects;
- Average yield from surface and groundwater supplies;
- Retail agency compliance with SBX7-7 2020 conservation target of 167 GPCD, which remains the target through 2035;
- Water Authority's QSA supplies delivered in accordance with agreements;
- Deliveries commence from the Regional Carlsbad Seawater Desalination Facility by 2016; and
- Metropolitan is able to meet the supplemental supply needed within the Water Authority's service area.

Figure 10-1 below includes the projected water resource mix for 2030 under normal weather conditions.

Figure 10-1
2030 Projected Water Resource Mix (Normal Year)



As shown in Figure 10-1, if the projected Metropolitan, Water Authority, and member agency supplies are developed as planned, no shortages are anticipated within the Water Authority's service area in 2030 in a normal year. Consistent with the UWMP Act, it is important that a risk assessment be conducted on the projected resource mix to ensure long-term reliable and sustainable water supplies to meet demands. This is accomplished through the scenario planning process, with the next step being to identify the critical uncertainties.

10.1.3 Critical Uncertainties Associated with Implementation of Projected Resource Mix

Following identification of the projected resource mix, the next step in the analysis is to identify critical uncertainties surrounding implementation of the mix. Table 10-1 provides a list of the critical uncertainties, derived through input from the internal working group and source documents, such as the Department Water Resources 2009 California Water Plan Update. The list doesn't include all the uncertainties water planners face, but focuses on critical uncertainties associated with supply planning reliability. For example, managing uncertainties associated with physical system reliability, such as a potential pipeline failure, is handled through the Water Authority's Integrated Contingency Plan: Emergency Operations Plan. The critical uncertainties form the basis for developing potential future scenarios. To aid in the process of formulating the potential scenarios, the uncertainties are categorized into whether the source of change is gradual over the long-term or more sudden.

Table 10-1. Critical Uncertainties Associated with Implementation of Projected Resource Mix

Sources of Gradual Change and Uncertainty	Sources of Sudden or Short-term Change and Uncertainty
Demographic	**Droughts**
Growth deviates from SANDAG Forecast	Severity, timing, and frequency
Climate Change	**SWP Regulatory Restrictions**
Impacts from long-term changes in temperature and precipitation	Regulatory restrictions are put in place that further limit supply availability
State Water Project Reliability	**Delta Levee Failure**
Willingness to pay for Delta Fix	Delta levees fail due to earthquake or flooding and supplies are curtailed from SWP
Local Supplies not Developed as Planned	
Notes: Format adopted from DWR California Water Plan Update 2009, Chapter 5	

10.1.4 Scenario Analysis – Future Potential Scenarios Based on Critical Uncertainties

"Traditional scenario planning, also known as traditional scenario analysis is a methodology that relies on developing future scenarios that consider a variety of potential future situations." (WUCA, 2010) The scenarios are plausible, but not predictions or forecasts of the future. They incorporate the water supply uncertainties urban water planners face and can be qualitative, quantitative or both. Important to traditional scenario planning is to select just a few scenarios that focus on critical uncertainties and avoid having too many scenarios. When working with numerous scenarios they will begin to blur and lose their meaningful distinctions as decision tools. From the scenario analysis common strategies are developed to manage the uncertainties. The six potential scenarios developed based on the uncertainties are listed in Table 10-2, followed by a detailed description.

Table 10-2. Future Potential Scenarios Based on Critical Uncertainties

	Future Potential Scenarios Identified for Planning Purposes
1	Drought
2	Drought with Further Limitations on Metropolitan Supplies
3	Drought with Limited Metropolitan Supplies and Member Agency Local Supplies
4	Drought with Limited Metropolitan Supplies and Limited Water Authority and Member Agency Local Supplies
5	Demographic Shift
6	Climate Change

The six scenarios and potential supply gap are described below.

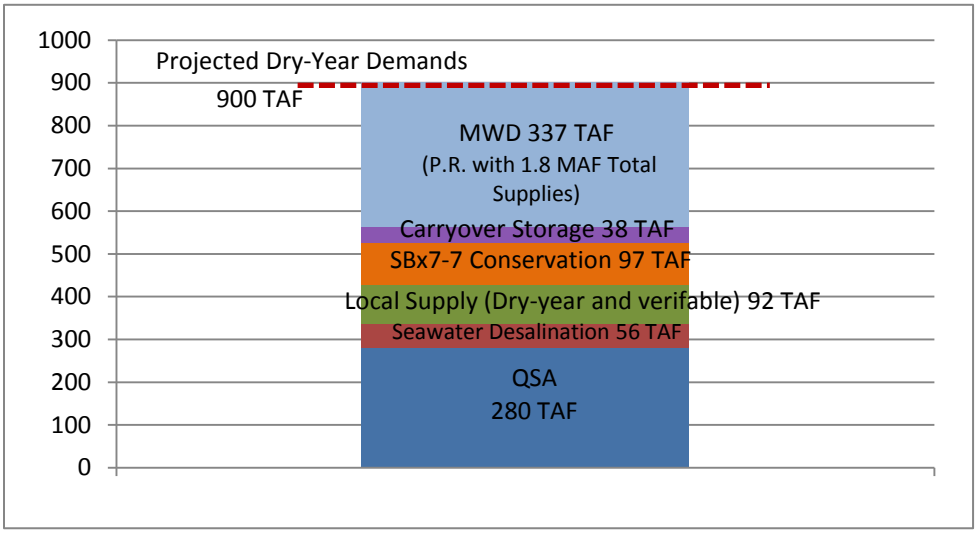
Scenario 1: Drought
Scenario 1 is a dry-year situation developed based on the following factors:

- Single dry-year demands derived from CWA-MAIN modeling effort (Refer to Section 2);

- Demands do not reflect reductions due to potential mandatory water-use restrictions or public outreach, which might be imposed during drought conditions. These shortage management actions could serve as potential strategies to overcome potential supply gaps. In addition, achieving these demand savings in 2030 could prove more difficult than reductions achieved during the 2007-2010 drought due to demand hardening, as discussed in Section 9.3.1;
- Metropolitan is allocating supplies due to dry conditions. It is unknown how Metropolitan will allocate supplies in the long-term. For this reason and for conservative planning purposes, the Water Authority's allocation is based on its preferential right to purchase supplies from Metropolitan. In 2030 that right is estimated to be approximately 18.7 percent with 1.8 million acre-feet of supply available (Refer to Section 6.1.1 for details on preferential rights);
- Surface and groundwater supply yields reduced based on historic 1991 supplies;
- Supplies utilized from carryover storage reserves;
- Verifiable member agency projected water recycling and brackish groundwater supplies;
- SBX7-7 2020 Conservation target fixed at 167 GPCD beyond 2020;
- Water Authority's QSA supplies are being delivered in accordance with agreements; and
- Deliveries commence from the Regional Carlsbad Seawater Desalination Facility by 2016.

The projected mix of supplies and potential gap are shown in Figure 10-2.

Figure 10-2
Scenario 1 – Drought (2030)



Scenario 2: Drought with Further Limitation on Metropolitan Supplies

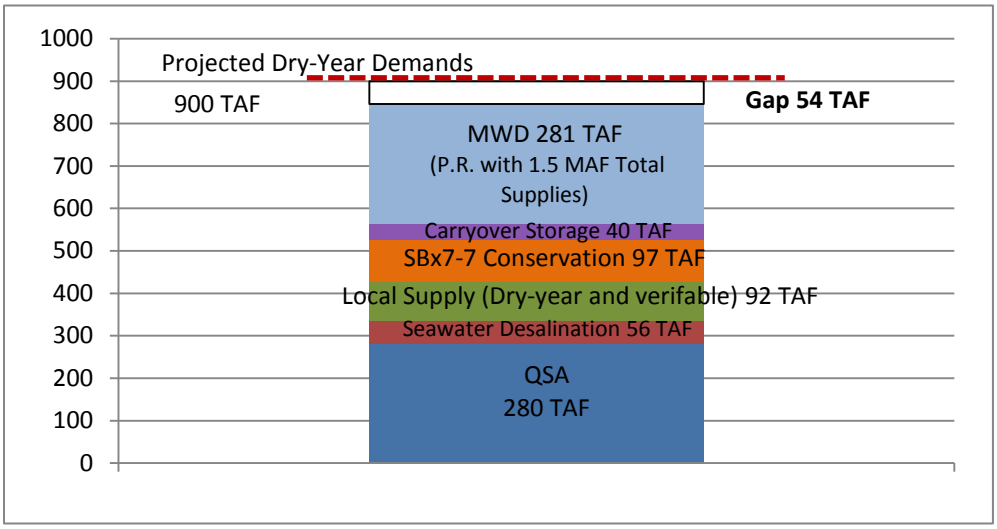
Scenario 2 was developed utilizing the same variables identified in Scenario 1, with the following modification:

- Metropolitan supplies are further limited and being allocated to the member agencies:

- Metropolitan limited to 1.5 MAF of supplies due to dry conditions and increased reductions in deliveries from State Water Project (no delta improvements) and/or reduction in Colorado River deliveries, and
- Water Authority receives estimated preferential right allocation of 18.7 percent.

The projected mix of supplies and potential gap are shown in Figure 10-3.

Figure 10-3
Scenario 2 – Drought with Further Limitations on Metropolitan Supplies (2030)

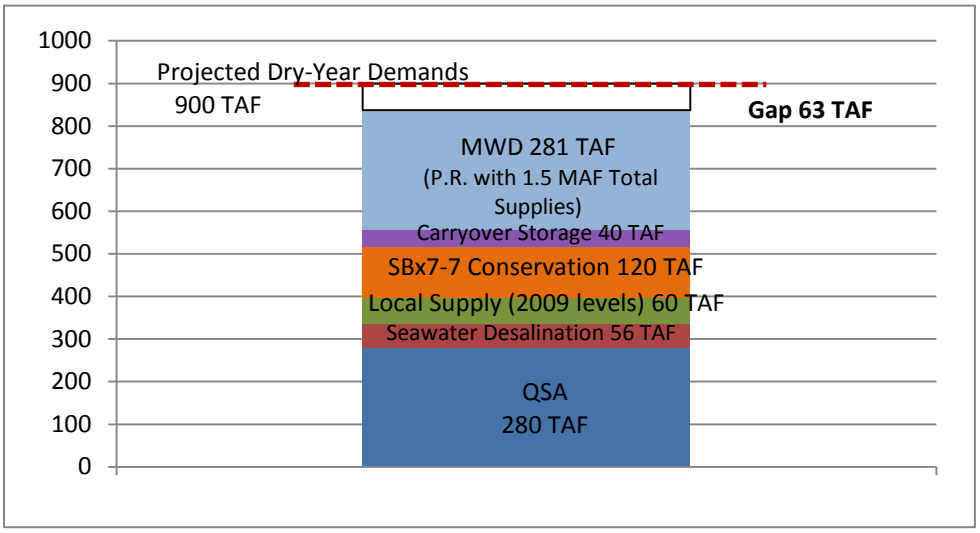


Scenario 3: Drought with Limited Metropolitan and Member Agency Local Supplies
Scenario 3 was developed utilizing the same variables identified in Scenario 2, with the following modification:

- Recycled water and brackish groundwater projects are not developed as planned and remain fixed at current levels; and
- The SBX7-7 conservation target is increased in order to maintain compliance with the 167 GPCD efficiency target. The conservation target must be increased to replace the recycled water yield assumed not to occur. The water use efficiency target identified in Section 2 is shown to be met by both recycled water and conservation.

The projected mix of supplies and potential gap are shown in Figure 10-4.

