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MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

2015 URBAN WATER MANAGEMENT PLAN

DRAFT

~~March~~ APRIL 2016

,

2015 URBAN WATER MANAGEMENT PLAN

Municipal Water District of Orange County

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ACRONYMS AND ABBREVIATIONS

20x2020	20% water use reduction in GPCD by year 2020
Act	Urban Water Management Planning Act
ACWRF	Aliso Creek Water Reclamation Facility
AF	Acre-feet
AFY	Acre-feet per year
AOP	Advanced Oxidation Processes
AWTP	Advanced Water Treatment Plant
AWWA	American Water Works Association
BDCP	Bay-Delta Conservation Plan
BEA	Basin Equity Assessment
Biops	Biological opinions
BMO	Best Management Objective
BMP	Best Management Practice
BPP	Basin Production Percentage
BPOU	Baldwin Park Operable Unit
CalWARN	California Water and Wastewater Agency Response Network
CCC	California Coastal Commission
CDR	Center for Demographic Research
CDWC	California Domestic Water Company
CII	Commercial/Industrial/Institutional
CRA	Colorado River Aqueduct
CSANS	California Sprinkler Adjustment Notification System
CTP	Coastal Treatment Plant
CUP	Conjunctive Use Program
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVWD	Cucamonga Valley Water District
CVWD	Coachella Valley Water District
CWRP	Chiquita Water Reclamation Plant
DATS	Deep Aquifer Treatment System
DDW	Division of Drinking Water
Delta	Sacramento-San Joaquin River Delta
DMM	Demand Management Measure
DVL	Diamond Valley Lake
DWR	Department of Water Resources
EBSD	Emerald Bay Services District
EOCWD	East Orange County Water District
EIR	Environmental Impact Report
EOC	Emergency Operation Center

ET	Evapotranspiration
ETWD	El Toro Water District
FY	Fiscal Year
GAC	Granular Activated Carbon Filter
GAP	Green Acres Project
GCM	General Circulation Model
GPCD	Gallons per capita per day
GPD	Gallons per day
GRF	Groundwater Recovery Facility
GSWC	Golden State Water Company
GWRP	Groundwater Recovery Plant
GWRS	Groundwater Replenishment System
HECW	High Efficiency Clothes Washers
HET	High Efficiency Toilet
IID	Imperial Irrigation District
IPR	Indirect Potable Reuse
IRP	Integrated Water Resource Plan
IRWD	Irvine Ranch Water District
IWA	International Water Association
LAWRP	Los Alisos Water Recycling Plant
LBCWD	Laguna Beach County Water District
LRP	Local Resources Program
LTFP	Long-Term Facilities Plan
MARS	Member Agency Response System
MAWA	Maximum Allowed Water Allowance
M&I	Municipal and industrial
MAF	Million acre feet
MCL	Maximum Contaminant Level
Mesa Water	Mesa Water District
Metropolitan	Metropolitan Water District of Southern California
MF	Microfiltration
MNWD	Moulton Niguel Water District
MGD	million gallons per day
MOU	Memorandum of Understanding Regarding Urban Water Conservation in California
MWDOC	Municipal Water District of Orange County
MWRP	Michelson Water Recycling Plant
NDMA	N-nitrosodimethylamine
NRCS	Natural Resource Conservation Service
OC	Orange County
OCSD	Orange County Sanitation District

OCWD	Orange County Water District
OCWRP	Oso Creek Water Reclamation Plant
Poseidon	Poseidon Resources LLC
PPCP	Pharmaceuticals and Personal Care Product
Ppb	Parts per billion
PPR	Percent perfected right
PVID	Palo Verde Irrigation District
QSA	Quantification Settlement Agreement
RA	Replenishment Assessment
RO	Reverse Osmosis
RRWTP	Robinson Ranch Wastewater Treatment Plant
RTP	Regional Treatment Plant
RWQCB	Regional Water Quality Control Board
SAR	Santa Ana River
SARCCUP	Santa Ana River Conservation and Conjunctive Use Program
SBx7-7	Senate Bill 7 as part of the Seventh Extraordinary Session
SCAB	South Coast Air Basin
SCWD	South Coast Water District
SDCWA	San Diego County Water Authority
SDP	Seawater Desalination Program
SEMS	Standardized Emergency Management System
Serrano	Serrano Water District
SJBA	San Juan Basin Authority
SMWD	Santa Margarita Water District
SNWA	Southern Nevada Water Authority
SOCWA	South Orange County Wastewater Authority
Study	Colorado River Basin Water Supply and Demand Study
SWP	State Water Project
SWRCB	California State Water Resources Control Board
SWSD	Semitrophic Water Storage District
TCWD	Trabuco Canyon Water District
TDS	Total Dissolved Solids
TVMWD	Three Valleys Municipal Water District
USBR	United States Bureau of Reclamation
USGVMWD	Upper San Gabriel Valley Municipal Water District
UV	Ultraviolet
UWMP	Urban Water Management Plan
WACO	Water Advisory Committee of Orange County
WBIC	Weather Based Irrigation Controller
WEROC	Water Emergency Response Organization of Orange County

WRP	Water Recycling Plant
WSAP	Water Supply Allocation Plan
WSDM	Water Surplus and Drought Management Plan
WUE	Water Use Efficiency
YLWD	Yorba Linda Water District

MESSAGE FROM THE BOARD OF DIRECTORS

Since the Municipal Water District of Orange County's (MWDOC) formation in 1951, MWDOC has remained steadfast in its commitment to provide a reliable supply of high-quality water for Orange County at a reasonable rate. Through leadership, representation at the Metropolitan Water District of Southern California (Metropolitan) and collaboration with our retail agencies, MWDOC seeks opportunities to improve Orange County's water resources and reliability. By integrating local planning challenges and regional stakeholder partnerships, MWDOC maximizes water system reliability and overall system efficiencies. MWDOC works to expand Orange County's water supply portfolio by providing planning and local resource development in the areas of recycled water, groundwater, ocean water desalination, and water-use efficiency.

DIRECTORS

Division 1 ***Brett R. Barbre***

Brea, Buena Park, La Habra, La Palma, Yorba Linda Water District, and portions of Golden State Water Company

Division 2 ***Larry D. Dick***

Orange, Tustin, East Orange County Water District, portions of Golden State Water Company, Serrano Water District, portions of Garden Grove, and portions of Irvine Ranch Water District

Division 3 ***Wayne Osborne***

Fountain Valley, Westminster, portions of Golden State Water Company, and portions of Garden Grove

Division 4 ***Joan C. Finnegan***

Huntington Beach, Seal Beach, and Mesa Water District

Division 5 ***Sat Tamaribuchi***

Newport Beach and portions of Irvine Ranch Water District and El Toro Water District

Division 6 ***Jeffery M. Thomas***

Santa Margarita Water District, Trabuco Canyon Water District, and portions of Irvine Ranch Water District

Division 7 ***Susan Hinman***

San Clemente, San Juan Capistrano, Moulton Niguel Water District, Laguna Beach County Water District, and South Coast Water District

MISSION STATEMENT

"To provide reliable, high-quality supplies from Metropolitan Water District of Southern California and other sources to meet present and future needs, at an equitable and economical cost, and to promote water use efficiency for all of Orange County."

1 INTRODUCTION

1.1 Urban Water Management Plan Requirements

Water Code Sections 10610 through 10656 of the Urban Water Management Planning Act (Act) require every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet (AF) of water annually to prepare, adopt, and file an Urban Water Management Plan (UWMP) with the California Department of Water Resources (DWR) every five years in the years ending in zero and five. The 2015 UWMP updates are due to DWR by July 1, 2016.

This UWMP provides DWR with a detailed summary of present and future water resources and demands within the Municipal Water District of Orange County (MWDOC) service area and assesses its water resource needs. Specifically, the UWMP provides water supply planning for a 25-year planning period in five-year increments and identifies water supplies needed to meet existing and future demands. The demand analysis must identify supply reliability under three hydrologic conditions: a normal year, a single-dry year, and multiple-dry years. MWDOC's 2015 UWMP updates the 2010 UWMP in compliance with the requirements of the Act as amended in 2009, and includes a discussion of:

- Water Service Area and Facilities
- Water Sources and Supplies
- Water Use by Customer Type
- Demand Management Measures
- Water Supply Reliability
- Planned Water Supply Projects and Programs
- Water Shortage Contingency Plan
- Recycled Water Use

Since the original Act's passage in 1983, several amendments have been added. The most recent changes affecting the 2015 UWMP include Senate Bill 7 as part of the Seventh Extraordinary Session (SBx7-7) and SB 1087. SBx7-7, or the Water Conservation Act of 2009, is part of the Delta Action Plan that stemmed from the Governor's goal to achieve a 20 percent statewide reduction in urban per capita water use by 2020 (20x2020). Reduction in water use is an important part of this plan that aims to sustainably manage the Bay Delta and reduce conflicts between environmental conservation and water supply conveyance; it is detailed in Section 3.2.3. SBx7-7 requires each urban retail water supplier to develop urban water use targets to achieve the 20x2020 goal and the interim ten percent goal by 2015. Each urban retail water supplier must include in its 2015 UWMPs the following information from its target-setting process:

- Baseline daily per capita water use
- 2020 urban water use target

- 2015 interim water use target compliance
- Compliance method being used along with calculation method and support data
- An implementation plan to meet the targets

Wholesale water suppliers such as MWDOC are required to include an assessment of present and proposed future measures, programs, and policies that would help achieve the 20 percent water use reduction by 2020 goal.

In an effort to assist retail agencies in Orange County meet the requirement of SB7x7, the MWDOC 2015 UWMP describes the Orange County Regional Alliance and methodology used to calculate the regional targets for 2015 and 2020.

The other recent amendment, made to the UWMP on September 19, 2014, is set forth by SB 1420, Distribution System Water Losses. SB 1420 requires water purveyors to quantify distribution system losses for the most recent 12-month period available. The water loss quantification is based on the water system balance methodology developed by the American Water Works Association (AWWA).

This 2015 Plan update also incorporates MWDOC's current and planned water use efficiency efforts pursuant to the *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU). MWDOC became a signatory and adopted the MOU in 1991.

A UWMP may serve as a foundational document and source of information for a Water Supply Assessment, (Water Code Section 10613), and a Written Verification of Water Supply, (Water Code Section 66473.7). Both statutes require detailed information regarding water supply availability be provided to city and county decision makers prior to approval of specified large development projects. Additionally, a UWMP also serves as a:

- Long-range planning document for water supply;
- Long-range planning document for water use efficiency measures;
- Source data for development of a regional water plan;
- Source document for cities and counties, as they prepare and update their General Plans;
- Key component of an Integrated Regional Water Management Plan; and
- Condition to qualify for receipt of certain State grant funds.

The activities associated with the update of MWDOC's Plan and the benefits the Plan ultimately affords its local retailers extend far beyond the implied or stated supply-reliability goals. This Plan allows MWDOC to do the following:

- Provide a comprehensive assessment of water resource needs in its service area;
- Provide guidance to coordinate implementation of water use efficiency programs in a cost-effective manner;
- Provide assistance to maximize the beneficial use of recycled water and local groundwater supplies, supplying the region with new sources of local water to reduce the need to purchase imported water supplies from Metropolitan (described in the next section); and

- Offer opportunities for community participation through public meetings, and provide information that allows the public to gain further understanding of the region's comprehensive water planning.

The sections in this UWMP correspond to the outline of the Act, specifically Article 2, Contents of Plans, Sections 10631, 10632, and 10633. The sequence used for the required information, however, differs slightly in order to present information in a manner reflecting the unique characteristics of MWDOC. The UWMP Checklist which identifies the location of Act requirements in this Plan is included in Appendix A. This is an individual UWMP for a wholesale agency, as shown in Tables 1-1 and 1-2. Table 1-2 also indicates the units that will be used throughout this document.

Table 1-1: Plan Identification

Plan Identification			
Select Only One	**Type of Plan**		**Name of RUWMP or Regional Alliance** *if applicable*
☑	**Individual UWMP**		
	☐	Water Supplier is also a member of a RUWMP	-
	☑	Water Supplier is also a member of a Regional Alliance	Orange County 20x2020 Regional Alliance
☐	**Regional Urban Water Management Plan (RUWMP)**		-
NOTES:			

Table 1-2: Agency Identification

Agency Identification	
Type of Agency (select one or both)	
☑	Agency is a wholesaler
☐	Agency is a retailer
Fiscal or Calendar Year (select one)	
☐	UWMP Tables Are in Calendar Years
☑	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Date that the Fiscal Year Begins (mm/dd)	
7/1	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

1.2 Municipal Water District of Orange County

1.2.1 Formation and Purpose

Orange County was settled around areas of surface water. San Juan Creek supplied the mission at San Juan Capistrano. The Santa Ana River supplied the early Cities of Anaheim and Santa Ana. The Santa Ana River also provided water to a large aquifer underlying the northern half of the county, enabling settlers to move away from the river's edge and still obtain water by drilling wells.

By the early 1900s, Orange County residents understood that their water supply was limited, the rivers and creeks did not flow all year long, and the aquifer would eventually be degraded or even dry up if the water was not replenished on a regular basis.

In 1928, the Cities of Anaheim, Santa Ana, and Fullerton joined with 10 other southern California cities to form Metropolitan. Their objective was to build an aqueduct from the Colorado River to provide the additional water necessary to sustain the growing southern California economy and its enviable lifestyle.

The Orange County Water District (OCWD) was formed in 1933 to protect the County's water rights on the Santa Ana River. Later that mission was expanded to manage the underground aquifer, optimizing use of local supplies and augmenting those with imported supplies provided through the Metropolitan member agencies in Orange County.

It was not long before other parts of Orange County also saw the need for supplemental supplies. A severe drought in the late 1940s further emphasized this need for coastal communities from Newport Beach to San Clemente. In 1948, coastal communities from Newport Beach south to the San Diego county line formed the Coastal Municipal Water District as a way to join in the benefits provided by Metropolitan. Three years later, MWDOC was formed by Orange County voters in 1951 under the Municipal Water District Act of 1911 to provide imported water to inland areas of Orange County. To improve services and reduce cost, the Coastal Municipal Water District became a part of MWDOC in January 2001.

Today, MWDOC is Metropolitan's third largest member agency, providing and managing the imported water supplies used within its service area.

1.2.2 Relationship to Metropolitan

MWDOC became a member agency of Metropolitan in 1951 to bring supplemental imported water supplies to parts of Orange County. Metropolitan is a consortium of 26 cities and water agencies that provides supplemental water supplies to parts of Los Angeles, Orange, San Diego, Riverside, San Bernardino, and Ventura Counties. Metropolitan's two main sources of supply are the Colorado River and Sacramento-San Joaquin Bay-Delta. Supplies from these sources are delivered to southern California via the Colorado River Aqueduct (CRA) and the State Water Project (SWP). MWDOC purchases imported water from these sources from Metropolitan and distributes the water to its 28 retail agencies, which provide retail water services to the public.

1.2.3 MWDOC Board of Directors

MWDOC is governed by an elected seven-member Board of Directors, with each board member representing a specific area of the County and elected to a four-year term by voters who reside within that part of the MWDOC service area. The Board of Directors map is shown on Figure 1-1.

Each director is a member of at least one of the following three standing committees: Planning and Operations; Administration and Finance; and Public Affairs and Legislation. Each committee meets monthly. The full board convenes for its regular monthly meeting on the third Wednesday of the month, and holds a Board workshop on Metropolitan issues the first Wednesday of the month.

The President of the Board, Vice President, and immediate past President also comprise the Executive Committee, which meets monthly with the General Manager, Assistant General manager, and Board Secretary.

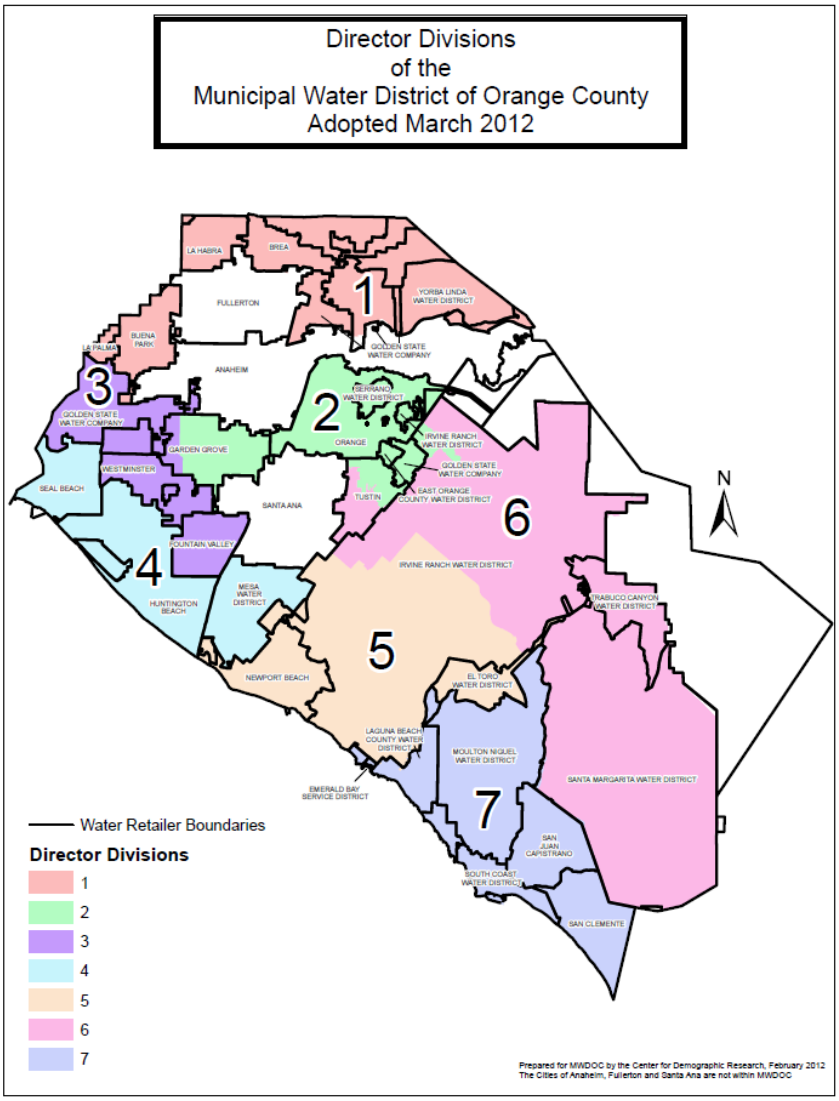


Figure 1-1: MWDOC Board of Directors Map, by Director Division

1.2.4 Goals and Objectives

MWDOC's Mission Statement is "*To provide reliable, high-quality supplies from Metropolitan Water District of Southern California and other sources to meet present and future needs, at an equitable and economical cost, and to promote water use efficiency for all of Orange County.*"

MWDOC's related water management goals and objectives are to

- Represent the interests of the public within its jurisdiction;
- Appoint its representative directors to the Board of Metropolitan;
- Inform its directors and its retail agencies about Metropolitan issues;
- Guide Metropolitan in its planning efforts and act as a resource of information and advocate for our retail agencies;
- Purchase water from Metropolitan and represent the interest of our service area at Metropolitan;
- Work together with Orange County water agencies and others to focus on solutions and priorities for improving Orange County's future water supply reliability;
- Cooperate with and assist OCWD and other agencies in coordinating the balanced use of the area's imported and native surface and groundwater;
- Plan and manage the allocation of imported water to its retail agencies during periods of shortage;
- Coordinate and facilitate the resolution of water issues and development of joint water projects among its retail agencies;
- Represent the public and assist its retail agencies in dealing with other governmental entities at the local, regional, state, and federal levels on water-related issues; and
- Inform its retail agencies and inform and educate the general public on matters affecting present and future water use and supply.

As a regional wholesaler, MWDOC has roles that are broadly applicable to all of its retail agencies. A key goal of MWDOC is to provide broad reaching services and programs that the retail agencies cannot reasonably provide as single entities.

MWDOC works with other agencies to promote efficient use of Orange County's water supply. As previously stated, MWDOC is a signatory to the MOU monitored by the California Urban Water Conservation Council (CUWCC), which outlines 14 Best Management Practices (BMP) for urban water use efficiency. The urban water use efficiency practices are intended to reduce long-term urban demands from what they would have been without implementation of these practices, and are in addition to programs that may be instituted during occasional water supply shortages.

For more than 30 years, MWDOC's Public Information and Water Education programs have reached thousands of consumers and nearly 90,000 Orange County students annually. The programs are performed on behalf of, and in coordination with, MWDOC's retail agencies and are designed to facilitate a student's understanding of current water issues as well as the challenges, opportunities, and costs involved in securing a reliable supply of high quality water.

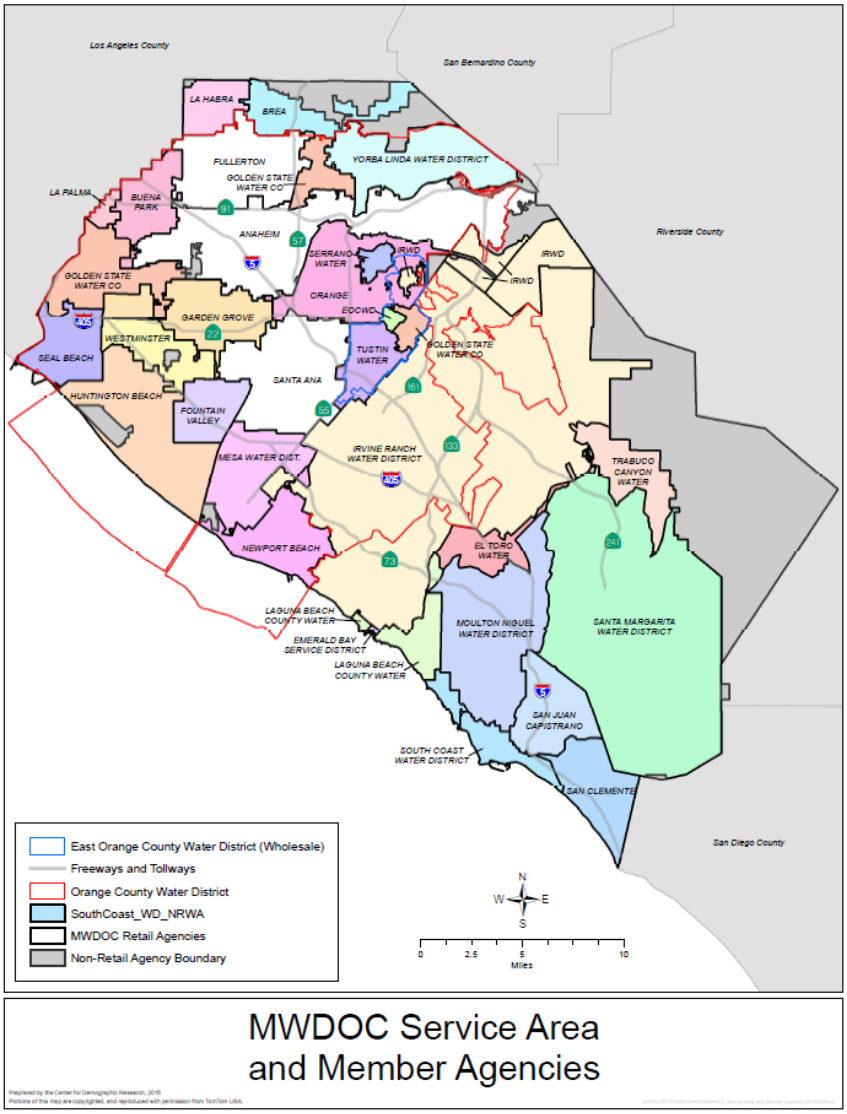
In 2004, MWDOC formed a partnership with the Discovery Science Center to bring the School Education Program to more students and provide them with even greater educational experiences in the areas of water and science.

1.3 Service Area

MWDOC is a regional water wholesaler and resource planning agency, managing all of Orange County's imported water supply with the exception of water imported to the cities of Anaheim, Fullerton, and Santa Ana. MWDOC serves more than 2.3 million residents in a 600-square-mile service area (see Figure 1-2 below). It is committed to ensuring water reliability for the communities it serves. To that end, MWDOC focuses on sound planning and appropriate investments in water supply, water use efficiency, regional delivery infrastructure, and emergency preparedness.