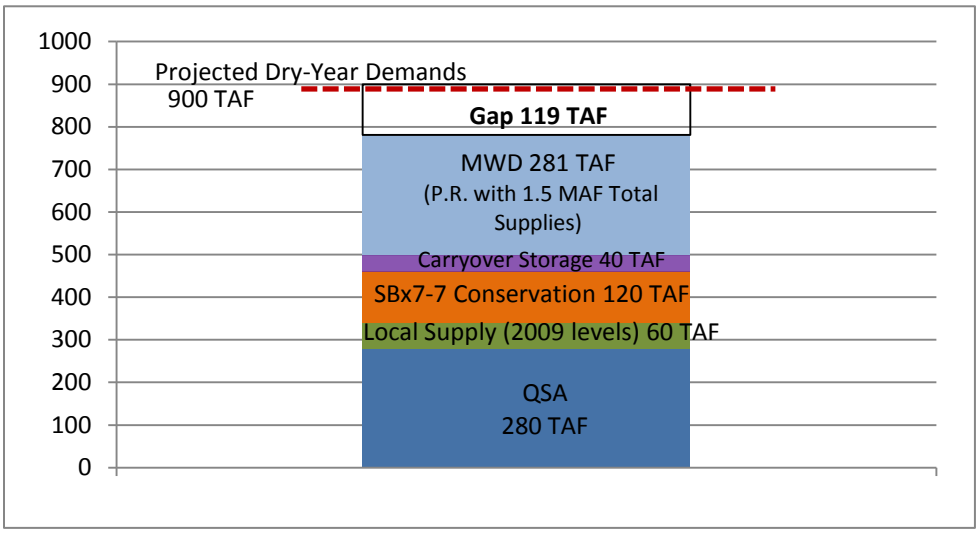
Figure 10-4
Scenario 3 – Drought with Limited Metropolitan and Member Agency Local Supplies (2030)



Scenario 4: Drought with Limited Metropolitan Supplies and Limited Water Authority and Member Agency Local Supplies

Scenario 4 was developed utilizing the same variables identified in Scenario 3, except that the Regional Carlsbad Seawater Desalination Facility is not completed as planned. The projected mix of supplies and potential gap are shown in Figure 10-5.

Figure 10-5
Scenario 4 – Drought with Limited Metropolitan and Limited Water Authority and Member Agency Local Supplies (2030)



Scenario 5: Demographic Shift

As discussed in Section 2, the Water Authority's demand projections are driven by SANDAG's most recent regional growth forecast. In turn, the regional growth forecast is based on the cities and county general plans. Under this scenario, land-use development approval would differ from that identified in the cities and county general plans. Depending upon the variation in housing type, demands could be higher or lower. Single-family homes with larger lots (lower density and potentially more irrigated landscape) will generally use more water than multi-family units (higher density). One potential scenario that would cause demands to be higher than projected is if the multi-family units included in the growth forecast are approved as single-family units. The magnitude of a potential housing shift is difficult to quantify. The affect on water demands due to a shift in demographics would be a gradual change that would be captured in each five-year update to the UWMP. Projected demands in the UWMP updates would be updated based on SANDAG's most recent growth forecast, which would reflect changes to land-use plans occurring between plan updates. In part to deal with this uncertainty associated with land-use approvals occurring during the 2010 Plan planning horizon, an additional demand increment, termed Accelerated Forecasted Growth, has been included in the regional total demand forecast, as discussed in Section 2.

Scenario 6: Climate Change

Scenario 6 considers the potential influence climate change may have on the projected resource mix. Because there are still too many uncertainties regarding the impact of climate change on supplies and demands, a qualitative risk assessment is conducted. The assessment is based primarily on the California Department of Water Resources October 2008 Report entitled "Managing an Uncertain Future; Climate Change Adaptation Strategies for California's Water."

When evaluating the effects of climate change on long-term water supply planning, a distinction should be made between climate and weather. Weather consists of the short-term (minutes to months) changes in the atmosphere. Climate is how the atmosphere "behaves" over relatively long periods of time. The term climate change refers to changes in long-term averages of daily weather. Changes to climate will be gradual, providing water supply agencies the ability to adapt planning strategies to manage for the supply uncertainties. The affect on supply would be gradual and captured in each five-year update to the UWMP.

Researchers have concluded that increasing atmospheric concentrations of greenhouse gases, such as carbon dioxide, are causing the Earth's air temperature to rise. While uncertainties remain regarding the exact timing, magnitude, and regional impacts of the temperature and potential precipitation changes due to climate change, researchers have identified several areas of concern that could influence long-term water supply reliability. These potential areas are listed below:

Loss of Natural Snowpack Storage. Rising temperatures reduce snowpack in the Sierra Nevada because more precipitation falls as rain, and snowmelt occurs sooner. Snowpack in the Sierra Nevada is the primary source of supply for the State Water Project. Snowpack is often considered a large surface "reservoir," where water is slowly released between April and July each year. Much of the state's water infrastructure was designed to capture the slow spring runoff and deliver it during the drier summer and fall months. The California Department of Water Resources projects that the Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050.

Sea Level Rise. Rising sea levels could increase the risk of damage to water and water recycling facilities from storms, high-tide events, and erosion of levees. A potential catastrophic levee failure in the Delta could interrupt supplies from the State Water Project, potentially reducing supply

deliveries to the San Diego region from Metropolitan. In addition, rising sea levels could cause saltwater intrusion into the Delta, degrading drinking water quality. More freshwater releases from upstream reservoirs would be required to repel the sea to maintain salinity levels for municipal, industrial, and agricultural uses.

Changes in Average Precipitation and Runoff Volume. The effect of climate change on overall precipitation and runoff volumes is still unclear and highly uncertain. For example, a number of studies conclude that the flow of the Colorado River may be reduced by climate change, but a wide disparity exists on the predicted volume. The yield from local surface water resources could potentially be reduced, if annual runoff volumes are reduced due to a decline in precipitation or there is an increase in evapotranspiration in reservoirs. It must be highlighted that research is still highly unclear on how precipitation levels may be impacted by climate change.

Change in Frequency and Intensity of Droughts. Warming temperatures, combined with potential changes in rainfall and runoff patterns, could exacerbate the frequency and intensity of droughts.

Demands Levels. Climate change could also gradually affect water demands out in the future. Warmer temperatures increase evapotranspiration rates and growing season, which are likely to increase outdoor consumptive water use for landscaping. As part of the water demand forecasting effort for the 2010 Plan, the long-term influence of climate change on demands in the San Diego region was evaluated. Results from the analysis are included in Section 2.

All five of the areas discussed above focus on the potential effect climate change could have on future supply reliability. The potential long-term effect is a possible decrease in the availability of imported supplies from Metropolitan and local supplies – causing a potential gap between supply and demands. With so many unknowns regarding the actual impact, the previous uncertainty scenarios could be seen as capturing any potential shortfalls in supply due to climate change. In addition, the supply and demand impacts from climate change will just start to be experienced within the 2010 Plan 25-year planning horizon, but should be considered in establishing “no regret” strategies that provide water supply benefits within the planning horizon, while increasing the ability to manage potential climate change impacts in the future.

10.1.5 Strategies to Strengthen Implementation of Resource Mix and Manage Uncertainty Scenarios

For each projected scenario, including the projected resource mix, management strategies are identified to both strengthen likelihood of development of identified resources and fill potential gaps in supply. The strategies are generally common to all the scenarios, which mean that such projects and programs will be useful under a wide range of possible outcomes. As a result, they are more likely to be viable as the future unfolds. The strategies include individual elements that can consist of policies and programs, as well as, various potential construction projects.

The management strategies included in the 2010 Plan scenario planning process are derived based on the following:

- Input from internal scenario planning working group, based on evaluation of uncertainty scenarios;
- Water Authority Board 2008 Strategic Plan;

- Water Authority 2015 Business Plan Management Strategies; and
- Previous Water Authority Board actions on policies and programs surrounding supply reliability and development.

Table 10-3 contains strategies that the Water Authority can employ to aid in the implementation of the supplies identified in the projected resource mix and manage uncertainty scenarios. The strategies focus on programs, many of which are already being implemented consistent with Water Authority Board policy.

Table 10-3. Potential Common Strategies to Strengthen Implementation of Projected Resource Mix and Manage Uncertainty Scenarios

Potential Water Authority Policies/Programs
Foundational Strategy
Diversify the region's supply mix, thereby reducing dependence on Metropolitan, and also strengthening the reliability of existing supplies.
State Water Project
Advocate for near-term actions and permanent Delta fixes, including federal and state legislation to fund improvements, which will improve the water quality and supply reliability of the State Water Project.
Colorado River - Quantification Settlement Agreement
Defend the QSA against existing and potential litigation to ensure continued delivery of conserved supplies from canal lining projects and Imperial Irrigation District water transfer.
Member Agency Local Projects
Provide technical assistance to member agencies in the planning, design, and construction of local projects
Continue to provide funding for recycled and brackish groundwater projects through the Local Projects Development Fund
Advocate at local, state, and federal level for minimizing regulatory constraints and enacting acceptable and practicable regulatory standards that allow member agencies to maximize local supply project development.
Advocate for state and federal funding for local projects and work with agencies to ensure projects qualify for funding.
Water Conservation
Offer programs that encourage long-term behavioral change towards measureable reductions in outdoor water use.
Climate Change
Encourage focused scientific research on climate change to identify the impacts on the San Diego region's imported and local water supplies.

In addition to the policies and programs identified in Table 10-3, Table 10-4 provides a list of the potential management strategies that the Water Authority and member agencies can take in regard to managing the uncertainty scenarios and filling the potential gap identified in Figures 10-3, 10-4, and 10-5.

Table 10-4. Potential Strategies to Manage Uncertainty Scenarios (2030)

Potential Strategy	Minimum Estimated Yield (AF)
Member Agency Potential Additional Planned Local Projects[1]	
Additional Planned Recycled Water and Brackish Groundwater	14,000
City of San Diego Water Purification Project	15,000
Helix WD/Padre Dam MWD El Monte Valley Recharge Project	5,000
Fallbrook PUD/Camp Pendleton Groundwater Recharge and Recovery Project	5,200
Otay WD Rosarito Beach Desalination Project	32,000
Total Additional Planned Local Projects (Member Agencies):	71,200
Water Authority Potential Strategies	
Potential Regional Seawater Desalination Facility (Camp Pendleton):	56,000 - 168,000
Regional Shortage Management Actions (Dry-year transfers and potential extraordinary conservation savings)	--[2]
Total Minimum Estimated Yield from Potential Strategies:	127,200 – 239,200

[1] The estimated yields from the additional planned local supply projects are from the member agencies and the development and implementation of these supplies rests with the member agencies.
[2] Availability of dry-year supplies is described in Section 11.2.3.

If the uncertainty scenarios were to materialize, the potential gap, based on current information and variables could potentially range from approximately 54 TAF to a maximum estimate of 119 TAF. As shown in Table 10-4, there are currently strategies (alternative supply sources) that could potentially be implemented that would assist in ensuring supply reliability if imported supplies are limited or verifiable local supplies are not developed as planned.

As listed in Table 10-4, extraordinary conservation is identified as a potential shortage management action to assist in managing uncertainties. It should be noted that, due to SBX7-7 retail compliance, the amount of extraordinary savings expected to be achieved through mandatory measures, such as water-use restrictions, could be less than that experienced in the current and previous shortage periods. This is due to the concept known as demand hardening, which is described in the dry-year reliability assessment (Section 9.3).