MWDOC serves imported water in Orange County to 28 retail water agencies. MWDOC has informed these water suppliers of its available supplies in accordance with CWC 10631. These entities, comprised of cities and water districts, are referred to as MWDOC retail agencies and provide water to approximately 2.3 million customers. MWDOC retail agencies include

- City of Brea
- City of Buena Park
- City of Fountain Valley
- City of Garden Grove
- City of Huntington Beach
- City of La Habra
- City of La Palma
- City of Newport Beach
- City of Orange
- City of San Clemente
- City of San Juan Capistrano
- City of Seal Beach
- City of Tustin
- City of Westminster
- East Orange County Water District (EOCWD)
- El Toro Water District (ETWD)
- Emerald Bay Services District (EBSD)
- Irvine Ranch Water District (IRWD)
- Laguna Beach County Water District (LBCWD)
- Mesa Water District (Mesa)
- Moulton Niguel Water District (MNWD)
- Orange County Water District (OCWD)
- Santa Margarita Water District (SMWD)
- Serrano Water District (Serrano)
- South Coast Water District (SCWD)
- Golden State Water Company (GSWC)
- Trabuco Canyon Water District (TCWD)
- Yorba Linda Water District (YLWD)



MWDOC Service Area and Member Agencies

Figure 1-2: Regional Location of Urban Water Supplier

Orange County relies on numerous sources of water and water purveyors to meet the needs of its growing population, sources include imported water, groundwater, surface water, and recycled water.

Imported water provided by Metropolitan from Northern California and the Colorado River meet approximately half of the County's water needs. However, this dependence of 50 percent imported water does not apply evenly over the entire service area. South Orange County relies on imported water to meet approximately 95 percent of its water demand. The remaining five percent is provided by surface water, limited groundwater, and water recycling. North Orange County relies roughly 30 percent on imported water, as a result of their ability to rely on the Orange County Groundwater Basin to meet a majority of their demands.

OCWD manages the Orange County Groundwater basin. The groundwater basin, which underlies north and central Orange County, provides approximately 62 percent of the water needed in that area; with imported water meeting the remaining balance of the water demand. Groundwater is pumped by producers before being delivered to customers.

Figure 1-3 illustrates the water service organization in the MWDOC service area.

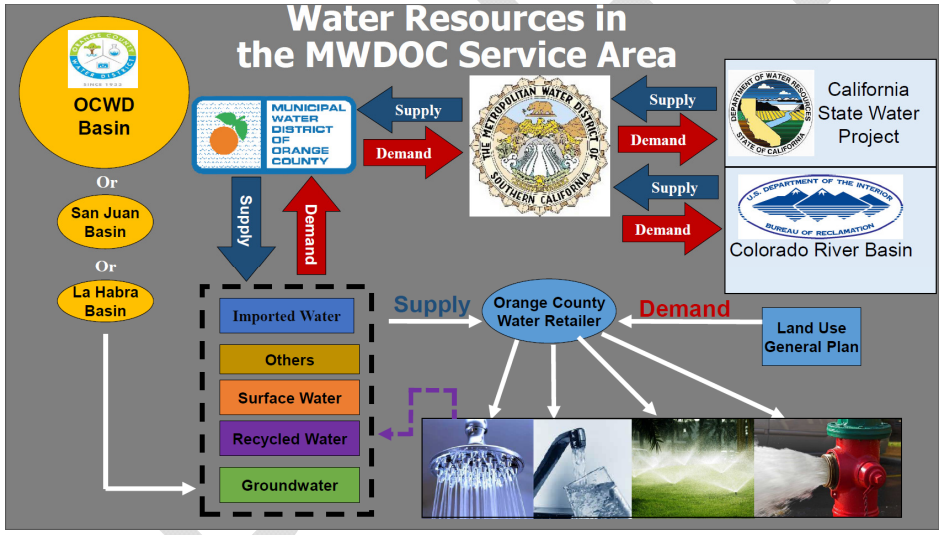


Figure 1-3: Water Service Organization in MWDOC's Service Area

2 WATER DEMAND

2.1 Overview

One of the main objectives of this UWMP is to provide an insight into MWDOC's future water demands. This section describes MWDOC service area's current and future water demands, factors that influence demands, and the methodology used to forecast of future water demands over the next 25 years. In addition, to satisfy SBx7-7 requirements for the Regional Alliance, this section provides details of MWDOC's SBx7-7 compliance method selection, baseline water use calculation, and 2015 and 2020 water use targets.

Similar to all of California, MWDOC's urban water demands has been largely shaped by Governor's Emergency Regulations. This is the result of one of the most severe droughts in California's history, requiring a collective reduction in statewide urban water use of 25 percent by February 2016, with each agency in the state given a specific reduction target by DWR. In response to the Governor's mandate, MWDOC's retail agencies carried out aggressive outreach efforts and implemented higher (more restrictive) stages of their water conservation ordinance.

As shown below, MWDOC service area's municipal and industrial (M&I) water use for the fiscal year (FY) 2014-15 totaled 432,276 AF. This is roughly the same amount of water used 25 years ago (1990-91); all the while the service area's population has grown 32 percent since 1990 as shown on Figure 2-1.

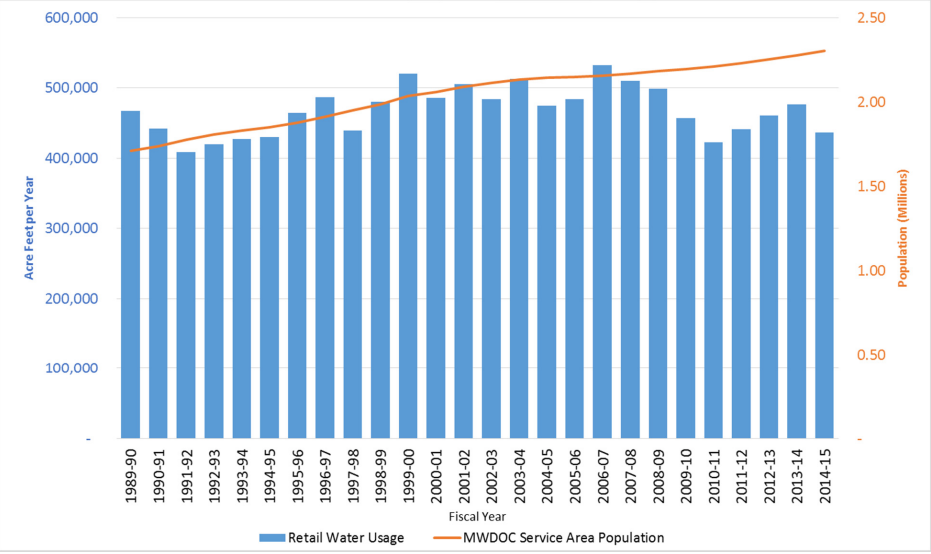


Figure 2-1: MWDOC's Service Area Historical Water Demand and Population

2.2 Factors Affecting Demand

Water demands within MWDOC's service area are dependent on many factors such as local climate conditions, demographics, land use characteristics, and economics. Below is a description of factors that influence water demand.

2.2.1 Climate Characteristics

MWDOC's service area is located within the South Coast Air Basin (SCAB) that encompasses all of Orange County, as well as the urban areas of Los Angeles, San Bernardino, and Riverside Counties. The SCAB climate is characterized by southern California's "Mediterranean" climate: a semi-arid environment with mild winters, warm summers and moderate rainfall.

Local rainfall and temperature greatly influence water usage in the service area. Most of the biggest variation in annual water demand are due to changes in rainfall and temperature. In Orange County, the average daily temperatures range from 58 ˚F in December and January to 74 ˚F in August in a typical year. The average annual precipitation is 14 inches, although the region is subject to significant variations in annual precipitation. The average evapotranspiration (ET) is almost 50 inches per year which is four times the annual average rainfall. This translates to a high demand for landscape irrigation for homes, commercial properties, parks, and golf courses.

It should also be noted that Metropolitan's core water supplies from the SWP and the CRA are significantly influenced by climate conditions in northern California and the Colorado River Basin, respectively. Both regions have been suffering from multi-year drought conditions due to record low precipitation which directly impact water supplies to southern California.

2.2.2 Demographics

MWDOC serves a 2015 population of 2,302,578 according to the California State University at Fullerton's Center of Demographics Research (CDR). MWDOC's population is representative of 28 retail agencies which include 14 cities and 14 water districts. The population is projected to increase 10 percent by 2040, representing an average growth rate of 0.4 percent per year.

Projected growth decreased slightly since the 2010 UWMP due to less than expected economic rebound. However, housing, in particular within the cities, is becoming denser with new multi-storied residential units. This is apparent in many of the cities located in the northern and central areas of MWDOC's service area. Whereas in South Orange County, the southern portion of MWDOC's service area, there still remains open land suitable for further development and growth. Table 2-1 shows the population projections in five-year increments out to 2040 within MWDOC's service area.

Table 2-1: Current and Projected MWDOC Service Area Population

Wholesale: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	2,302,578	2,409,256	2,470,451	2,505,284	2,527,230	2,533,088
NOTES: Center for Demographic Research at California State University, Fullerton, 2015						

As shown below in Table 2-2, the number of Housing Units in the MWDOC service area is expected to increase by 11.7 percent in the next 25 years from 791,404 in 2015 to 883,864 in 2040. While the number of persons per household is projected to remain relatively flat, urban employment in the service area is expected to rise by 13.5 percent over the next 25 years.

Table 2-2: MWDOC Service Area Demographics

MWDOC Service Area Demographics						
Demographics	2015	2020	2025	2030	2035	2040
Occupied Housing Units	**791,404**	**814,115**	**836,907**	**849,545**	**862,183**	**883,864**
Single Family	525,735	538,990	547,622	551,054	560,304	569,960
Multi-Family	265,668	275,125	289,285	298,491	301,879	313,903
Persons per Household	**2.89**	**2.91**	**2.89**	**2.89**	**2.85**	**2.89**
Urban Employment	**1,150,840**	**1,174,471**	**1,207,065**	**1,230,646**	**1,259,511**	**1,305,817**
Source: Metropolitan 2015 UWMP						

2.3 Direct and Indirect Water Use

There are two types of water use in Orange County. “Direct use” is the consumption of water directly piped from treatment facilities or wells to homes, commercial, institutional, and industrial buildings, landscape, and agriculture. “Indirect use” is the use of water to replenish groundwater basins and to serve as a hydrologic barrier against seawater intrusion. Although this water is used to fill the groundwater basins or act as a seawater barrier it will eventually become a future source of supply for Orange County residents, thus an indirect use.

Integrating the two usages of water in the planning process can be confusing and misleading and does not necessarily reflect the actual level of consumptive water demand in the region. In practice, the two types of water usage are often shown separately. The following subsections will discuss these two types of uses separately.

2.3.1 Direct Use – Municipal/Industrial and Agricultural Demands

Direct water use in Orange County includes municipal, industrial, and agricultural use. It represents on average approximately 90 percent of MWDOC's total demands. Demands for direct use are met through imported water, groundwater, local surface water, and recycled water. M&I demands represent the full spectrum of water use within a region, including residential and commercial, industrial, institutional (CII), as well as un-metered uses (e.g. hydrant flushing, fire-fighting). Agricultural demands represent less than 1 percent of the total direct use. It has significantly decreased over the years due to development and growth within the service area.

Direct Use water demands total 432,276 AF in FY 2014-15, roughly 36,000 AF or 12 percent less than the 10-year average. This decrease is the result of recent statewide water conservation mandates imposed on retail agencies throughout the state. While MWDOC's service area M&I demands are expected to return to average, conservation and public awareness will likely keep future demands increases relative low.

2.3.2 Indirect Use – Replenishment and Barrier Demands

Indirect water use in Orange County includes water to replenish groundwater basins and to serve as a barrier against seawater intrusion. It represents on average 10 percent of MWDOC's total demands. Most, if not all of the indirect water use delivered is for managing and replenishing the Orange County Groundwater Basin. This water is purchased by the OCWD, a special district created by the state and governed by a ten-member Board of Directors to protect, manage, and replenish the Orange County Groundwater Basin with purchased imported water, storm water, and recycled water. OCWD further protects the groundwater basin from seawater intrusion through the injection of imported and recycled water along the coast, known as the Talbert Injection Barrier.

Since demands for replenishment of the groundwater basin storage and seawater barriers are driven by the availability of supply for Orange County, the demand forecast for this type of use is based on the projection of the following supplies under normal conditions:

- Santa Ana River Flows;
- Incidental Recharge;
- Imported supplies from Metropolitan; and
- Recycled supplies for replenishment & seawater barrier use.

In addition to Replenishment and Barrier demands, MWDOC also provides imported water to meet the needs of surface water demands, such as Irvine Lake. The water delivered to Irvine Lake is used for both consumptive and storage water purposes. Imported water delivered into Irvine Lake can held for a short or long periods of time to be later delivered for consumptive use. On average, surface water demands total 7,300 AFY.

Figure 2-2 shows the historical demand of imported water for indirect consumption in MWDOC's service area.

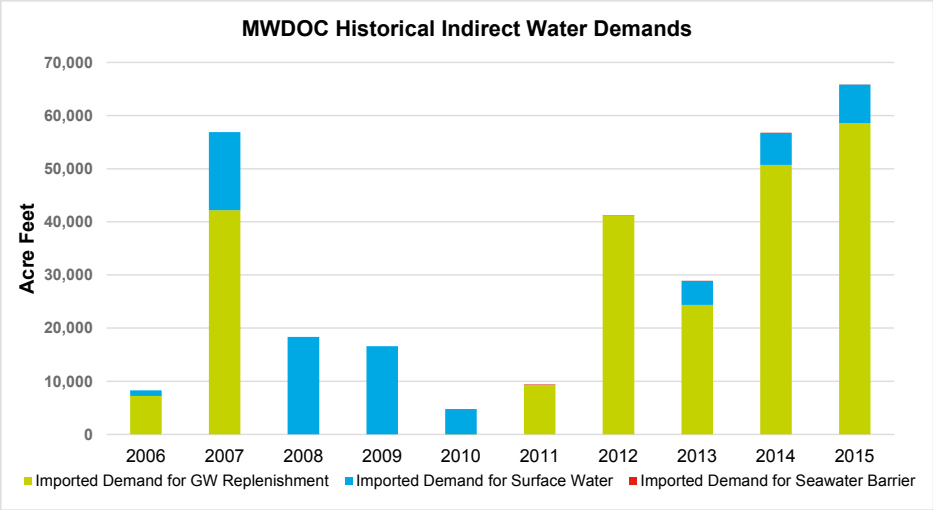


Figure 2-2: MWDOC Historical Indirect Water Demands

2.4 MWDOC Demand Projections

MWDOC's service area total retail water demand in FY 2014-2015 was 499,120 AF, which was met through a combination of 45 percent groundwater, 45 percent imported water, 2 percent surface water, and 8 percent recycled water. This includes both direct and indirect water use. Under normal conditions, total retail water demands are projected to increase to 515,425 AF by the year 2040 or 3.27 percent over the next 25 years. This demand projection comes from MWDOC's Orange County (OC) Reliability Study that considered such factors as current and future demographics, future conservation measures, and ground & surface water needs. Below is a detail description of the methodology used to calculated MWDOC's demand projections.

2.4.1 Demand Projection Methodology

The water demand projections were an outcome of the Orange County (OC) Reliability Study led by MWDOC where demand projections were divided into three regions within Orange County: Brea/La Habra, Orange County Groundwater Basin, and South County. The demand projections were obtained based on multiplying a unit water use factor and a demographic factor for three water use sectors, including single-family and multi-family residential (in gallons per day per household), and non-residential (in gallons per day per employee). The unit water use factors were based on a survey of Orange County water agencies (FY 2013-14) and represent a normal weather, normal economy, and non-drought condition. Additionally, MWDOC worked with OCWD to determine groundwater replenishment and seawater barrier demands. MWDOC also worked with Metropolitan to obtain projections on employment

and economic growth in the MWDOC service area, which was taken into account when developing the demand projections.

Also included was the effects of water conservation on demand projections. Three trajectories were developed representing three levels of conservation: 1) continued with existing levels of conservation (lowest conservation), 2) addition of future passive measures and active measures (baseline conservation), and 3) aggressive turf removal program - 20 percent removal by 2040 (aggressive conservation). The second level of conservation, i.e. baseline demand projection, was selected for the 2015 UWMP. The baseline scenario assumes the implementation of future passive measures affecting new developments, including the Model Water Efficient Landscape, plumbing code efficiencies for toilets, and expected plumbing code for high-efficiency clothes washers. It also assumes the implementation of future active measures, assuming the implementation of Metropolitan incentive programs at historical annual levels seen in Orange County.

The OC Reliability Study also considered the drought impacts on demands by applying the assumption that water demands will bounce back to 85 percent of 2014 levels i.e. pre-drought levels by 2020 and 90 percent by 2025 ~~without future conservation~~, and continue at 90 percent of unit water use through 2040. The unit water use factor multiplied by a demographic factor yields demand projections without new conservation. To account for new conservation, projected savings from new passive and active conservation were subtracted from these demands. Figure 2-3 shows MWDOC's historical and future demand forecast.

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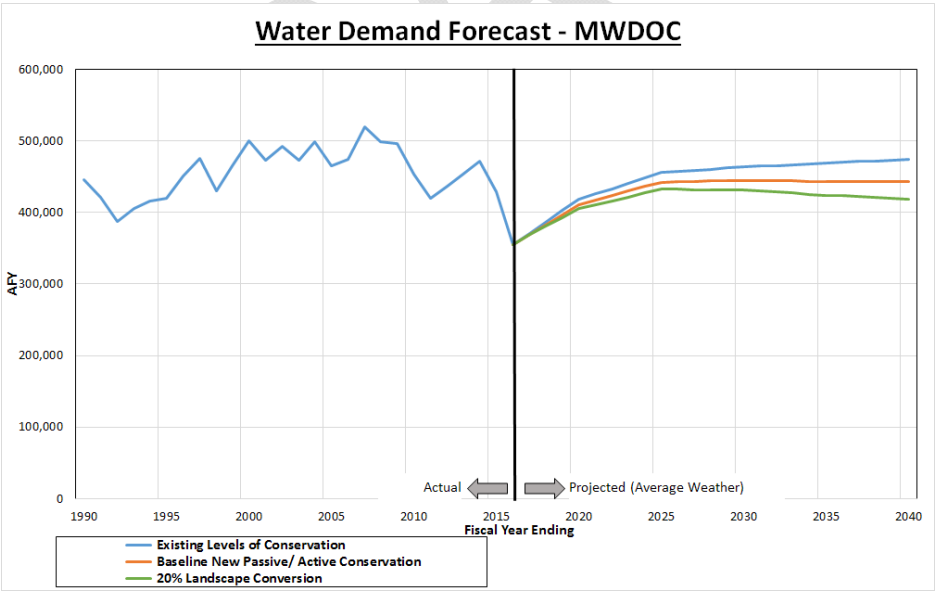
Figure 2-3: MWDOC Water Demand Forecast



2.4.2 25 Year Total ~~Retail~~ Demand Projections

Based on the OC Reliability Study Demand methodology, MWDOC's total ~~retail~~ water demands for the next 25 years are shown in Table 2-3.

Table 2-3: MWDOC Service Area Total ~~Retail~~ Demands – Current and Projected (AFY)

MWDOC Service Area Total ~~Retail~~ Demands – Projected (AFY)						
Water Source	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
OCWD Basin GW	202,403	196,035	207,383	208,510	208,438	208,665
Non-OCWD GW	20,036	27,297	27,477	27,477	27,477	27,477
Recycled	41,280	49,415	58,157	63,546	66,344	66,842
Surface Water	9,893	5,000	5,000	5,000	5,000	5,000
Imported Water (Retail M&I)	158,664	132,826	144,254	140,203	135,913	135,135
Total MWDOC Direct-Use Water Demand	**432,276**	**410,573**	**442,271**	**444,735**	**443,171**	**443,119**
Imported Demand for Surface Water	8,227	7,306	7,306	7,306	7,306	7,306
Imported Demand for GW Replenishment	58,617	65,000	65,000	65,000	65,000	65,000
Total MWDOC Indirect-Use Water Demand	**499,120**	**482,879**	**514,577**	**517,041**	**515,477**	**515,425**

The demand data presented in this section accounts for additional future passive measures and active measures. Passive savings are water savings as a result of codes, standards, ordinances and public outreach on water conservation and higher efficiency fixtures. Active savings are water savings as a result of water conservation rebates, programs, and incentives.

As described in previous sections, MWDOC provides only imported water to its service area. Table 2-4 below shows MWDOC's total projected demand of imported water.

Table 2-4: MWDOC's Total Imported Water Demands (AFY)

MWDOC's Total Imported Water Demands (AFY)						
	2015	2020	2025	2030	2035	2040
M&I Water Demands	158,664	132,826	144,254	140,203	135,913	135,135
Groundwater Replenishment and Surface Water Demands	66,844	72,306	72,306	72,306	72,306	72,306
Recycled Water	0	0	0	0	0	0
TOTAL MWDOC IMPORTED WATER DEMAND	**225,508**	**205,132**	**216,560**	**212,509**	**208,219**	**207,441**
NOTES: Includes all M&I as well as GW replenishment and surface water demands						

2.5 SBx7-7 Requirements

The Water Conservation Act of 2009, also known as SBx7-7, signed into law on February 3, 2010, requires the State of California to reduce urban water use by 20 percent by the year 2020. To achieve this each retail urban water supplier must determine baseline water use during their baseline period and target water use for the years 2015 and 2020 to meet the state's water reduction goal. Retail water suppliers are required to comply with SBx7-7 individually or as a region in collaboration with other retail water suppliers, or demonstrate they have a plan or have secured funding to be in compliance, in order to be eligible for water related state grants and loans on or after July 16, 2016.

As a wholesale water supplier, MWDOC is not required to establish a baseline or set targets for daily per capita water use. However, it is required to provide an assessment of its present and proposed future measures, programs and policies that will help its retail water suppliers achieve their SBx7-7 water use reduction targets. One of the ways MWDOC is assisting its retail agencies is by leading the coordination of Orange County Regional Alliance for all of the retail agencies in Orange County. MWDOC's role is to assist each retail water supplier in Orange County in analyzing the requirements and establishing their baseline and target water use, as guided by DWR (DWR, Technical Methodologies, February 2011[1]).

The following sections describe the efforts by MWDOC to assist retail agencies in complying with the requirements of SBx7-7, including the formation of a Regional Alliance to provide additional flexibility to all water suppliers in Orange County. This section also includes the documentation off~~or~~ calculations that ~~will~~ allow retail water suppliers to use recycled water for groundwater recharge (indirect reuse) to offset a portion of their potable demand when meeting the regional as well as individual water use targets for compliance purposes. A discussion of programs ~~intended to be~~ implemented to support retail agencies in achieving their per capita water reduction goals is covered in Section 4 – Demand Management Measures of this UWMP.

2.5.1 Orange County 20x2020 Regional Alliance

MWDOC in collaboration with all of its retail agencies as well as the Cities of Anaheim, Fullerton, and Santa Ana, has created the Orange County 20x2020 Regional Alliance in an effort to create flexibility in meeting the daily per capita water use targets. This Regional Alliance allows all of Orange County to benefit from regional investments, such as the Groundwater Replenishment System (GWRS), recycled water, and water conservation programs. The members of the Orange County 20x2020 Regional Alliance are shown in Table 2-5.

[1] An *Updated Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use* document is pending DWR management approval and is expected in April 2016.

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Table 2-5: Members of Orange County 20x2020 Regional Alliance

Orange County 20x2020 Regional Alliance	
Anaheim	Moulton Niguel Water District
Brea	Newport Beach
Buena Park	Orange
East Orange County Water District	San Clemente
El Toro WD	San Juan Capistrano
Fountain Valley	Santa Ana
Fullerton	Santa Margarita Water District
Garden Grove	Seal Beach
Golden State Water Company	Serrano Water District
Huntington Beach	South Coast Water District
Irvine Ranch Water District	Trabuco Canyon Water District
La Habra	Tustin
La Palma	Westminster
Laguna Beach County Water District	Yorba Linda Water District
Mesa Water District	

Within a Regional Alliance, each retail water supplier will have an additional opportunity to achieve compliance under either~~both~~ an individual target or~~and~~ a regional water use target.

- If the Regional Alliance meets its water use target on a regional basis, all agencies in the alliance are deemed compliant.
- If the Regional Alliance fails to meet its water use target, each individual supplier will have an opportunity to meet their water use targets individually.

Individual water suppliers in the Orange County 20x2020 Regional Alliance will state their participation in the A~~a~~lliance, and include the regional 2015 and 2020 water use targets in their individual UWMPs.

As the reporting agency for the Orange County 20x2020 Regional Alliance, MWDOC has documented the calculations for the regional urban water use reduction targets. MWDOC will also provide annual monitoring and reporting for the region on progress toward the regional per capita water use reduction targets.

2.5.2 Water Use Target Calculations

To preserve maximum flexibility in the Orange County 20x2020 Regional Alliance, each water supplier in the Regional Alliance first calculates its individual target in its retail UWMP as if it were complying individually. Then, the individual targets are weighted by each supplier's population and averaged over all members in the alliance to determine the regional water use target.