10.1.6 Key Tracking Metrics – Track Progress on Implementation of Projected Resource Mix and Need for Adaptive Strategies

Through the scenario analysis, the projected resource mix plus the six uncertainty scenarios have been identified. Potential strategies to strengthen implementation of the resource mix and manage the uncertainty scenarios have been identified. The critical final step, which links these two components, is to establish a few key tracking metrics that evaluate the status of supply sources in the projected resource mix and whether the adaptive management strategies are required to ensure continued reliability. The primary vehicle for reporting to the Board on the metrics would be through the Water Authority's Annual Water Supply Report. Water Authority Administrative Code Section 8.00.050 outlines preparation of an annual water supply report that would provide

information on the reliability of existing supplies and implementation of plans and programs to meet the future water supply requirements. The annual report serves as an excellent vehicle to monitor the key tracking metrics. A complete evaluation and update of the resource mix would occur every five years with update of the UWMP. Table 10-5 highlights the timing upon which the Water Authority Board would track progress on implementation of the projected resource mix and evaluate the tracking metrics. If necessary, reporting to the Board on issues related to implementation of the resource mix could occur more frequently.

Table 10-5. Tracking Progress on Implementation of Resource Mix

Time Period	Vehicle	Purpose
Annually (except UWMP years)	Annual Supply Report to Board (Consistent with Administrative Code Section 8.00.050)	Utilizing key indicators, conduct evaluation and track progress on implementation of UWMP projected water resource mix
At Least Every 5 years	Urban Water Management Plan Update	Conduct evaluation of supply and demand conditions and update projected resource mix
As Needed	Reports to Board	Update the Board on issues impacting resource mix implementation

With the many unknown factors and outside influences affecting development of supply sources in the projected mix, the key metrics for tracking implementation will be included in the next update of the annual supply report, planned for completion in 2012. The metrics could be reset with each annual supply report update. Table 10-6 lists the key tracking metrics to be considered in the 2012 Annual Water Supply Report for the region's two sources of imported supplies. Table 10-7 lists the key tracking metrics for 2012 Annual Water Supply Report associated with water conservation and local supply development. The metrics in both tables were derived based on supplies identified in the projected resource mix and the Water Authority 2008 Strategic Plan Objectives and 2015 Business Plan Goals. For further information on the action or event listed in Table 10-6, please reference Sections 4 and 6 on Water Authority and Metropolitan supplies.

Table 10-6. Proposed Key Tracking Metrics for 2012 Annual Water Supply Report Major Sources of Imported Supplies

Management Action or Event - Description	Key Metrics for 2012
State Water Project – Bay-Delta Improvements	
The BDCP is to provide the regulatory approvals and framework for achieving the co-equal goals of supply reliability and ecosystem restoration. Scheduled for completion by end of 2012.	Has the draft BDCP and EIR/EIS been released for public review? Are documents still on schedule for approval by the end of 2012?
The state water bond measure (Safe, Clean and Reliable Drinking Water Supply Act) will, in part, provide funding to carry-out the BDCP and is scheduled for November 2012 ballot.	Has the water bond measure passed?
Near-term Delta actions are being pursued by Metropolitan to provide increased supply reliability prior to a long-term Delta fix. (i.e., the Two-Gate System and habitat restoration	Has progress been made towards completion of the near-term projects that would increase SWP supply reliability?

Management Action or Event - Description	Key Metrics for 2012
projects.)	
Colorado River Aqueduct	
The Bureau of Reclamation has claimed that under certain hydrologic conditions, a potential shortage declaration could be made on the Colorado River which could impact yield from Metropolitan's WSDM programs on the Colorado River.	Have dry-year conditions resumed within the Colorado River watershed? Has the Secretary of the Interior declared shortages?
Superior Court judge invalidated 13 agreements related to the Quantification Settlement Agreement. The Water Authority and other parties involved in the QSA have appealed the judge's decision. Appellate decision is expected in 2011 or 2012.	What is the result of the appellate court? Will there be reductions in QSA supplies to Metropolitan and Water Authority?

Table 10-7. Proposed Key Tracking Metrics for 2012 Annual Water Supply Report Water Conservation and Local Supply Development

Management Action or Event - Description	Key Indicators for 2012
Water Conservation	Is per capita water use on track to achieve retail 2020 SBX7-7 target?
Water Recycling	Is recycled water development on track to assist in achieving the 2020 SBX7-7 target included in UWMP?
Brackish Groundwater	Is brackish groundwater development on track to achieve the UWMP targets?
Seawater Desalination	Is the Carlsbad seawater desalination facility on track to be on-line by 2015?

The analysis included in the annual supply report will include a discussion on the status of the proposed metrics identified in the table above and overall implementation of the projected resources mix. Highlighting this list of metrics, doesn't preclude other metrics from being evaluated in the supply report. Key to the reporting will also be an update on the potential strategies; whether they remain a viable option taking into account specific project studies and political decisions made over the reporting period.

10.2 Conclusion

As identified at the beginning of the scenario planning process, the focal question that ultimately needed to be answered as a result of this process is:

> In this climate of supply uncertainty and scarcity, how will the Water Authority and its member agencies adaptively provide water supply reliability over the next 20 years?

Based on the results of the scenario planning process, the Water Authority and its member agencies can help ensure a long-term reliable water supply for the region through the following four basic measures:

1. Implementation of the diverse resource mix identified in the 2010 Plan;
2. Retail compliance with the SBX7-7 conservation compliance target;
3. Continue to implement programs and explore additional planned local projects that could strengthen implementation of the projected resource mix and manage potential shortfalls in development of supplies identified in the resource mix; and
4. Conduct annual tracking and reporting on implementation of the mix that will allow for the Water Authority and its member agencies to take appropriate action if supplies in the resource mix are not developed as planned.

While these measures focus on supply development, the Water Authority and its member agencies will also be conducting a Regional Water Facilities Optimization and Master Plan Update in 2012. As discussed in Section 1.5, the 2012 Master Plan Update will, among other objectives, match new infrastructure needs with the water demand and supply projections included in the 2010 Plan. This is another important element to ensuring a long-term reliable supply for the region.

10.3 Primary Source Documents

California Department of Water Resources. California Water Plan Update 2009. Chapter 5: Managing an Uncertain Future.

California Department of Water Resources, 2008. Managing an Uncertain Future; Climate Change Adaptation strategies for California's Water.

Hanak, Ellen and Lund, Jay, 2008. Adapting California's Water Management to Climate Change, Public Policy Institute of California.

Howe, Charles W., Goemans, Christopher, 2007. "The Simple Analytics of Demand Hardening." Journal AWWA.

Metropolitan Water District 2010 Urban Water Management Plan

Schartz, Peter, 1991. The Art of the Long View: Planning for the Future in an Uncertain World.

U.S. Geological Survey Circular 1331, 2009. Climate Change and water resources management – A Federal Perspective

Water Utility Climate Alliance (WUCA), 2010. Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning

Section 10
Scenario Planning – Managing an Uncertain Future

The Water Authority's water supply reliability assessment can be found in **Section 9**. The Act also requires that, for any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, that the agency describe to the extent practicable, plans to replace that source with alternative sources or water demand management measures.

In order to adequately assess the reliability of the region's future resource mix and plan for potential uncertainties of the water supply sources, the 2010 Plan update incorporates a traditional scenario planning process. The process assesses potential risks associated with implementation of the projected resource mix and identifies management strategies to help deal with the uncertainties. A procedure to track development of supply sources to determine when and if potential adaptive management strategies may be needed is also included.

A list of the primary source documents that were utilized to prepare this section is included in Section 10.3. One of foundational documents used as a resource in selecting the traditional scenario planning process is the 2010 Water Utility Climate Alliance Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning. (2010 WUCA Report)

10.1 Traditional Scenario Planning Process

There are various decision support planning methods available to planners that incorporate uncertainty and risk assessment into water planning. Traditional scenario planning was selected for the 2010 Plan based primarily on the following factors:

- Used for uncertainty analysis specific to water resources/water utility planning;
- Develops a small but wide ranging set of future scenarios to test and make planning decisions more robust;
- Highly transparent, easily implemented with medium level of development by internal staff, outside expertise not required;
- Does not require extensive computer power, can accommodate changes in assumptions, inputs and objectives;
- Uses concepts familiar to stakeholders, improves understanding and communicability, and avoids the 'black box' issue.

A summary of the basic steps for the 2010 Plan scenario planning process are listed below:

1. Define the focal issue or central question for the process that will be assessed and ultimately answered through the process;
2. Identify the projected water resource supply mix;
3. Identify critical uncertainties that could influence implementation of the mix;

4. Formulate potential scenarios based on the critical uncertainties;
5. Identify common strategies to manage the scenarios; and
6. Establish key tracking metrics that evaluate the status of supply sources in the projected resource mix and whether adaptive management strategies are required to ensure continued reliability.

A Water Authority internal scenario planning team was formed to provide input into the process. The group consisted of representatives from the General Manager's office as well as the Water Resources Department, Conservation Program, Metropolitan Program, and Colorado River Program. They provided expertise to the process, assisting in development of the focal issue (central question) along with identifying the critical uncertainties and management strategies.

Each of the steps taken and the results from the process are described in the remainder of this Section.

10.1.1 Definition of the Focal Issue or Central Question

The focal issue or central question to be assessed and ultimately answered through the scenario planning process is:

> In this climate of supply uncertainty and scarcity, how will the Water Authority and its member agencies adaptively provide water supply reliability over the next 20 years?

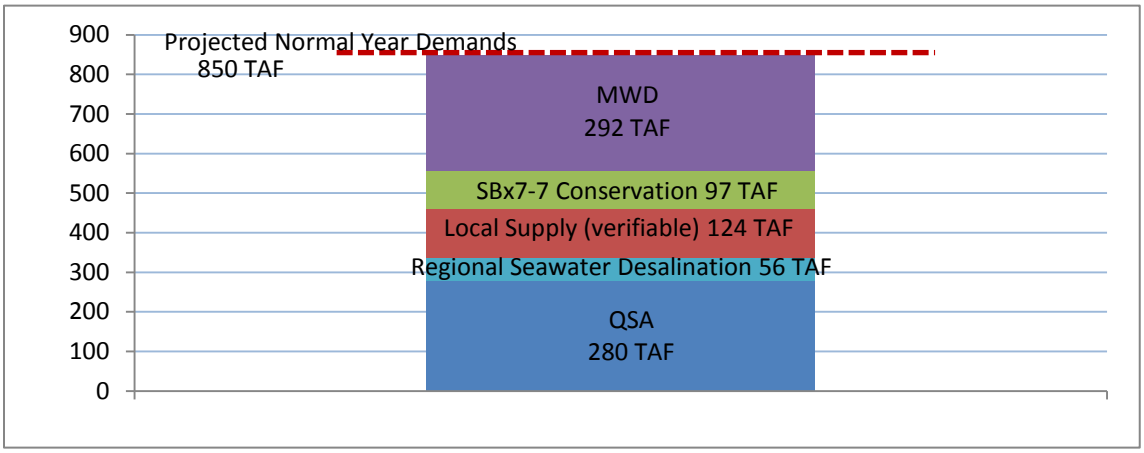
10.1.2 Identify Projected Water Resource Mix

As discussed in Section 9, in coordination with the member agencies, a projected resource mix to meet future demands was generated in five-year increments. For the scenario planning process the projected mix in 2030 was selected for evaluation in order to capture long-term supply planning. The normal weather resource mix in 2030 is based on the following factors:

- Member agency implementation of additional projected verifiable water recycling, and brackish groundwater recovery projects;
- Average yield from surface and groundwater supplies;
- Retail agency compliance with SBX7-7 2020 conservation target of 167 GPCD, which remains the target through 2035;
- Water Authority's QSA supplies delivered in accordance with agreements;
- Deliveries commence from the Regional Carlsbad Seawater Desalination Facility by 2016; and
- Metropolitan is able to meet the supplemental supply needed within the Water Authority's service area.

Figure 10-1 below includes the projected water resource mix for 2030 under normal weather conditions.

Figure 10-1
2030 Projected Water Resource Mix (Normal Year)



As shown in Figure 10-1, if the projected Metropolitan, Water Authority, and member agency supplies are developed as planned, no shortages are anticipated within the Water Authority's service area in 2030 in a normal year. Consistent with the UWMP Act, it is important that a risk assessment be conducted on the projected resource mix to ensure long-term reliable and sustainable water supplies to meet demands. This is accomplished through the scenario planning process, with the next step being to identify the critical uncertainties.

10.1.3 Critical Uncertainties Associated with Implementation of Projected Resource Mix

Following identification of the projected resource mix, the next step in the analysis is to identify critical uncertainties surrounding implementation of the mix. Table 10-1 provides a list of the critical uncertainties, derived through input from the internal working group and source documents, such as the Department Water Resources 2009 California Water Plan Update. The list doesn't include all the uncertainties water planners face, but focuses on critical uncertainties associated with supply planning reliability. For example, managing uncertainties associated with physical system reliability, such as a potential pipeline failure, is handled through the Water Authority's Integrated Contingency Plan: Emergency Operations Plan. The critical uncertainties form the basis for developing potential future scenarios. To aid in the process of formulating the potential scenarios, the uncertainties are categorized into whether the source of change is gradual over the long-term or more sudden.

Table 10-1. Critical Uncertainties Associated with Implementation of Projected Resource Mix

Sources of Gradual Change and Uncertainty	Sources of Sudden or Short-term Change and Uncertainty
Demographic	**Droughts**
Growth deviates from SANDAG Forecast	Severity, timing, and frequency
Climate Change	**SWP Regulatory Restrictions**
Impacts from long-term changes in temperature and precipitation	Regulatory restrictions are put in place that further limit supply availability
State Water Project Reliability	**Delta Levee Failure**
Willingness to pay for Delta Fix	Delta levees fail due to earthquake or flooding and supplies are curtailed from SWP
Local Supplies not Developed as Planned	
Notes: Format adopted from DWR California Water Plan Update 2009, Chapter 5	

10.1.4 Scenario Analysis – Future Potential Scenarios Based on Critical Uncertainties

"Traditional scenario planning, also known as traditional scenario analysis is a methodology that relies on developing future scenarios that consider a variety of potential future situations." (WUCA, 2010) The scenarios are plausible, but not predictions or forecasts of the future. They incorporate the water supply uncertainties urban water planners face and can be qualitative, quantitative or both. Important to traditional scenario planning is to select just a few scenarios that focus on critical uncertainties and avoid having too many scenarios. When working with numerous scenarios they will begin to blur and lose their meaningful distinctions as decision tools. From the scenario analysis common strategies are developed to manage the uncertainties. The six potential scenarios developed based on the uncertainties are listed in Table 10-2, followed by a detailed description.

Table 10-2. Future Potential Scenarios Based on Critical Uncertainties

	Future Potential Scenarios Identified for Planning Purposes
1	Drought
2	Drought with Further Limitations on Metropolitan Supplies
3	Drought with Limited Metropolitan Supplies and Member Agency Local Supplies
4	Drought with Limited Metropolitan Supplies and Limited Water Authority and Member Agency Local Supplies
5	Demographic Shift
6	Climate Change

The six scenarios and potential supply gap are described below.

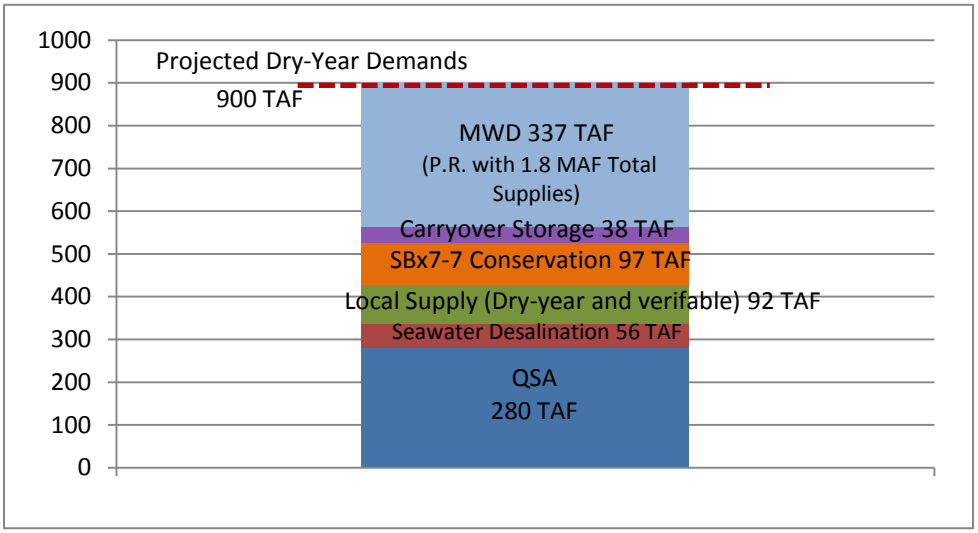
Scenario 1: Drought
Scenario 1 is a dry-year situation developed based on the following factors:

- Single dry-year demands derived from CWA-MAIN modeling effort (Refer to Section 2);

- Demands do not reflect reductions due to potential mandatory water-use restrictions or public outreach, which might be imposed during drought conditions. These shortage management actions could serve as potential strategies to overcome potential supply gaps. In addition, achieving these demand savings in 2030 could prove more difficult than reductions achieved during the 2007-2010 drought due to demand hardening, as discussed in Section 9.3.1;
- Metropolitan is allocating supplies due to dry conditions. It is unknown how Metropolitan will allocate supplies in the long-term. For this reason and for conservative planning purposes, the Water Authority's allocation is based on its preferential right to purchase supplies from Metropolitan. In 2030 that right is estimated to be approximately 18.7 percent with 1.8 million acre-feet of supply available (Refer to Section 6.1.1 for details on preferential rights);
- Surface and groundwater supply yields reduced based on historic 1991 supplies;
- Supplies utilized from carryover storage reserves;
- Verifiable member agency projected water recycling and brackish groundwater supplies;
- SBX7-7 2020 Conservation target fixed at 167 GPCD beyond 2020;
- Water Authority's QSA supplies are being delivered in accordance with agreements; and
- Deliveries commence from the Regional Carlsbad Seawater Desalination Facility by 2016.

The projected mix of supplies and potential gap are shown in Figure 10-2.

Figure 10-2
Scenario 1 – Drought (2030)



Scenario 2: Drought with Further Limitation on Metropolitan Supplies

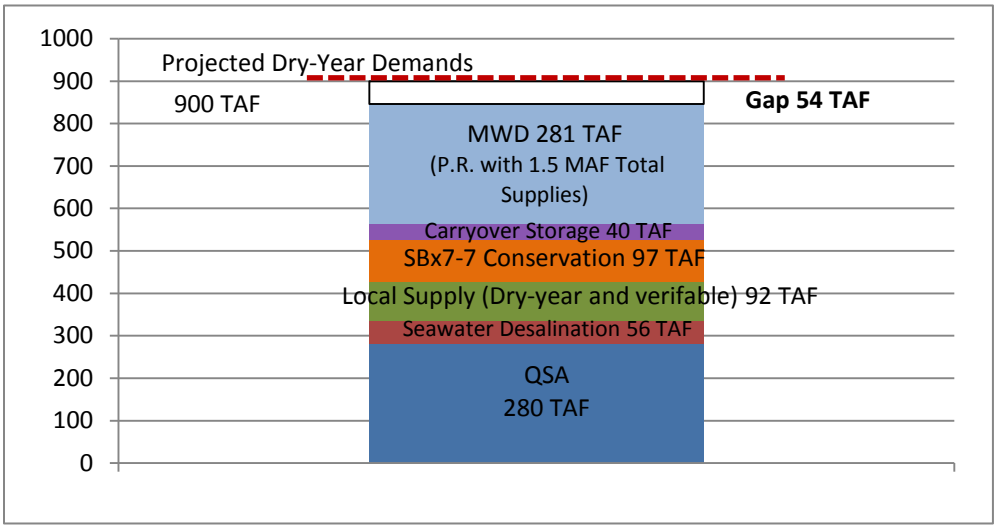
Scenario 2 was developed utilizing the same variables identified in Scenario 1, with the following modification:

- Metropolitan supplies are further limited and being allocated to the member agencies:

- Metropolitan limited to 1.5 MAF of supplies due to dry conditions and increased reductions in deliveries from State Water Project (no delta improvements) and/or reduction in Colorado River deliveries, and
- Water Authority receives estimated preferential right allocation of 18.7 percent.

The projected mix of supplies and potential gap are shown in Figure 10-3.

Figure 10-3
Scenario 2 – Drought with Further Limitations on Metropolitan Supplies (2030)

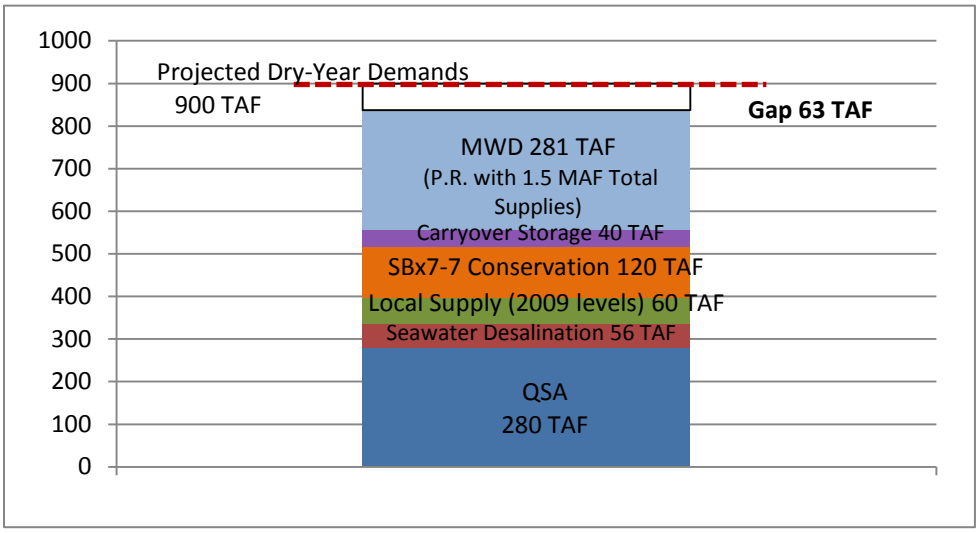


Scenario 3: Drought with Limited Metropolitan and Member Agency Local Supplies
Scenario 3 was developed utilizing the same variables identified in Scenario 2, with the following modification:

- Recycled water and brackish groundwater projects are not developed as planned and remain fixed at current levels; and
- The SBX7-7 conservation target is increased in order to maintain compliance with the 167 GPCD efficiency target. The conservation target must be increased to replace the recycled water yield assumed not to occur. The water use efficiency target identified in Section 2 is shown to be met by both recycled water and conservation.

The projected mix of supplies and potential gap are shown in Figure 10-4.