2.5.2.1 Retail Agency Compliance Targets

As described above, the first step in calculating a regional water use target is to determine each water supplier's individual target. DWR has established four target options for urban retail water suppliers to choose from in calculating their water use reduction targets under SBx7-7. The four options are as follows:

- *Option 1* requires a simple 20 percent reduction from the baseline by 2020 and 10 percent by 2015.
- *Option 2* employs a budget-based approach by requiring an agency to achieve a performance standard based on three metrics
  - Residential indoor water use of 55 gallons per capita per day (GPCD)
  - Landscape water use commensurate with the Model Landscape Ordinance
  - 10 percent reduction in baseline CII water use
- *Option 3* is to achieve 95 percent of the applicable state hydrologic region target as set forth in the State's 20x2020 Water Conservation Plan.
- *Option 4* requires the subtraction of Total Savings from the baseline GPCD:
  - Total savings includes indoor residential savings, meter savings, CII savings, and landscape and water loss savings.

MWDOC has analyzed each of these options, and has worked with all retail agencies in Orange County to assist them in selecting the most suitable option in 2010 and 2015. In 2015, retail water agencies may update their 2020 water use target using a different target method than was used in 2010. However, the target method is not permitted to change after the 2015 UWMP is submitted.

2.5.2.2 Regional Targets Calculation and 2015 Compliance

The regional water use targets for the Orange County 20x2020 Regional Alliance are calculated by weighting the individual retail agency water use targets by population and averaging them over all members of the alliance. The calculation of the baseline water use and water use targets in the 2010 UWMP was based on the 2000 U.S. Census population numbers obtained from CDR. In 2015, the baseline water use and water use targets for all retail agencies have been revised using population numbers based on the 2010 U.S. Census obtained from CDR in 2012.

The regional alliance target calculation is provided below in Table 2-5. Column (1) shows the 2015 population for each individual supplier. The individual targets for each supplier is provided in column (2) for the interim 2015 targets, and column (4) for the final 2020 targets.

To calculate the weighted averages for each retail water supplier, the population is multiplied by the individual targets to get a weighted total for each individual supplier. This is found in column (3) for the interim 2015 targets and in column (5) for the final 2020 targets. The regional targets for the Orange County 20x2020 Regional Alliance are then derived as the sum of the individual weighted averages divided by the total population for a regional alliance.

For example, the 2020 water use target for the City of Brea is 222 GPCD, and the 2015 population is 43,093. By multiplying this 2020 target by the population, the result is a weighted average of 9,513,018. The sum of the weighted averages for all members of the Orange County 20x2020 Regional Alliance is 479,137,952. By dividing this weighted total by the regional population of 3,138,846, the resulting regional 2020 water use target is 158 GPCD.

The source of the information in Table 2-6, including the population figures, is from within the individual 2015 UWMPs for each water supplier in the Orange County 20x2020 Regional Alliance.

Table 2-6: Calculation of Regional Urban Water Use Targets for Orange County 20x2020 Regional Alliance

Calculation of Regional Compliance Daily Per Capita Water Use					
Orange County 20x2020 Regional Alliance	**(1) 2015 Population**	**(2) Individual GPCD 2015**	**(3) Weighted Total 2015**	**(4) Individual Targets 2020**	**(5) Weighted Total 2020**
Brea	43,093	222	9,581,501	221	9,513,018
Buena Park	82,791	121	10,034,039	158	13,102,421
East Orange CWD RZ	3,257	206	671,970	232	756,925
El Toro WD	48,797	158	7,704,992	163	7,951,415
Fountain Valley	57,908	122	7,053,791	142	8,196,877
Garden Grove	176,649	102	17,999,322	142	25,004,666
Golden State WC	169,573	109	18,449,432	142	24,003,058
Huntington Beach	198,429	105	20,776,526	142	28,087,625
Irvine Ranch WD	379,510	109	41,456,743	170	64,663,229
La Habra	61,843	138	8,555,901	150	9,292,066
La Palma	16,030	91	1,452,524	140	2,243,890
Laguna Beach CWD	20,311	160	3,250,029	163	3,308,708
Mesa Water	107,588	114	12,254,327	145	15,552,825
Moulton Niguel WD	170,326	140	23,918,392	173	29,410,570
Newport Beach	65,777	177	11,640,781	203	13,322,487
Orange	138,987	145	20,118,020	181	25,089,782
San Clemente	51,385	157	8,065,839	153	7,853,609
San Juan Capistrano	38,829	178	6,908,041	183	7,116,874
Santa Margarita WD	156,949	152	23,858,542	169	26,471,025
Seal Beach	23,706	110	2,598,237	142	3,355,584
Serrano WD	6,464	219	1,415,140	386	2,492,565
South Coast WD	35,004	151	5,280,304	150	5,261,051
Trabuco Canyon WD	12,712	208	2,649,553	200	2,539,757
Tustin	68,088	122	8,286,943	151	10,294,836
Westminster	93,785	93	8,706,701	130	12,195,988
Yorba Linda WD	74,787	203	15,195,992	237	17,698,918
Anaheim	360,142	128	45,964,321	162	58,460,008
Fullerton	140,827	146	20,546,762	179	25,141,917
Santa Ana	335,299	82	27,471,738	116	38,756,257
Regional Alliance Total	3,138,846	**125**	391,866,402	**158**	497,137,952

* Calculated using the first option for calculating regional compliance from page 53 of the Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use, dated October

Table 2-7 provides the regional urban water use targets for the Orange County 20x2020 Regional Alliance – the 2015 target is 178 GPCD and the 2020 target is 158 GPCD. The actual 2015 GPCD achieved by the regional alliance is 125 GPCD indicating that not only has the region met its 2015 target but it has already well below its 2020 water use target. This is indicative of the collective efforts of MWDOC and retail agencies in reducing water use in the region. Note, the target and actual GPCD values listed include appropriate deductions for recycled water used for indirect potable reuse as detailed below.

Table 2-7: Urban Water Use Targets for Orange County 20x2020 Regional Alliance

	2015 GPCD	2020 Target
Orange County 20X2020 Regional Alliance	125	158

2.5.2.3 Deducting Recycled Water Used for Indirect Potable Reuse

SBx7-7 allows urban retail water suppliers to calculate a deduction for recycled water entering their distribution system indirectly through a groundwater source. Individual water suppliers within the Orange County Groundwater Basin have the option of choosing this deduction to account for the recharge of recycled water into the Orange County Groundwater Basin by OCWD, historically through Water Factory 21, and more recently by GWRS. These deductions also benefit all members of the Orange County 20x2020 Regional Alliance.

MWDOC has provided the documentation for the calculations of this deduction to assist retail water suppliers if they choose to include recycled water for indirect potable reuse in their individual targets. This calculation is applied as a deduction from the water supplier's calculation of Gross Water Use.

Table 2-8 provides the calculation deducting recycled water for indirect potable reuse for Orange County Groundwater Basin Agencies. Because year-to-year variations can occur in the amount of recycled water applied in a groundwater recharge operations, a previous five year average of recharge is used, as found in column (1). To account for losses during recharge and recovery, a factor of 96.5 percent is applied in column (2).

After accounting for these losses, the estimated volume of recycled water entering the distribution system is calculated in column (3).

In column (4), the annual deduction for recycled water for indirect potable reuse is expressed as a percentage of the total volume of water extracted from the Orange County Groundwater Basin in that year. This is the annual percentage of total OCWD basin production that is eligible for a deduction. For individual water suppliers in the OCWD Basin, the annual deduction is calculated as their basin pumping in a given year multiplied by the value in column (4).

For example, if Agency A pumped 10,000 AF of water from the OCWD Basin in Fiscal Year 2004-05, then 1.47 percent of that total production would be deducted from the agency's calculation of Gross Water Use for that year as found in column (4). This equates to a deduction of 147 AF.

Table 2-8: Calculation of Annual Deductible Volume of Indirect Recycled Water Entering Distribution System

Deduct Recycled Water Used for Indirect Potable Reuse [1]						
Fiscal Year Ending	Total Groundwater Recharge	(1) 5-Year Average Recharge (Acre-Feet)	(2) Loss Factor for Recharge & Recovery	(1) x (2) = (3) Volume Entering Distribution System (Acre-Feet)	Total Basin Production	(4) Percent of Total Basin Production
1990	6,498	6,498	96.5%	6,271	229,878	2.73%
1991	6,634	6,498	96.5%	6,271	235,532	2.66%
1992	6,843	6,566	96.5%	6,336	244,333	2.59%
1993	8,161	6,658	96.5%	6,425	243,629	2.64%
1994	5,042	7,034	96.5%	6,788	237,837	2.85%
1995	2,738	6,636	96.5%	6,403	276,096	2.32%
1996	4,282	5,884	96.5%	5,678	302,273	1.88%
1997	4,389	5,413	96.5%	5,224	310,217	1.68%
1998	2,496	4,922	96.5%	4,750	297,726	1.60%
1999	3,489	3,789	96.5%	3,657	322,476	1.13%
2000	5,774	3,479	96.5%	3,357	320,250	1.05%
2001	2,067	4,086	96.5%	3,943	323,129	1.22%
2002	4,143	3,643	96.5%	3,515	322,590	1.09%
2003	3,867	3,594	96.5%	3,468	274,927	1.26%
2004	1,784	3,868	96.5%	3,733	272,954	1.37%
2005	4,156	3,527	96.5%	3,404	232,199	1.47%
2006	4,086	3,203	96.5%	3,091	215,172	1.44%
2007	218	3,607	96.5%	3,481	284,706	1.22%
2008	17,792	2,822	96.5%	2,723	351,622	0.77%
2009	54,261	5,607	96.5%	5,411	310,586	1.74%
2010	65,950	16,103	96.5%	15,539	273,889	5.67%
2011	66,083	28,461	96.5%	27,465	248,659	11.05%
2012	71,678	40,861	96.5%	39,431	266,066	14.82%
2013	72,877	55,153	96.5%	53,223	298,175	17.85%
2014	66,167	66,170	96.5%	63,854	318,967	20.02%
2015	76,546	68,551	96.5%	66,152	296,292	22.33%
2016						
2017						
2018						
2019						
2020						

[1] Indirect is recycled water for groundwater recharge through spreading and injection of GWRS and Water Factory 21. The yearly totals are apportioned among the OCWD Basin agencies on the basis of groundwater production over a five year rolling average.

[2] Loss factor provided by OCWD, includes loss over county lines to LA Basin.

The deductible amount of indirect recycled water increased four folds from 2010 to approximately 66,000 AF in 2015 as a result of the full production from GWRS. OCWD has additional expansion plans for GWRS, which are expected to ~~may~~ further increase the deductible amount of indirect recycled water up to approximately 98~~145~~,4~~7~~00 AF.

3 WATER SOURCES AND SUPPLY RELIABILITY

3.1 Overview

Water supplies in MWDOC's service area are from local and imported sources. MWDOC delivers water, purchased from Metropolitan, to its retail agencies in order to supplement their local supplies. In FY 2014-15, MWDOC supplied approximately 158,664 AFY of imported water to its retail agencies for M&I purposes and 66,844 AFY for groundwater replenishment and surface water purposes. Imported water represents approximately 35 percent of total water supply in the MWDOC service area. Sources of Metropolitan's imported water include the CRA and SWP.

Local supplies developed by individual retail agencies, primarily groundwater, presently account for approximately 65 percent of the service area's water supplies. Local supplies include groundwater, recycled water, and surface water. The primary groundwater basin, Orange County Groundwater Basin is located in the northern portion of MWDOC's service area.

Figure 3-1 shows a breakdown of all sources within MWDOC's service area. Although MWDOC only delivers imported water to its retail agencies, other sources of water are obtained locally and are specific to each retail agency. Note: GWRS Supplies are included as part of groundwater pumping numbers.