Figure 10-4
Scenario 3 – Drought with Limited Metropolitan and Member Agency Local Supplies (2030)



Scenario 4: Drought with Limited Metropolitan Supplies and Limited Water Authority and Member Agency Local Supplies

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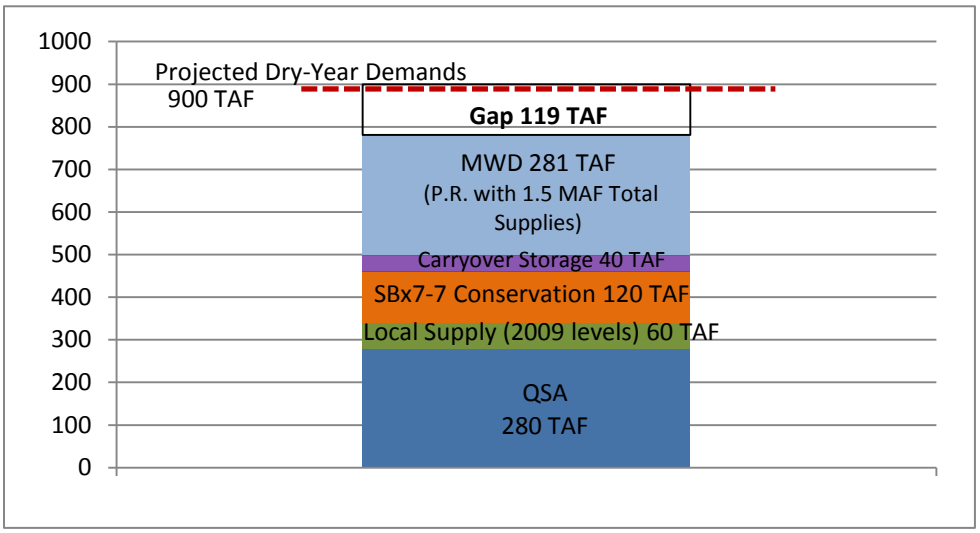
Figure 10-5
Scenario 4 – Drought with Limited Metropolitan and Limited Water Authority and Member Agency Local Supplies (2030)



Scenario 5: Demographic Shift

As discussed in Section 2, the Water Authority's demand projections are driven by SANDAG's most recent regional growth forecast. In turn, the regional growth forecast is based on the cities and county general plans. Under this scenario, land-use development approval would differ from that identified in the cities and county general plans. Depending upon the variation in housing type, demands could be higher or lower. Single-family homes with larger lots (lower density and potentially more irrigated landscape) will generally use more water than multi-family units (higher density). One potential scenario that would cause demands to be higher than projected is if the multi-family units included in the growth forecast are approved as single-family units. The magnitude of a potential housing shift is difficult to quantify. The affect on water demands due to a shift in demographics would be a gradual change that would be captured in each five-year update to the UWMP. Projected demands in the UWMP updates would be updated based on SANDAG's most recent growth forecast, which would reflect changes to land-use plans occurring between plan updates. In part to deal with this uncertainty associated with land-use approvals occurring during the 2010 Plan planning horizon, an additional demand increment, termed Accelerated Forecasted Growth, has been included in the regional total demand forecast, as discussed in Section 2.

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When evaluating the effects of climate change on long-term water supply planning, a distinction should be made between climate and weather. Weather consists of the short-term (minutes to months) changes in the atmosphere. Climate is how the atmosphere "behaves" over relatively long periods of time. The term climate change refers to changes in long-term averages of daily weather. Changes to climate will be gradual, providing water supply agencies the ability to adapt planning strategies to manage for the supply uncertainties. The affect on supply would be gradual and captured in each five-year update to the UWMP.

Researchers have concluded that increasing atmospheric concentrations of greenhouse gases, such as carbon dioxide, are causing the Earth's air temperature to rise. While uncertainties remain regarding the exact timing, magnitude, and regional impacts of the temperature and potential precipitation changes due to climate change, researchers have identified several areas of concern that could influence long-term water supply reliability. These potential areas are listed below:

Loss of Natural Snowpack Storage. Rising temperatures reduce snowpack in the Sierra Nevada because more precipitation falls as rain, and snowmelt occurs sooner. Snowpack in the Sierra Nevada is the primary source of supply for the State Water Project. Snowpack is often considered a large surface "reservoir," where water is slowly released between April and July each year. Much of the state's water infrastructure was designed to capture the slow spring runoff and deliver it during the drier summer and fall months. The California Department of Water Resources projects that the Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050.

Sea Level Rise. Rising sea levels could increase the risk of damage to water and water recycling facilities from storms, high-tide events, and erosion of levees. A potential catastrophic levee failure in the Delta could interrupt supplies from the State Water Project, potentially reducing supply

deliveries to the San Diego region from Metropolitan. In addition, rising sea levels could cause saltwater intrusion into the Delta, degrading drinking water quality. More freshwater releases from upstream reservoirs would be required to repel the sea to maintain salinity levels for municipal, industrial, and agricultural uses.

Changes in Average Precipitation and Runoff Volume. The effect of climate change on overall precipitation and runoff volumes is still unclear and highly uncertain. For example, a number of studies conclude that the flow of the Colorado River may be reduced by climate change, but a wide disparity exists on the predicted volume. The yield from local surface water resources could potentially be reduced, if annual runoff volumes are reduced due to a decline in precipitation or there is an increase in evapotranspiration in reservoirs. It must be highlighted that research is still highly unclear on how precipitation levels may be impacted by climate change.

Change in Frequency and Intensity of Droughts. Warming temperatures, combined with potential changes in rainfall and runoff patterns, could exacerbate the frequency and intensity of droughts.

Demands Levels. Climate change could also gradually affect water demands out in the future. Warmer temperatures increase evapotranspiration rates and growing season, which are likely to increase outdoor consumptive water use for landscaping. As part of the water demand forecasting effort for the 2010 Plan, the long-term influence of climate change on demands in the San Diego region was evaluated. Results from the analysis are included in Section 2.

All five of the areas discussed above focus on the potential effect climate change could have on future supply reliability. The potential long-term effect is a possible decrease in the availability of imported supplies from Metropolitan and local supplies – causing a potential gap between supply and demands. With so many unknowns regarding the actual impact, the previous uncertainty scenarios could be seen as capturing any potential shortfalls in supply due to climate change. In addition, the supply and demand impacts from climate change will just start to be experienced within the 2010 Plan 25-year planning horizon, but should be considered in establishing “no regret” strategies that provide water supply benefits within the planning horizon, while increasing the ability to manage potential climate change impacts in the future.

10.1.5 Strategies to Strengthen Implementation of Resource Mix and Manage Uncertainty Scenarios

For each projected scenario, including the projected resource mix, management strategies are identified to both strengthen likelihood of development of identified resources and fill potential gaps in supply. The strategies are generally common to all the scenarios, which mean that such projects and programs will be useful under a wide range of possible outcomes. As a result, they are more likely to be viable as the future unfolds. The strategies include individual elements that can consist of policies and programs, as well as, various potential construction projects.

The management strategies included in the 2010 Plan scenario planning process are derived based on the following:

- Input from internal scenario planning working group, based on evaluation of uncertainty scenarios;
- Water Authority Board 2008 Strategic Plan;

- Water Authority 2015 Business Plan Management Strategies; and
- Previous Water Authority Board actions on policies and programs surrounding supply reliability and development.

Table 10-3 contains strategies that the Water Authority can employ to aid in the implementation of the supplies identified in the projected resource mix and manage uncertainty scenarios. The strategies focus on programs, many of which are already being implemented consistent with Water Authority Board policy.

Table 10-3. Potential Common Strategies to Strengthen Implementation of Projected Resource Mix and Manage Uncertainty Scenarios

Potential Water Authority Policies/Programs
Foundational Strategy
Diversify the region's supply mix, thereby reducing dependence on Metropolitan, and also strengthening the reliability of existing supplies.
State Water Project
Advocate for near-term actions and permanent Delta fixes, including federal and state legislation to fund improvements, which will improve the water quality and supply reliability of the State Water Project.
Colorado River - Quantification Settlement Agreement
Defend the QSA against existing and potential litigation to ensure continued delivery of conserved supplies from canal lining projects and Imperial Irrigation District water transfer.
Member Agency Local Projects
Provide technical assistance to member agencies in the planning, design, and construction of local projects
Continue to provide funding for recycled and brackish groundwater projects through the Local Projects Development Fund
Advocate at local, state, and federal level for minimizing regulatory constraints and enacting acceptable and practicable regulatory standards that allow member agencies to maximize local supply project development.
Advocate for state and federal funding for local projects and work with agencies to ensure projects qualify for funding.
Water Conservation
Offer programs that encourage long-term behavioral change towards measureable reductions in outdoor water use.
Climate Change
Encourage focused scientific research on climate change to identify the impacts on the San Diego region's imported and local water supplies.

In addition to the policies and programs identified in Table 10-3, Table 10-4 provides a list of the potential management strategies that the Water Authority and member agencies can take in regard to managing the uncertainty scenarios and filling the potential gap identified in Figures 10-3, 10-4, and 10-5.

Table 10-4. Potential Strategies to Manage Uncertainty Scenarios (2030)

Potential Strategy	Minimum Estimated Yield (AF)
Member Agency Potential Additional Planned Local Projects[1]	
Additional Planned Recycled Water and Brackish Groundwater	14,000
City of San Diego Water Purification Project	15,000
Helix WD/Padre Dam MWD El Monte Valley Recharge Project	5,000
Fallbrook PUD/Camp Pendleton Groundwater Recharge and Recovery Project	5,200
Otay WD Rosarito Beach Desalination Project	32,000
Total Additional Planned Local Projects (Member Agencies):	71,200
Water Authority Potential Strategies	
Potential Regional Seawater Desalination Facility (Camp Pendleton):	56,000 - 168,000
Regional Shortage Management Actions (Dry-year transfers and potential extraordinary conservation savings)	--[2]
Total Minimum Estimated Yield from Potential Strategies:	127,200 – 239,200

[1] The estimated yields from the additional planned local supply projects are from the member agencies and the development and implementation of these supplies rests with the member agencies.
[2] Availability of dry-year supplies is described in Section 11.2.3.

If the uncertainty scenarios were to materialize, the potential gap, based on current information and variables could potentially range from approximately 54 TAF to a maximum estimate of 119 TAF. As shown in Table 10-4, there are currently strategies (alternative supply sources) that could potentially be implemented that would assist in ensuring supply reliability if imported supplies are limited or verifiable local supplies are not developed as planned.

As listed in Table 10-4, extraordinary conservation is identified as a potential shortage management action to assist in managing uncertainties. It should be noted that, due to SBX7-7 retail compliance, the amount of extraordinary savings expected to be achieved through mandatory measures, such as water-use restrictions, could be less than that experienced in the current and previous shortage periods. This is due to the concept known as demand hardening, which is described in the dry-year reliability assessment (Section 9.3).

10.1.6 Key Tracking Metrics – Track Progress on Implementation of Projected Resource Mix and Need for Adaptive Strategies

Through the scenario analysis, the projected resource mix plus the six uncertainty scenarios have been identified. Potential strategies to strengthen implementation of the resource mix and manage the uncertainty scenarios have been identified. The critical final step, which links these two components, is to establish a few key tracking metrics that evaluate the status of supply sources in the projected resource mix and whether the adaptive management strategies are required to ensure continued reliability. The primary vehicle for reporting to the Board on the metrics would be through the Water Authority's Annual Water Supply Report. Water Authority Administrative Code Section 8.00.050 outlines preparation of an annual water supply report that would provide

information on the reliability of existing supplies and implementation of plans and programs to meet the future water supply requirements. The annual report serves as an excellent vehicle to monitor the key tracking metrics. A complete evaluation and update of the resource mix would occur every five years with update of the UWMP. Table 10-5 highlights the timing upon which the Water Authority Board would track progress on implementation of the projected resource mix and evaluate the tracking metrics. If necessary, reporting to the Board on issues related to implementation of the resource mix could occur more frequently.