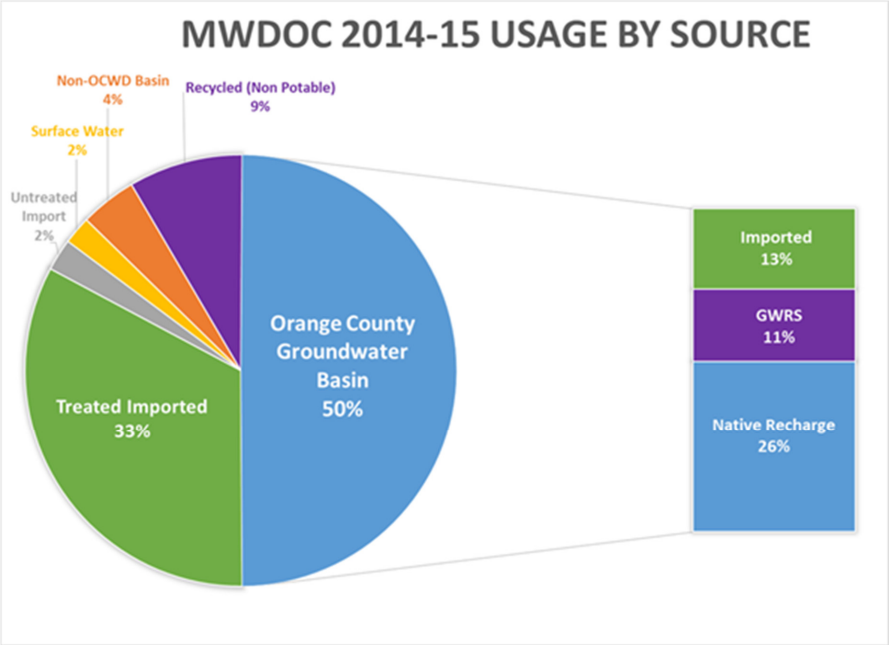

Figure 3-1: Water Supply Sources within MWDOC

MWDOC and its retail agencies collectively work together to improve the water reliability within the service area by developing additional local supplies and by implementing water use efficiency efforts. MWDOC works in collaboration with two primary agencies – Metropolitan and OCWD to insure a safe and high quality water supply.

Figure 3-2 provides a summary illustrating the different water sources in MWDOC service area and for all of Orange County:

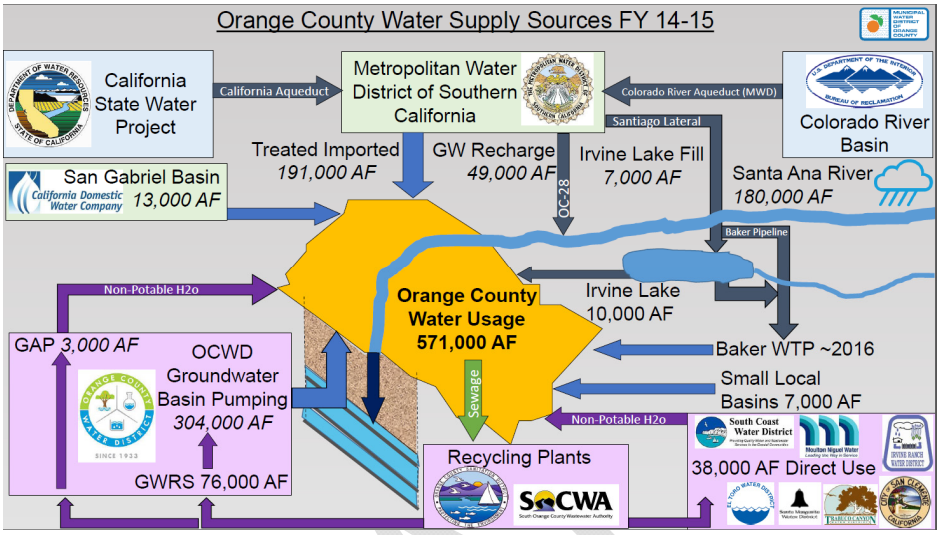

Figure 3-2: Orange County Water Supply Sources

The following sections provide a detailed discussion of MWDOC's water source portfolio as well as projections for the next 25 years. In addition, this section will evaluate MWDOC's projected supply and demand under various hydrological conditions to determine its supply reliability during a 25 year planning horizon.

3.2 Metropolitan Water District of Southern California

Metropolitan is the largest water wholesaler for domestic and municipal uses in California, serving approximately 21.9 million customers. Metropolitan wholesales imported water supplies to 26 member cities and water districts in six southern California counties. Its service area covers the southern California coastal plain, extending approximately 200 miles along the Pacific Ocean from the City of Oxnard on the north to the international boundary with Mexico on the south. This encompasses 5,200 square miles and includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura counties. Approximately85 percent of the population from the aforementioned counties reside with Metropolitan's boundaries.

Metropolitan is governed by a Board of Directors comprised of 38 appointed individuals with a minimum of one representative from each of Metropolitan's 26 member agencies. The allocation of directors and voting rights are determined by each agency's assessed valuation. Each member of the Board shall be entitled to cast one vote for each ten million dollars ($10,000,000) of assessed valuation of property taxable for district purposes, in accordance with Section 55 of the Metropolitan Water District Act (Metropolitan Act). Directors can be appointed through the chief executive officer of the member agency

or by a majority vote of the governing board of the agency. Directors are not compensated by Metropolitan for their service.

Metropolitan is responsible for importing water into the region through its operation of the CRA and its contract with the State of California for SWP supplies. Major imported water aqueducts bringing water to southern California are shown in Figure 3-3. Member agencies receive water from Metropolitan through various delivery points and pay for service through a rate structure made up of components including uniform volumetric rates, capacity charges and readiness to serve charges. Member agencies provide estimates of imported water demand to Metropolitan annually in April regarding the amount of water they anticipate they will need to meet their demands for the next five years.

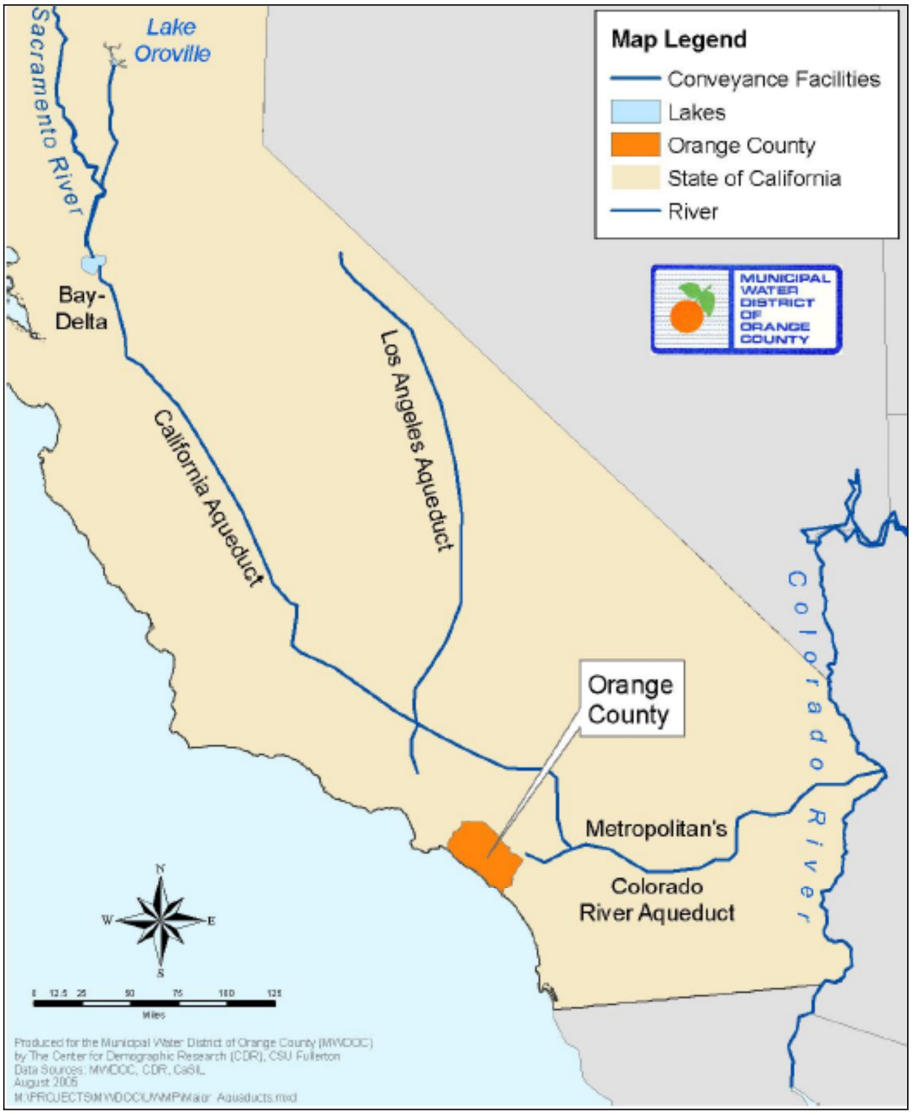

Figure 3-3: Major Aqueducts Bringing Water to Southern California

In Orange County, MWDOC and the cities of Anaheim, Fullerton, and Santa Ana are Metropolitan member agencies that purchase imported water directly from Metropolitan. Furthermore, MWDOC purchases both treated potable and untreated water from Metropolitan to supplement its retail agencies' local supplies. Figure 3-4 illustrates the Metropolitan feeders and major transmission pipelines that deliver water within Orange County (Metropolitan, 2015 Draft UWMP, March 2016).

Figure 3-4: Metropolitan Feeders and Transmission Mains Serving Orange County

3.2.1 Metropolitan's 2015 Urban Water Management Plan

Metropolitan's 2015 Urban Water Management Plan reports on its water reliability and identifies projected supplies to meet the long-term demand within its service area. The Metropolitan 2015 UWMP discusses the current water supply conditions and long-term plans for supply implementation and continued development of a diversified resource mix. It describes the programs being implemented such as: the CRA, SWP, and Central Valley storage/transfer programs, water use efficiency programs, local resource projects, and in-region storage that will enable the region to meet its water supply needs. Metropolitan's 2015 UWMP also presents Metropolitan's supply capacities from 2020 through 2040 for average year, single dry-year, and multiple dry-years as specified in the UWMP Act.

Information concerning Metropolitan's UWMP, including the background, associated challenges, and long-term development of programs for each of Metropolitan's supply sources and capacities have been summarized and included herein. Additional information on Metropolitan can be found directly in Metropolitan's 2015 UWMP, http://www.mwdh2o.com/PDF_About_Your_Water/2015_UWMP.pdf

3.2.2 Colorado River Aqueduct

The Colorado River was Metropolitan's original source of water after Metropolitan's establishment in 1928. The CRA, which is owned and operated by Metropolitan, transports water from the Colorado River to its terminus at Lake Mathews in Riverside County. The actual amount of water per year that may be conveyed through the CRA to Metropolitan's member agencies is subject to the availability of Colorado River water for delivery.

The CRA includes supplies from the implementation of the Quantification Settlement Agreement and related agreements to transfer water from agricultural agencies to urban uses. The 2003 Quantification Settlement Agreement enabled California to implement major Colorado River water conservation and transfer programs, stabilizing water supplies for 75 years and reducing the state's demand on the river to its 4.4 MAF entitlement. Colorado River transactions are potentially available to supply additional water up to the CRA capacity of 1.25 million acre-feet (MAF) on an as-needed basis. Water from the Colorado River or its tributaries is available to users in California, Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as well as to Mexico. California is apportioned the use of 4.4 MAF of water from the Colorado River each year plus one-half of any surplus that may be available for use collectively in Arizona, California, and Nevada. In addition, California has historically been allowed to use Colorado River water apportioned to but not used by Arizona or Nevada. Metropolitan has a basic entitlement of 550,000 AFY of Colorado River water, plus surplus water up to an additional 662,000 AFY when the following conditions exists (Metropolitan, 2015 Draft UWMP, March 2016):

- Water unused by the California holders of priorities 1 through 3
- Water saved by the Palo Verde land management, crop rotation, and water supply program
- When the U.S. Secretary of the Interior makes available either one or both:
    - Surplus water is available
    - Colorado River water is apportioned to but unused by Arizona and/or Nevada

Unfortunately, Metropolitan has not received surplus water for a number of years. The Colorado River supply faces current and future imbalances between water supply and demand in the Colorado River Basin due to long term drought conditions. Over the past 16 years (2000-2015), there have only been three years when the Colorado River flow has been above average (Metropolitan, 2015 Draft UWMP, March 2016). The long-term imbalance in future supply and demand is projected to be approximately 3.2 MAF by the year 2060.

Approximately 40 million people rely on the Colorado River and its tributaries for water with 5.5 million acres of land using Colorado River water for irrigation. Climate change will also affect future supply and demand as increasing temperatures may increase evapotranspiration from vegetation along with an increase in water loss due to evaporation in reservoirs, therefore reducing the available amount of supply from the Colorado River and exacerbating imbalances between increasing demands from rapid growth and decreasing supplies.

Four water supply scenarios were developed around these uncertainties, each representing possible water supply conditions. These four scenarios are as follow:

- **Observed Resampled:** future hydrologic trends and variability are similar to the past approximately 100 years.
- **Paleo Resampled:** future hydrologic trends and variability are represented by reconstructions of streamflow for a much longer period in the past (approximately 1,250 years) that show expanded variability.
- **Paleo Conditioned:** future hydrologic trends and variability are represented by a blend of the wet-dry states of the longer paleo-reconstructed period.
- **Downscaled General Circulation Model (GCM) Projected:** future climate will continue to warm, with regional precipitation and temperature trends represented through an ensemble of future downscaled GCM projections.

The Colorado River Basin Water Supply and Demand Study (Study) assessed the historical water supply in the Basin through two historical streamflow data sets, from the year 1906 through 2007 and the paleo-reconstructed record from 762 through 2005. The following are findings from the study:

- Increased temperatures in both the Upper and Lower Colorado River Basins since the 1970s has been observed.
- Loss of springtime snowpack was observed with consistent results across the lower elevation northern latitudes of the western United States. The large loss of snow at lower elevations strongly suggest the cause is due to shifts in temperature.
- The deficit between the two year running average flow and the long-term mean annual flow that started in the year 2000 is more severe than any other deficit in the observed period, at nine years and 28 MAF deficit.
- There are deficits of greater severity from the longer paleo record compared to the period from 1906 through 2005. One deficit amounted to 35 MAF through a span of 16 years.

- A summary of the trends from the observed period suggest declining stream flows, increases in variability, and seasonal shifts in streamflow that may be related to shifts in temperature.

Findings concerning the future projected supply were obtained from the Downscaled GCM Projected scenario as the other methods did not consider the impacts of a changing climate beyond what has occurred historically. These findings include:

- Increased temperatures are projected across the Basin with larger changes in the Upper Basin than in the Lower Basin. Annual Basin-wide average temperature is projected to increase by 1.3 degrees Celsius over the period through 2040.
- Projected seasonal trends toward drying are significant in certain regions. A general trend towards drying is present in the Basin, although increases in precipitation are projected for some higher elevation and hydrologically productive regions. Consistent and expansive drying conditions are projected for the spring and summer months throughout the Basin, although some areas in the Lower Basin are projected to experience slight increases in precipitation, which is thought to be attributed to monsoonal influence in the region. Upper Basin precipitation is projected to increase in the fall and winter, and Lower Basin precipitation is projected to decrease.
- Snowpack is projected to decrease due to precipitation falling as rain rather than snow and warmer temperatures melting the snowpack earlier. Areas where precipitation does not change or increase is projected to have decreased snowpack in the fall and early winter. Substantial decreases in spring snowpack are projected to be widespread due to earlier melt or sublimation of snowpack.
- Runoff (both direct and base flow) is spatially diverse, but is generally projected to decrease, except in the northern Rockies. Runoff is projected to increase significantly in the higher elevation Upper Basin during winter but is projected to decrease during spring and summer.

The following future actions must be taken to implement solutions and help resolve the imbalance between water supply and demand in areas that use Colorado River water (U.S. Department of the Interior USBR, Colorado River Basin Water Supply and Demand Study, December 2012):

- Resolution of significant uncertainties related to water conservation, reuse, water banking, and weather modification concepts.
- Costs, permitting issues, and energy availability issues relating to large-capacity augmentation projects need to be identified and investigated.
- Opportunities to advance and improve the resolution of future climate projections should be pursued.
- Consideration should be given to projects, policies, and programs that provide a wide-range of benefits to water users and healthy rivers for all users.

3.2.2.1 Background on Colorado River Aqueduct Supplies

Historically, Metropolitan's fifth priority rights under the Seven Party Agreement were satisfied with water allocated to Arizona and Nevada that these states did not use. Beginning in 1985, with the commencement of Colorado River water deliveries to the Central Arizona Project, year-to-year availability of Colorado River water to Metropolitan became uncertain. The Secretary of the Interior asserted that California's users of Colorado River water had to limit their use to a total of 4.4 MAF per year, plus any

available surplus water. Under the auspices of the State's Colorado River Board, these users developed a draft plan to resolve the problems, which was known as "California's Colorado River Water Use Plan" (California Plan).

The California Plan characterized how California would develop a combination of programs to allow the state to limit its annual use of Colorado River water to 4.4 MAF per year plus any available surplus water. The 2003 Quantification Settlement Agreement (QSA) among Imperial Irrigation District (IID), Coachella Valley Water District (CVWD), and Metropolitan is a critical component of this plan. It established a baseline water use for each of these agencies and facilitates the transfer of water from agricultural agencies to urban uses, and specifies that IID, CVWD, and Metropolitan would forbear use of water to permit the Secretary of the Interior to satisfy the uses of the non-encompassed present perfected rights (PPRs). The PPR holders include certain Indian reservation, federal wildlife refuges, and other users, some but not all of which are encompassed by the Seven Party Agreement.

3.2.2.2 Current Conditions of the Colorado River Aqueduct

On November 5, 2003, IID filed a validation action in Imperial County Superior Court, seeking a judicial determination that thirteen agreements associated with the IID/San Diego County Water Authority (SDCWA) water transfer and the QSA are valid, legal and binding. Other lawsuits also were filed challenging the execution, approval and subsequent implementation of the QSA on various grounds. One of the key issues was the constitutionality of the QSA Joint Powers Authority Agreement, pursuant to which IID, CVWD, and SDCWA agreed to commit $133 million toward certain mitigation costs associated with implementation of the transfer of 300 TAF of water conserved by IID pursuant to the QSA, and the State agreed to be responsible for any mitigation costs exceeding this amount. A final judgment was issued on February 11, 2015, holding that the State's commitment was unconditional in nature and, as such, violated the State's debt limitation under the California Constitution, and that eleven other agreements, including the QSA, also are invalid because they are inextricably interrelated with the QSA Joint Powers Authority Agreement and the funding mechanism it established to cover such mitigation costs.

Metropolitan, CVWD and SDCWA have filed appeals of the court's decision, which will stay the ruling pending outcome of the appeal. If the ruling stands, it could delay the implementation of programs authorized under the QSA or result in increased costs or other adverse impacts. The impact, if any, which the ruling might have on Metropolitan's water supplies cannot be adequately determined at this time.

3.2.2.3 Colorado River Programs and Long-Term Planning

Metropolitan has identified a number of programs that could be used to achieve the regional long-term development targets for the CRA and has entered into or is exploring agreements with a number of agencies as discussed below. These programs are described in greater detail in Metropolitan's 2015 UWMP.

Existing and proposed Colorado River Water Management Programs include:

- ***IID / Metropolitan Conservation Program*** - Under this program, Metropolitan has funded water efficiency improvements within IID's service area in return for the right to divert the water conserved by those investments.

- ***Palo Verde Land Management, Crop Rotation, and Water Supply Program*** - Under this program, participating farmers in Palo Verde Irrigation District (PVID) are paid to reduce their water use by not irrigating a portion of their land.
- ***Southern Nevada Water Authority (SNWA) and Metropolitan Storage and Interstate Release Agreement*** - Under this agreement, additional Colorado River supplies are made available to Metropolitan when there is space available in the CRA to receive the water. SNWA may call on Metropolitan to reduce is Colorado River water order to return this water no earlier than 2019, unless Metropolitan agrees otherwise.
- ***Lower Colorado Water Supply Project*** - Under this contract, Metropolitan receives, on an annual basis, Lower Colorado Water Supply Project water unused by the City of Needles and other entities with no rights or insufficient rights to use of Colorado River water in California.
- ***Lake Mead Storage Program*** - This program allows Metropolitan to storage "Intentionally Created Surplus" conserved through extraordinary conservation in Lake Mead.

3.2.2.4 Available Supplies on Colorado River Aqueduct

Metropolitan's current CRA program capabilities under average year, single dry year, and multiple dry year hydrologies are shown below in Table 3-1 (Metropolitan, Draft 2015 UWMP, March 2016). The projections essentially indicate that Metropolitan can achieve a full CRA whenever needed, by augmenting supplies from ICS, fallowing or other exchange opportunities. This analysis has not considered the potential for shortage declarations on the Colorado River under the condition that the Lake Mead elevation declines to 1000 feet; at this point, new provisions would need to be put into place to handle such a situation.

Table 3-1: Metropolitan Colorado River Aqueduct Program Capabilities

Colorado River Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2004)
Current Programs			
Basic Apportionment – Priority 4	550,000	550,000	550,000
IID/MWD Conservation Program	85,000	85,000	85,000
Priority 5 Apportionment (Surplus)	250,000	0	21,000
PVID Land Management, Crop Rotation, and Water Supply Program	130,000	130,000	130,000
Lower Colorado Water Supply Project	5,000	5,000	5,000
Lake Mead ICS Storage Program	400,000	400,000	400,000
Binational ICS	8,000	24,000	24,000
Forbearance for Present Perfected Rights	(2,000)	(2,000)	(2,000)
CVWD SWP/QSA Transfer Obligation	(35,000)	(35,000)	(35,000)
DWCV SWP Table A Obligation	(45,000)	(42,000)	(118,000)
DWCV SWP Table A Transfer Callback	23,000	22,000	61,000
DWCV Advance Delivery Account	22,000	20,000	57,000
SNWA Agreement Payback	0	0	(5,000)
Subtotal of Current Programs	***1,391,000***	***1,157,000***	***1,173,000***
Programs Under Development			
SNWA Interstate Banking Agreement	0	0	0
Additional Fallowing Programs	25,000	25,000	25,000
Subtotal of Proposed Programs	***25,000***	***25,000***	***25,000***
Additional Non-Metropolitan CRA Supplies			
SDCWA/IID Transfer	200,000	200,000	200,000
Coachella & All-American Canal Lining			
To SDCWA	82,000	82,000	82,000
To San Luis Rey Settlement Parties[1]	16,000	16,000	16,000
Subtotal of Non-Metropolitan Supplies	***298,000***	***298,000***	***298,000***
Maximum CRA Supply Capability[2]	**1,714,000**	**1,480,000**	**1,496,000**
Less CRA Capacity Constraint (amount above 1.20 MAF)	*(464,000)*	*(230,000)*	*(246,000)*
Maximum Expected CRA Deliveries[3]	**1,200,000**	**1,200,000**	**1,200,000**
Less Non-Metropolitan Supplies[4]	*(298,000)*	*(298,000)*	*(298,000)*
Maximum Metropolitan Supply Capability[5]	**902,000**	**902,000**	**902,000**

[1] Subject to satisfaction of conditions specified in agreement among Metropolitan, the United States, and the San Luis Rey Settlement Parties
[2] Total amount of supplies available without taking into consideration CRA capacity constraint.
[3] The Colorado River Aqueduct delivery capacity is 1.20 MAF annually.
[4] Exchange obligation for the SDCWA-IID transfer and exchange and the Coachella and All American Canal Lining projects.
[5] The amount of CRA water available to Metropolitan after meeting its exchange obligations.

3.2.3 State Water Project

3.2.3.1 Background

The SWP consists of a series of pump stations, reservoirs, aqueducts, tunnels, and power plants operated by DWR and is an integral part of the effort to ensure that business and industry, urban and suburban residents, and farmers throughout much of California have sufficient water. The SWP is the largest state-built, multipurpose, user-financed water project in the United States. Nearly two-thirds of residents in California receive at least part of their water from the SWP with approximately 70 percent of SWP's contracted water supply going to urban users and 30 percent to agricultural users. The primary purpose of the SWP is to divert and store water during wet periods in Northern and Central California and distribute it to areas of need in Northern California, the San Francisco Bay area, the San Joaquin Valley, the Central Coast, and southern California.

The availability of water supplies from the SWP can be highly variable. A wet water year may be followed by a dry or critically dry year and fisheries issues can restrict the operations of the export pumps even when water supplies are available.

The Sacramento-San Joaquin River Delta (Delta) is key to the SWP's ability to deliver water to its agricultural and urban contractors. All but five of the 29 SWP contractors receive water deliveries below the Delta (pumped via the Harvey O. Banks or Barker Slough pumping plants). However, the Delta faces many challenges concerning its long-term sustainability such as climate change posing a threat of increased variability in floods and droughts. Sea level rise complicates efforts in managing salinity levels and preserving water quality in the Delta to ensure a suitable water supply for urban and agricultural use. Furthermore, other challenges include continued subsidence of Delta islands, many of which are below sea level, and the related threat of a catastrophic levee failure as the water pressure increases, or as a result of a major seismic event.