Table 10-5. Tracking Progress on Implementation of Resource Mix

Time Period	Vehicle	Purpose
Annually (except UWMP years)	Annual Supply Report to Board (Consistent with Administrative Code Section 8.00.050)	Utilizing key indicators, conduct evaluation and track progress on implementation of UWMP projected water resource mix
At Least Every 5 years	Urban Water Management Plan Update	Conduct evaluation of supply and demand conditions and update projected resource mix
As Needed	Reports to Board	Update the Board on issues impacting resource mix implementation

With the many unknown factors and outside influences affecting development of supply sources in the projected mix, the key metrics for tracking implementation will be included in the next update of the annual supply report, planned for completion in 2012. The metrics could be reset with each annual supply report update. Table 10-6 lists the key tracking metrics to be considered in the 2012 Annual Water Supply Report for the region's two sources of imported supplies. Table 10-7 lists the key tracking metrics for 2012 Annual Water Supply Report associated with water conservation and local supply development. The metrics in both tables were derived based on supplies identified in the projected resource mix and the Water Authority 2008 Strategic Plan Objectives and 2015 Business Plan Goals. For further information on the action or event listed in Table 10-6, please reference Sections 4 and 6 on Water Authority and Metropolitan supplies.

Table 10-6. Proposed Key Tracking Metrics for 2012 Annual Water Supply Report Major Sources of Imported Supplies

Management Action or Event - Description	Key Metrics for 2012
State Water Project – Bay-Delta Improvements	
The BDCP is to provide the regulatory approvals and framework for achieving the co-equal goals of supply reliability and ecosystem restoration. Scheduled for completion by end of 2012.	Has the draft BDCP and EIR/EIS been released for public review? Are documents still on schedule for approval by the end of 2012?
The state water bond measure (Safe, Clean and Reliable Drinking Water Supply Act) will, in part, provide funding to carry-out the BDCP and is scheduled for November 2012 ballot.	Has the water bond measure passed?
Near-term Delta actions are being pursued by Metropolitan to provide increased supply reliability prior to a long-term Delta fix. (i.e., the Two-Gate System and habitat restoration	Has progress been made towards completion of the near-term projects that would increase SWP supply reliability?

Management Action or Event - Description	Key Metrics for 2012
projects.)	
Colorado River Aqueduct	
The Bureau of Reclamation has claimed that under certain hydrologic conditions, a potential shortage declaration could be made on the Colorado River which could impact yield from Metropolitan's WSDM programs on the Colorado River.	Have dry-year conditions resumed within the Colorado River watershed? Has the Secretary of the Interior declared shortages?
Superior Court judge invalidated 13 agreements related to the Quantification Settlement Agreement. The Water Authority and other parties involved in the QSA have appealed the judge's decision. Appellate decision is expected in 2011 or 2012.	What is the result of the appellate court? Will there be reductions in QSA supplies to Metropolitan and Water Authority?

Table 10-7. Proposed Key Tracking Metrics for 2012 Annual Water Supply Report Water Conservation and Local Supply Development

Management Action or Event - Description	Key Indicators for 2012
Water Conservation	Is per capita water use on track to achieve retail 2020 SBX7-7 target?
Water Recycling	Is recycled water development on track to assist in achieving the 2020 SBX7-7 target included in UWMP?
Brackish Groundwater	Is brackish groundwater development on track to achieve the UWMP targets?
Seawater Desalination	Is the Carlsbad seawater desalination facility on track to be on-line by 2015?

The analysis included in the annual supply report will include a discussion on the status of the proposed metrics identified in the table above and overall implementation of the projected resources mix. Highlighting this list of metrics, doesn't preclude other metrics from being evaluated in the supply report. Key to the reporting will also be an update on the potential strategies; whether they remain a viable option taking into account specific project studies and political decisions made over the reporting period.

10.2 Conclusion

As identified at the beginning of the scenario planning process, the focal question that ultimately needed to be answered as a result of this process is:

> In this climate of supply uncertainty and scarcity, how will the Water Authority and its member agencies adaptively provide water supply reliability over the next 20 years?

Based on the results of the scenario planning process, the Water Authority and its member agencies can help ensure a long-term reliable water supply for the region through the following four basic measures:

1. Implementation of the diverse resource mix identified in the 2010 Plan;
2. Retail compliance with the SBX7-7 conservation compliance target;
3. Continue to implement programs and explore additional planned local projects that could strengthen implementation of the projected resource mix and manage potential shortfalls in development of supplies identified in the resource mix; and
4. Conduct annual tracking and reporting on implementation of the mix that will allow for the Water Authority and its member agencies to take appropriate action if supplies in the resource mix are not developed as planned.

While these measures focus on supply development, the Water Authority and its member agencies will also be conducting a Regional Water Facilities Optimization and Master Plan Update in 2012. As discussed in Section 1.5, the 2012 Master Plan Update will, among other objectives, match new infrastructure needs with the water demand and supply projections included in the 2010 Plan. This is another important element to ensuring a long-term reliable supply for the region.

10.3 Primary Source Documents

California Department of Water Resources. California Water Plan Update 2009. Chapter 5: Managing an Uncertain Future.

California Department of Water Resources, 2008. Managing an Uncertain Future; Climate Change Adaptation strategies for California's Water.

Hanak, Ellen and Lund, Jay, 2008. Adapting California's Water Management to Climate Change, Public Policy Institute of California.

Howe, Charles W., Goemans, Christopher, 2007. "The Simple Analytics of Demand Hardening." Journal AWWA.

Metropolitan Water District 2010 Urban Water Management Plan

Schartz, Peter, 1991. The Art of the Long View: Planning for the Future in an Uncertain World.

U.S. Geological Survey Circular 1331, 2009. Climate Change and water resources management – A Federal Perspective

Water Utility Climate Alliance (WUCA), 2010. Decision Support Planning Methods: Incorporating Climate Change Uncertainties into Water Planning

Section 11
Shortage Contingency Analysis

The Act requires that urban water agencies conduct a water shortage contingency analysis as part of their 2010 plan. This section includes the Water Authority's analysis and plans to address supply shortages due to a catastrophe, drought, or other situations. An estimate of the minimum supplies available during each of the next three years, required under the Act, is also contained in this section.

11.1 Catastrophic Water Shortage

A catastrophic water shortage occurs when a disaster, such as an earthquake, results in insufficient available water to meet the region's needs or eliminates access to imported water supplies. The following section describes the Water Authority's Integrated Contingency Plan (ICP) and ESP, both of which were developed to protect public health and safety and to prevent or limit economic damage that could occur from a severe shortage of water supplies.

11.1.1 Integrated Contingency Plan

The Water Authority's ICP provides staff with the information necessary to respond to an emergency that causes severe damage to the Water Authority's water distribution system, or impedes the Water Authority's ability to provide reliable water service to its member agencies. The ICP describes the situations and incidents that will trigger the activation of the Water Authority's ICP and Emergency Operations Center. It also provides direction and strategies for responding to a crisis. The Water Authority's ICP includes:

- Authorities, policies, and procedures associated with emergency response activities
- Emergency Operations Center activities, including activation and deactivation guidelines
- Multi-agency and multi-jurisdictional coordination, particularly between the Water Authority, its member agencies, and Metropolitan in accordance with Standardized Emergency Management System (SEMS) and National Incident Management System (NIMS) guidelines
- Incident Command System management and organization and emergency staffing required to assist in mitigating any significant emergency or disaster
- Mutual Aid Agreements and covenants that outline the terms and conditions under which mutual aid assistance will be provided
- Hazard specific action plans and Incident Command System position checklists

In addition, the Water Authority's ICP uses a step-by-step approach to emergency response planning by providing tools such as resource and information lists, personnel rosters, pertinent policies and procedures, and reference materials. The Water Authority provides input to the Unified San Diego County Emergency Services Organization's "Operational Area Emergency Plan," which in turn, supports the Water Authority's plan.

11.1.2 Water Authority's Emergency Storage Project

In June 1998, the Water Authority's Board authorized implementation of the ESP to reduce the risk of potential catastrophic damage that could result from a prolonged interruption of imported water due to earthquake, drought, or other disasters. The ESP is a system of reservoirs, pipelines, and other facilities that will work together to store and move water around the county in the event of a natural disaster. The ESP will provide, when complete, up to six months of emergency water storage in the San Diego region.

The ESP facilities are located throughout San Diego County and are being constructed in phases. Construction of the first facilities began in 2000. The initial ESP phase included construction of the 318-foot-high Olivenhain Dam and accompanying Olivenhain Reservoir, which together added 24,300 AF of emergency storage for the region. Raising the height of the San Vicente Dam is the last major component of the ESP, and should be completed by 2012. The raised dam will add an additional 117 feet, making this the tallest dam raise in the United States, and will allow for an additional 52,000 AF of emergency storage, as well as 100,000 AF of carryover storage (see **Section 11.2.3.1** for discussion on carryover storage). When completed, the ESP will provide 90,100 AF of stored water for emergency purposes to meet the county's needs through at least 2030. The Water Authority Board of Directors may also authorize that supplies from the ESP be used in a prolonged drought or other water shortage situation where imported and local supplies do not meet 75 percent of the Water Authority's member agencies Municipal and Industrial (M&I) demands.

In sizing the ESP, the Water Authority assumed a 75 percent level of service to all Water Authority member agencies during an outage and full implementation of the water conservation best management practices. The following steps from the August 2002 Emergency Water Delivery Plans show the methodology for calculating the allocation of ESP supplies to member agencies in a prolonged outage situation without imported supplies:

1. Estimate the duration of the emergency (i.e. time needed to repair damaged pipelines).
2. Determine each member agency's net demand during the emergency period by adding M&I water demands and agricultural water demands and then subtracting recycled water supplies.
3. Determine each member agency's useable local supplies during the emergency period (local supplies include surface water and groundwater).
4. Determine each member agency's level of service based on usable local supplies and net demand.
5. Adjust the allocation of ESP supplies based on a member agency's participation in an interruptible agricultural program (e.g. Metropolitan Interim Agricultural Water Program or Water Authority Special Agricultural Water Rate). Interruptible agricultural program customers will be required to take a reduction in deliveries during a water shortage due to an emergency at double the system-wide reduction up to a maximum of 90 percent. Water not delivered to interruptible agricultural program customers will be redistributed to member agencies based on the "system-wide" level of service targets.
6. Determine the amount of local supplies that can be transferred between member agencies, with transfers occurring only after a member agency has a level of service greater than 75 percent based on their usable local supplies.

7. Allocate delivery of useable ESP storage supplies along with available Water Authority and Metropolitan supplies to member agencies with the goal of equalizing the level of service among the member agencies.

11.2 Water Shortage and Drought Response Planning

This section discusses the actions the Water Authority, in coordination with its member agencies, has taken to effectively plan for potential shortages. The Water Authority's Water Shortage and Drought Response Plan (WSDRP), which serves as the region's guiding shortage management document, is discussed below. The section also highlights the actions taken during the 2007-2010 shortage period to manage supply shortfalls and contains information on the Water Authority's dry-year supplies.

11.2.1 Water Shortage and Drought Response Plan

Following the major drought in California of 1987 - 1992, which led to severe water supply shortages throughout the state, the Water Authority and its member agencies aggressively developed plans to minimize the impact of potential shortages. In 2006, the Water Authority Board of Directors adopted the WSDRP, to serve as a comprehensive plan in the event that the region faced supply shortages due to drought or other water shortage conditions.

The WSDRP was developed by the Water Authority in coordination with its member agencies to provide a balanced, flexible, systematic approach to identifying regional actions necessary to reduce the impacts from shortages. It includes all aspects of drought planning, from steps to avoid rationing, to drought response stages, allocation methodology, pricing, tracking actual reductions in water use, and a communication strategy. Multiple actions are identified to manage shortage situations, including both supply augmentation measures and demand reductions up to 50 percent in water supply. Conservation savings is an essential component of meeting the need for water in a time when available supplies are limited.

The WSDRP is organized into three stages: voluntary supply management, supply enhancement, and mandatory cutbacks including a supply allocation methodology. These stages are summarized in the Drought Response Matrix in Table 11-1. A copy of the WSDRP is included in Appendix G.

11.2.1.1 Drought Response Matrix

The WSDRP includes a drought response matrix that serves as guidance to the Water Authority and member agencies in selecting potential regional actions to lessen the severity of shortage conditions. As shown in Table 11.1, the matrix identifies the three drought stages and potential actions available to the Water Authority at each stage.

Table 11-1. Drought Response Matrix – Firm Demands

Potential SDCWA Drought Actions	Stages		
	Voluntary	Supply Enhancement	Mandatory Cutbacks
Ongoing BMP implementation	X	X	X
Communication strategy	X	X	X
Monitoring supply conditions and storage levels	X	X	X
Call for voluntary conservation	X	X	X
Draw from SDCWA carryover storage	X	X	X
Secure transfer option contracts	X	X	X
Buy phase 1 spot transfers (cost at or below Tier 2 rate)		X	X
Call transfer options		X	X
Buy phase 2 spot transfers (cost at or above Tier 2 rate)		X	X
Implement allocation methodology			X
Utilize ESP Supplies			X

SDCWA = San Diego County Water Authority

11.2.1.2 M&I Supply Allocation Methodology

In the event of mandatory supply cutbacks from Metropolitan, the WSDRP includes an M&I allocation methodology to determine how the Water Authority's available supplies will be equitably allocated to its member agencies. The allocation methodology applies to those customers paying the M&I rate, including residential, commercial, and industrial customers.

The Water Authority administers the M&I allocation methodology following the procedures and policies contained in the Water Authority's Resolution Establishing Procedures and Policies for Administration of the Drought Management Plan Water Supply Allocation Methodology. A copy of the resolution is included in Appendix G. The resolution includes a requirement for the Water Authority staff to report monthly to the Board of Directors and member agency managers on agency deliveries are tracking compared to their allocation target.

11.2.2 Summary of 2007 – 2011 Shortage Period Management Actions

The last major drought in California began in 2007, which also marked the beginning of increased restrictions on State Water Project pumping from the Bay-Delta environmental considerations. The Colorado River was in the midst of a prolonged multi-year drought that began in 2000. In April 2007, Metropolitan notified its member agencies that it expected challenges in meeting demands due to insufficient imported water supplies from the State Water Project and the Colorado River. In order to meet demands, Metropolitan announced that it would implement shortage-related actions consistent with its WSDM Plan, including a need to draw upon its storage to meet expected 2007 demands. Metropolitan adopted its Water Surplus and Drought Management (WSDM) Plan in 1999

as guidance for managing regional water supplies during both surplus and shortage situations. Metropolitan's announcement that it would need to draw upon its storage to meet demands triggered implementation of the Water Authority's WSDRP.

The Water Authority began to implement a series of response measures identified in its WSDRP to reduce potential shortage impacts, starting with a call for voluntary conservation, and securing dry-year water transfers and storage programs for the region. As dry conditions persisted into 2009, the Water Authority and its member agencies intensified their drought response activities. Voluntary conservation turned to mandatory water use restrictions in many areas throughout the Water Authority's service area.

In April 2009, Metropolitan's Board of Directors voted to allocate urban water deliveries in fiscal year 2010 for the first time in decades to its member agencies. In turn, the Water Authority allocated water deliveries to its member agencies using the supply allocation methodology contained in the WSDRP. The Water Authority's long-term strategy to improve water supply reliability by diversifying the region's water supply portfolio helped offset some of the required cutbacks from Metropolitan. Residences and businesses responded to the call for conservation, and urban water use fell throughout San Diego County. Although hydrologic conditions began to improve in 2010, storage reserves remained low, and allocations continued into fiscal year 2011, to help restore storage reserves and prepare for a potential dry water year. Supply conditions continued to improve throughout the winter and into the spring 2011. Storage water began to rise to levels seen before the start of the 2007 drought. On April 13, 2011, Metropolitan terminated water allocations to its member agencies. Subsequently, the Water Authority discontinued allocations to its member agencies and deactivated the WSDRP on April 28, 2011.

The Water Authority will continue to work closely with the member agencies and Metropolitan to monitor supply conditions and storage levels, and to implement the WSDRP as needed to effectively manage and minimize the effect of shortages.

11.2.2.1 Timeline of Important Drought and Shortage Related Events

To assist in the potential activation of the WSDRP in the future, Table 11.2 contains a general timeline of events that occurred and actions taken during the 2007-2011 period:

Table 11-2. Timeline of Important Drought and Shortage Related Events

Date	Event or Action
2007	
April	Metropolitan staff announces to the Board that it will need to draw from storage supplies to meet expected 2007 demands, consistent with its WSDM Plan
May	• Water Authority activates WSDRP Stage 1, Voluntary Supply Management • US District Judge Oliver Wanger invalidates the US Fish and Wildlife 2005 Delta Smelt biological opinion and orders a new biological opinion be developed • DWR final calendar year 2007 water allocation to SWP contractors is 60 percent
July	Water Authority begins delivery of imported supplies to carryover storage accounts in local member agency reservoirs
October	Metropolitan announces plans to reduce agricultural deliveries to customers participating in their Interim Agricultural Water Program by 30 percent, effective January 1, 2008, consistent with its WSDM Plan

Date	Event or Action
November	DWR initial calendar year 2008 water allocation to SWP contractors is 25 percent
December	• Judge Wanger issues an interim order to direct actions at the export facilities to protect Delta Smelt until a new biological opinion is completed. • Water Authority activates WSDRP Stage 2, Supply Enhancement
2008	
February	DWR final water calendar year 2008 allocation to SWP contractors is 60 percent
March	Water Authority Board of Directors approves Model Drought Response Ordinance
April	• Water Authority declares Level 1 Drought Alert under its Model Drought Response Ordinance • Judge Wanger invalidates National Marine Fisheries Service biological opinion related to the operations of the CVP and SWP
June	Governor Arnold Schwarzenegger proclaims statewide emergency due to drought
October	• Metropolitan Board approves a plan to phase out the IAWP by 2013 • DWR initial calendar year 2009 water allocation to SWP contractors is 25 percent
December	• U.S. Fish and Wildlife Service releases revised biological opinion on Delta smelt • On February 27, 2009, Governor Schwarzenegger proclaims a state of emergency due to drought
2009	
April	• Metropolitan announces allocation of M&I deliveries to its member agencies, including the San Diego region for fiscal year 2010 at an estimated 13 percent cutback level • Water Authority implements WSDRP Stage 3 "Mandatory Cutbacks" and approves allocating M&I supplies to its member agencies in fiscal year 2010 at an estimated 8 percent cutback level • Water Authority declares Level 2 Drought Alert under its Model Drought Response Ordinance • Water Authority authorized utilization of approximately 16,000 AF acre-feet of dry-year transfers acquired in 2009
May	DWR final calendar year 2009 water allocation to SWP contractors is 25 percent
June	National Marine Fisheries Service releases final biological opinion and concludes that CVP and SWP pumping operations should be changed to protect the winter and spring run Chinook salmon, Central Valley steelhead, North American green sturgeon, and southern resident killer whales
November	DWR initial calendar year 2010 water allocation to SWP contractors is 5 percent
2010	
April	Metropolitan continues allocation of M&I deliveries to its member agencies for fiscal year 2011. In response, the Water Authority continues to allocate M&I deliveries to its member agencies
June	DWR final calendar year 2010 water allocation to SWP contractors is 50 percent
November	DWR initial calendar year 2011 water allocation to SWP contractors is 25 percent
2011	
January	DWR increases its calendar year 2011 water allocation to SWP contractors to 60 percent
March	Governor Jerry Brown proclaims an end to the statewide drought
April	• Metropolitan discontinues M&I allocations • DWR increases its calendar year 2011 water allocations to SWP contractors to 80 percent • Water Authority deactivates WSDRP and discontinues allocations • Water Authority declares an end to the Drought Response Levels contained in the model Drought Response Conservation Program Ordinance

11.2.3 Water Authority Dry-Year Supplies and Carryover Storage

The Water Authority's dry-year supplies and carryover storage are an important component of managing potential shortages within the region and for increasing supply reliability for the region. The dry-year supplies assist in minimizing or reducing potential supply shortages from Metropolitan. Over the last five years the Water Authority has developed a carryover storage program to more effectively manage supplies. This includes in-region surface storage currently in member agency reservoirs and increasing capacity through the raising of San Vicente Dam, which should be completed by 2012. The Water Authority also currently has an out-of-region groundwater banking program in the California central valley. Through these efforts, the Water Authority can store water available during wet periods for use during times of shortage. The Water Authority also implemented a dry-year transfer program during the last shortage period and successfully acquired and utilized dry-year transfer supplies in 2009. The Water Authority's carryover storage and dry-year transfer programs are discussed below.

11.2.3.1 Water Authority Carryover Storage Program

The carryover storage program provides water for the region in the case of a supply shortage, such as during a drought. The Water Authority has identified three main needs for carryover storage:

1. Enhance reliability of the water supply: During dry weather periods, increased regional demand for water may exceed available supplies, resulting in potential water shortages. Carryover storage provides a reliable and readily available source of water during periods of shortage, such as during dry years.
2. Increase system efficiency: Carryover storage provides operational flexibility to serve above normal demands, such as those occurring during peak summer months or extended droughts, from locally stored water rather than by the over-sizing of the Water Authority's imported water transmission facilities.
3. Better management of water supplies: Carryover storage allows the Water Authority to accept additional deliveries from its existing State Water Project- and Colorado River-derived sources during periods of greater availability, such as during wet years, to increase water availability locally during periods of shortage, such as during dry years.

San Vicente Dam Raise Carryover Storage Project

The Water Authority's Water Facilities Master Plan (December 2002) identified a need for approximately 100,000 AF of carryover storage to assist in maintaining a secure and reliable supply for the region.

The San Vicente Dam Raise CSP will meet this need by providing approximately 100,000 acre-feet of local storage and facilitate the reliable and efficient delivery of water to residents of the Water Authority service area. It will be located in the San Vicente Reservoir above the reservoir expansion for the ESP (see previous **Section 11.1.2**), and will increase water storage reliability for the region. Construction is scheduled to be completed in 2012, followed by filling of the reservoir in three to five years. Prior to completion of the project, the Water Authority is storing carryover water in member agency reservoirs under agreement.

Water Authority's Out-Of-Region Groundwater Program

As part of the Quantification Settlement Agreement, the Water Authority became the recipient of groundwater conjunctive use funds appropriated through Senate Bill 1765 (1998), which originally were designated to Metropolitan. Approximately $30.5 million was made available to the Water Authority for use in its groundwater program. A demand and supply analysis utilizing data from the Water Authority's 2005 Urban Water Management Plan identified a maximum potential need for approximately up to 95,000 acre-feet of additional carryover storage beyond the 100,000 acre-feet of carryover storage at San Vicente Reservoir. This evaluation looked at a three-year dry cycle scenario during which demands are high and imported supplies are constrained by preferential rights. Based on that scenario, the Water Authority distributed a Request for Proposal (RFP) in November 2005 to partner with agencies overlying a groundwater basin for a conjunctive use project. The project would allow water to be delivered and stored during above normal hydrology and extracted from the basin and delivered to the Water Authority either by wheeling through various facilities, exchanges, or other alternatives.

In 2008, the Water Authority acquired a total of 70,000 acre-feet of permanent storage allocation in the Semitropic-Rosamond Water Bank Authority and Semitropic Water Bank (40,000 acre-feet and 30,000 acre-feet respectively) located in Kern County. Due to its location near the California Aqueduct, the Kern River and the Friant-Kern Canal, the location was ideally suited for groundwater banking. The Water Authority's assigned rights also included a total Program Delivery Capacity of 12,715 acre-feet per year and 10,865 acre-feet per year of Program Pumpback Capacity.

Due to continuing statewide dry conditions, in 2008, the Water Authority purchased approximately 23,077 acre-feet of water from Butte Water District and Sutter Extension Water District (transfer water). Also in 2008, an agreement was executed between Metropolitan and the Water Authority allowing Metropolitan to take ownership of the Water Authority's Transfer Water at Banks Pumping Plant and Metropolitan would pay all costs to convey the Transfer Water to its service area for sale to its member agencies. In exchange, Metropolitan would assign to the Water Authority an amount of water stored in Metropolitan's existing Semitropic account equal to the Transfer Water, less a 10 percent one-time loss. In December 2008, 17,908 acre-feet was delivered into Metropolitan's service area. The Department of Water Resources confirmed the delivered amount, and Metropolitan assigned the like amount of water (less a 10 percent evaporative and aquifer loss) to the Water Authority's Semitropic Water Bank program. As a result, 16,117 acre-feet of water was stored and qualified as reimbursement for initial fill from the state funds provided under SB 1765. The 16,117 acre-feet of water continues to be stored in the Water Authority's 70,000 acre-feet out-of-region banking program.

Utilization of Carryover Storage Supplies

In accordance with the Water Authority's WSDRP, potential utilization of carryover storage supplies could occur in Stage 2, Supply Enhancement, or Stage 3, Mandatory Cutbacks. The amount of water taken from carryover storage reserves, to manage potential shortages, is influenced by a number of factors and should generally be handled on a case-by-case basis. Many of the factors influencing the storage take will vary depending upon conditions present. These factors include, but are not limited to:

- Current water demand trends;
- Core water supply availability from imported and local sources;

- Existing and projected hydrologic conditions;
- Storage supply available for withdrawal;
- Take capacity from the groundwater banking program; and
- Need to avoid depletion of storage reserves.

For planning purposes in the 2010 Plan, general guidelines are established that approximately one third of the carryover supplies available in storage will be utilized in one year. Utilizing only a portion of available storage supplies avoids depletion of storage reserves, thereby making water available for potential ongoing or future shortages. It should be emphasized that the carryover storage takes shown in the dry water year assessments contained in Section 9.3 are used for planning purposes only and should not dictate future carryover storage takes. The Water Authority's 2012 Master Plan Update will contain a more detailed evaluation of carryover storage program supply utilization. The supplies taken from carryover storage will be considered a Water Authority regional supply to be combined with Water Authority's core supplies and any potential dry-year transfers.

Another factor that will be considered when utilizing carryover supplies is the March 2010 Water Authority Board approval of a revised SAWR program. Customers in the SAWR class of service are exempt from paying the Water Authority's storage charge and in turn receive no water from the Carryover Storage Program during Stage 2 or 3 of the WSDRP. Water Authority staff will work with the agricultural member agencies on developing proposed procedures for administering this program prior to completion of the San Vicente Dam raise.

11.2.3.2 Water Authority's Dry-Year Transfer Program

To ensure adequate water supplies resulting from continuing drought conditions (2007 – 2010) and regulatory constraints, and as part of the Water Authority's WSDRP, staff developed a plan to secure one-time water transfer agreements, which could lay the foundation for long-term agreements as authorized by the Board on September 27, 2007. Although transfers of water supplies through the Delta may be subject to curtailments during certain periods due to operations of the pumps in the SWP system, staff pursued opportunities as a supply option in the event that Colorado River surplus was suspended or dry-year conditions continue. The supply could also hedge against shortfalls resulting from a reduced State Water Project allocation.

In 2009, the Water Authority acquired 20,000 acre-feet of water under a one-year transfer agreement with Placer County Water Agency in Northern California to lessen the impact of water supply reductions on the San Diego region. The transfer eased the region's transition from voluntary conservation to mandatory water use restrictions by keeping regional water savings target for the year at a manageable level. In 2010, the Water Authority actively sought water transfer options, however, due to the changed conditions of the Water Authority's water demands, which have significantly dropped since Metropolitan enacted Level 2 of its Water Supply Allocation Plan in July 2009, the expense necessary to obtain the necessary approvals and agreements and the comparatively higher cost of the supplies, the board approved not exercising its call rights to the 2010 dry-year transfer with the South Feather Water and Power Agency. The board also decided to end its pilot program efforts between San Juan Water District, Santa Clara Valley Water District, and the Water Authority for Calendar Year 2010 and continue it over to 2011.

Considerations that shaped negotiations between the Water Authority and the potential partners included:

- **Source Location**: To mitigate the delivery risks through the Delta, staff pursued transfers as a part of DWR's Dry Year Program, which had a wheeling priority in the Delta. In addition, staff investigated temporary storage agreements with DWR and the USBR in Lake Oroville or Lake Shasta to store the conserved water for when releases would be permitted.
- **Federal and State Agency Approvals**: Potential programs may have required environmental compliance and approval from overseeing agencies, such as the USBR and DWR.
- **Price**: The cost for water purchase, transportation, conveyance losses, and environmental/administrative fees should be comparable to the costs of other supply alternatives such as Metropolitan's Tier 2 purchases and IID transfers. In addition, staff made efforts to not drive the costs up of potential proposals by Metropolitan with the Northern California water districts.
- **Call Period**: Potential partners were seeking earlier call dates to ensure time to conserve the call amount. The Water Authority sought a balance that would provide a later call date opportunity due to changing weather conditions or water opportunities.
- **Available Capacity in the SWP system**: Consideration was made due to the uncertainty of the SWP pump operations and available capacity in the SWP system.

11.2.4 Model Drought Response Conservation Ordinance

In March 2008, the Water Authority's Board of Directors approved for release a Model Drought Response Conservation Program Ordinance (Model Drought Ordinance) for use by member agencies in updating their existing ordinances. The Model Drought Ordinance was developed with input from the member agencies to provide regional consistency during periods of shortages. The Department of Water Resource's 2008 Updated Urban Drought Guidebook was also utilized as a reference document for preparation of the Model Drought Ordinance. It identifies four drought response levels that contain water-use restrictions to help achieve demand reduction during temporary shortages. The restrictions become more stringent at each successive level to obtain necessary savings and delay economic impact until higher levels. The Model Drought Ordinance is included in Appendix H. Table 11.3 shows the correlation between the WSDRP stages and the Model Drought Ordinance.

Table 11-3. Correlation between WSDRP Stages and Model Ordinance Levels

WSDRP Stage	Drought Response Level	Use Restrictions	Conservation Target
1	1 – Drought Watch	Voluntary	Up to 10%
2	1 – Drought Watch	Voluntary	Up to 10%
	2 – Drought Alert	Mandatory	Up to 20%
3	2 - Drought Alert	Mandatory	Up to 20%
	3 - Drought Critical	Mandatory	Up to 40%
	4 - Drought Emergency	Mandatory	Above 40%+

The Water Authority's member agencies, not the Water Authority, have the direct customer service relationship with water users, and responsibility to address mandatory use prohibitions or restrictions during water shortages. The Model Drought Ordinance served as a model to the member agencies in updating their individual ordinances to help promote regional consistency. Member agencies independently adopt retail-level actions to manage potential shortages. Since its approval, all of the member agencies have updated their existing ordinances, based on the Model Drought Ordinance, but also tailoring their individual ordinances to their unique service area and characteristics.

11.2.5 Penalties for Excessive Water Use

Penalty rates may be used by the Water Authority to encourage conservation and reduce demand during a drought or other water supply shortage. If Metropolitan allocates imported water supplies to the Water Authority, Metropolitan can impose surcharges (penalty pricing) on water consumption in excess of the Water Authority's allocation. The Water Authority's Implementing Resolution, provides for a pass through to the Water Authority's member agencies of any penalties levied by Metropolitan on the Water Authority for exceeding its annual allocation. Penalties are assessed at the end of the fiscal or calendar year, depending on the class of service. Penalties will be assessed on a pro rata basis to the member agencies that exceed their allocations, and only if the Water Authority exceeds its allocation from Metropolitan. The Water Authority is subject to significant financial penalties if it exceeds its Metropolitan allocation.

Rates may also be adjusted based on any other allocation program implemented by the Water Authority as determined necessary by the Board of Directors. The Water Authority may also reduce the amount of water it allocates to a member agency if the member agency fails to adopt or implement water use restrictions.

11.2.6 Revenue Impacts

The Water Authority has taken significant steps to reduce potential revenue impacts resulting from fluctuating water sales. In fiscal year 1990, the Water Authority created a Rate Stabilization Fund (RSF) to provide funds that would mitigate the need for rate increases in the event of an unexpected decline in water sales. In 2006, the Board adopted new policies governing the RSF. Under the newly adopted policy, the RSF has a "target" balance that is the equivalent of the estimated financial impact 2.5 years of wet weather (reduced sales). The new policy also established a maximum RSF balance that is equal to the financial impact of 3.5 years of wet weather. The new policy matches the level of RSF funding with the risk (water sales volatility) that the fund is designed to mitigate. The RSF provides an important tool to mitigate water sales volatility and the impact that has on water rates.

Additionally, on January 1, 2003, the Water Authority implemented a new rate structure that substantially increased the percentage of water revenues generated from fixed charges. This increase replaced the previous variable "postage stamp" rate, which historically generated as much as 80 percent or more of total annual revenues, with two fixed charges, and one variable rate. These new fixed charges – Customer Service, Infrastructure Access Charge, and Storage – are key components to the Water Authority's future revenue stability.

Although the Water Authority maintains financial reserves, it is possible that additional costs associated with demand reduction and supply enhancement could negatively affect the Water

Authority's short-term financial situation. The Water Authority may compensate for increased costs or reduced water sales by adjusting water rates in succeeding years.

11.2.7 Minimum Water Supply Available Over Next Three Years

In accordance with the Act, agencies are required to estimate the minimum water supply available during each of the next three years, based on the driest three-year historic sequence. To determine the minimum supplies potentially available to the region, the same assumptions contained in the multi dry-year analysis in Section 9.3 were used. Table 11.4 contains the minimum estimated supplies. The minimum supplies are included in accordance with the Act. It should be noted that based on current supply and storage conditions statewide, the Water Authority is not currently forecasting this supply scenario.

Table 11-4. Estimated Minimum Supplies without Utilization of Carryover Storage

Supplies	2012	2013	2014
Member Agency Local Supplies	67,194	82,771	102,973
Water Authority QSA	170,200	180,200	180,200
Metropolitan Supplies (Allocation at Preferential Rights)	317,760	319,177	320,456
Total	555,154	582,148	603,629

11.3 Summary

The shortage contingency analysis included in this section demonstrates that the Water Authority and its member agencies, through the ICP and ESP, are taking actions to prepare for and appropriately handle a catastrophic interruption of water supplies. The analysis also describes the Water Authority's plans, procedures, and WSDRP for the San Diego region, and coordinated development of the Drought Model Ordinance. The WSDRP identifies the actions to be taken by the Water Authority to minimize the impacts of a supply shortage due to a drought or other water supply shortage, including a methodology for allocating M&I supplies to the member agencies during a water shortage. These components address the requirements of the Act that are applicable to the Water Authority.