Ongoing regulatory restrictions, such as those imposed by federal biological opinions (Biops) on the effects of SWP and the federal Central Valley Project (CVP) operations on certain marine life, also contributes to the challenge of determining the SWP's water delivery reliability. In dry, below-normal conditions, Metropolitan has increased the supplies delivered through the California Aqueduct by developing flexible CVP/SWP storage and transfer programs. The goal of the storage/transfer programs is to develop additional dry-year supplies that can be conveyed through the available Harvey O. Banks pumping plant capacity to maximize deliveries through the California Aqueduct during dry hydrologic conditions and regulatory restrictions. In addition, the California State Water Resources Control Board (SWRCB) has set water quality objectives that must be met by the SWP including minimum Delta outflows, limits on SWP and CVP Delta exports, and maximum allowable salinity level.

Metropolitan's Board approved a Delta Action Plan in June 2007 that provides a framework for staff to pursue actions with other agencies and stakeholders to build a sustainable Delta and reduce conflicts between water supply conveyance and the environment. The Delta action plan aims to prioritize immediate short-term actions to stabilize the Delta while an ultimate solution is selected, and mid-term steps to maintain the Delta while a long-term solution is implemented. Currently, Metropolitan is working towards addressing three basin elements: Delta ecosystem restoration, water supply conveyance, and flood control protection and storage development.

3.2.3.2 Current Conditions on State Water Project

"Table A" water is the maximum entitlement of SWP water for each water contracting agency. Currently, the combined maximum Table A amount is 4.17 MAFY. Of this amount, 4.13 MAFY is the maximum Table A water available for delivery from the Delta pumps as stated in the State Water Contract, however, deliveries commonly are less than 50% of the Table A.

SWP contractors may receive Article 21 water on a short-term basis in addition to Table A water if requested. Article 21 of SWP contracts allows contractors to receive additional water deliveries only under specific conditions, generally during wet months of the year (December through March). Because an SWP contractor must have an immediate use for Article 21 supply or a place to store it outside of the SWP, there are few contractors like Metropolitan that can access such supplies. .

Carryover water is SWP water allocated to an SWP contractor and approved for delivery to the contractor in a given year but not used by the end of the year. The unused water is stored in the SWP's share of San Luis Reservoir, when space is available, for the contractor to use in the following year.

Turnback pool water is Table A water that has been allocated to SWP contractors that has exceeded their demands. This water can then be purchased by another contractor depending on its availability.

SWP Delta exports are the water supplies that are transferred directly to SWP contractors or to San Luis Reservoir storage south of the Delta via the Harvey O. Banks pumping plant. Estimated average annual Delta exports and SWP Table A water deliveries have generally decreased since 2005, when Delta export regulations affecting SWP pumping operations became more restrictive due to the Biops. A summary SWP water deliveries from the years 2005 and 2013 is summarized in Table 3-2.

Table 3-2: Metropolitan Colorado River Aqueduct Program Capabilities

Year	Average Annual Delta Exports	Average Annual Table A Deliveries
2005	2.96 MAF	2.82 MAF
2013	2.61 MAF	2.55 MAF
Percent Change	-11.7%	-9.4%

The following factors affect the ability to estimate existing and future water delivery reliability:

- Water availability at the source: Availability depends on the amount and timing of rain and snow that fall in any given year. Generally, during a single dry year or two, surface and groundwater storage can supply most water deliveries, but multiple dry years can result in critically low water reserves.
- Water rights with priority over the SWP: Water users with prior water rights are assigned higher priority in DWR's modeling of the SWP's water delivery reliability, even ahead of SWP Table A water.
- Climate change: mean temperatures are predicted to vary more significantly than previously expected. This change in climate is anticipated to bring warmer winter storms that result in less snowfall at lower elevations, reducing total snowpack. From historical data, DWR projects that by 2050, the Sierra snowpack will be reduced from its historical average by 25 to 40 percent. Increased precipitation as rain could result in a larger number of "rain-on-snow" events, causing snow to melt

earlier in the year and over fewer days than historically, affecting the availability of water for pumping by the SWP during summer.

- Regulatory restrictions on SWP Delta exports due to the Biops to protect special-status species such as delta smelt and spring- and winter-run Chinook salmon. Restrictions on SWP operations imposed by state and federal agencies contribute substantially to the challenge of accurately determining the SWP's water delivery reliability in any given year.
- Ongoing environmental and policy planning efforts: the California WaterFix involves water delivery improvements that could reduce salinity levels by diverting a greater amount of lower salinity Sacramento water to the South Delta export pumps. The EcoRestore Program aims to restore at least 30,000 acres of Delta habitat, and plans to be well on the way to meeting that goal by the year 2020.
- Delta levee failure: The levees are vulnerable to failure because most original levees were simply built with soils dredged from nearby channels and were not engineered. A breach of one or more levees and island flooding could affect Delta water quality and SWP operations for several months. When islands are flooded, DWR may need to drastically decrease or even cease SWP Delta exports to evaluate damage caused by salinity in the Delta.

The Delta Risk Management Strategy addresses the problem of Delta levee failure and evaluates alternatives to reduce the risk to the Delta. Four scenarios were developed to represent a range of possible risk reduction strategies (Department of Water Resources, The State Water Project Final Delivery Capability Report 2015, July 2015). They are:

- ***Trial Scenario 1 Improved Levees:*** This scenario looks at improving the reliability of Delta levees against flood-induced failures by providing up to 100-year flood protection. The report found that improved levees would not reduce the risk of potential water export interruptions, nor would it change the seismic risk of most levees.
- ***Trial Scenario 2 Armored Pathway:*** This scenario looks at improving the reliability of water conveyance by creating a route through the Delta that has high reliability and the ability to minimize saltwater intrusion into the south Delta. The report found that this scenario would have the joint benefit of reducing the likelihood of levee failures from flood events and earthquakes, and of significantly reducing the likelihood of export disruptions.
- ***Trial Scenario 3 Isolated Conveyance:*** This scenario looks to provide high reliability for conveyance of export water by building an isolated conveyance facility on the east side of the Delta. The effects of this scenario are similar to those for Trial Scenario 2 but with the added consequence of seismic risk of levee failure on islands that are not part of the isolated conveyance facility.
- ***Trial Scenario 4 Dual Conveyance:*** This scenario is a combination of Scenarios 2 and 3 as it looks to improve reliability and flexibility for conveyance of export water by constructing an isolated conveyance facility and through-Delta conveyance. It would mitigate the vulnerability of water exports associated with Delta levee failure and offer flexibility in water exports from the Delta and the isolated conveyance facility. However, seismic risk would not be reduced on islands not part of the export conveyance system or infrastructure pathway.

DWR has altered the SWP operations to accommodate species of fish listed under the ESAs (biops), and these changes have adversely impacted SWP deliveries. DWR's Water Allocation Analysis indicated that export restrictions are currently reducing deliveries to Metropolitan as much as 150 TAF to 200 TAF under median hydrologic conditions.

Operational constraints likely will continue until a long-term solution to the problems in the Bay-Delta is identified and implemented. New biological opinions for listed species under the Federal ESA or by the California Department of Fish and Game's issuance of incidental take authorizations under the Federal ESA and California ESA might further adversely affect SWP and CVP operations. Additionally, new litigation, listings of additional species or new regulatory requirements could further adversely affect SWP operations in the future by requiring additional export reductions, releases of additional water from storage or other operational changes impacting water supply operations.

3.2.3.3 State Water Project Programs and Long-Term Planning

Metropolitan's implementation approach for the SWP depends on restoration of pre-biops exports based on implementation of a number of agreements, including the Sacramento Valley Water Management (Phase 8 Settlement Agreement and the Bay-Delta Conservation Plan (BDCP – now called the California WaterFix). The California WaterFix is being pursued through a collaboration of state, federal, and local water agencies, state and federal fish agencies, environmental organizations, and other interested parties with the ultimate goal of developing a set of actions that will provide for both species/habitat protection and improved reliability of water supplies. The Phase 8 Settlement Agreement was developed among Bay-Delta watershed users to determine how all Bay-Delta water users would bear some of the responsibility of meeting flow requirements.

Other programs and agreements that Metropolitan has implemented to improve management of SWP supplies include:

- ***Monterey Amendment*** – This settlement between SWP contractors and DWR altered the water allocation procedures such that both shortages and surpluses would be shared in the same manner for all contractors, eliminating the prior "agriculture first" shortage provision.
- ***SWP Terminal Storage*** – Metropolitan has contractual rights to 65 TAF of flexible storage at Lake Perris and 154 TAF of flexible storage at Castaic Lake, which provides Metropolitan with additional options for maximizing yield from the SWP. It can provide Metropolitan with 73 TAF of additional supply over multiply dry-years, and in a single-dry year as much as 219 TAF.
- ***Yuba Dry Year Water Purchase Program*** – Metropolitan entered into this agreement with DWR in 2007 to provide for Metropolitan's participation in the Yuba Dry Year Water Purchase Program, which provides transfers of water from the Yuba County Water Agency during dry years through 2025.
- ***Desert Water Agency/CVWD SWP Table A Transfer*** – Under this agreement, Metropolitan transferred 100 TAF of its SWP Table A contractual amount to Desert Water Agency/CVWD. Metropolitan is able to recall the SWP transfer water in years in which Metropolitan determines it needs the water to meet its water management goals. The main benefit of the agreement is to reduce Metropolitan's SWP fixed costs in wetter years when there are more than sufficient supplies to meet Metropolitan's water management goals, while at the same time preserving its dry-year SWP supply.

- ***Desert Water Agency/CVWD Advance Delivery Program*** – Under this program, Metropolitan delivers Colorado River water to the Desert Water Agency and CVWD in advance of the exchange for their SWP Contract Table A allocations. By delivering enough water in advance to cover Metropolitan's exchange obligations, Metropolitan is able to receive Desert Water Agency and CVWD's available SWP supplies in years in which Metropolitan's supplies are insufficient without having to deliver an equivalent amount of Colorado River water.
- ***Desert Water Agency/CVWD Other SWP Deliveries*** – Since 2008, Metropolitan has provided Desert Water Agency and CVWD written consent to take delivery from the SWP facilities non-SWP supplies separately acquired by each agency.
- ***Diamond Valley Lake (DVL)*** – The completion and filling of DVL between 1999 and 2003 marked the most important achievement with respect to protecting southern California against a SWP system outage. The lake can hold up to 810 TAF that provides a portion of southern California's six-month emergency water supply as well as carryover and regulatory storage. The remainder of the six-month emergency supply is held in other SWP reservoirs in southern California and in other Metropolitan reservoirs. It should be noted that the utility of DVL has been compromised by the existence of the quagga mussel in Colorado River supplies. The original design of DVL anticipated storage of both CRA and SWP water; to keep quaggas out of the DVL system, Metropolitan has made the decision to eliminate storage of any CRA supplies in DVL.
- ***Inland Feeder Project*** – The Inland Feeder project is a high-capacity water delivery system designed to increase southern California's water supply reliability. The project will take advantage of large volumes of water when available from northern California, depositing it in surface storage reservoirs, such as Diamond Valley Lake, and local groundwater basins for use during dry periods and emergencies.

3.2.3.4 Available Supplies on State Water Project

Metropolitan's current SWP (also known as the California Aqueduct) program capabilities under average year, single dry year, and multiple dry year hydrologies are shown below in Table 3-3 (Metropolitan, Draft 2015 UWMP, March 2016).

Table 3-3: Metropolitan California Aqueduct Program Capabilities

California Aqueduct
Program Capabilities
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2004)
Current Programs			
MWD Table A	410,000	210,000	1,181,000
DWCV Table A	45,000	42,000	118,000
San Luis Carryover [1]	80,000	240,000	240,000
Article 21 Supplies	0	0	51,000
Yuba River Accord Purchase	0	0	0
Subtotal of Current Programs	***535,000***	***492,000***	***1,590,000***
Programs Under Development			
Delta Improvements	87,000	178,000	205,000
Subtotal of Proposed Programs	***87,000***	***178,000***	***205,000***
Maximum Supply Capability	**622,000**	**670,000**	**1,795,000**

[1] Includes DWCV carryover.

3.2.4 Central Valley/State Water Project Storage and Transfer Programs

Storage is a major component of Metropolitan's dry year resource management strategy. Metropolitan's likelihood of having adequate supply capability to meet projected demands, without implementing its Water Supply Allocation Plan (WSAP), is dependent on its storage resources. Metropolitan aims to increase the reliability of its supplies through the development of flexible SWP storage and transfer programs. Over the years, Metropolitan has developed numerous voluntary Central Valley storage and transfer programs, aiming to develop additional dry-year water supplies.

3.2.4.1 Background on State Water Project Transfers

Metropolitan has formed partnerships in the past with Central Valley agricultural districts as well as with other southern California SWP Contractors in order to manage the wide fluctuations of SWP supplies. Metropolitan's storage and transfer programs were established to augment SWP reliability in dry years. Metropolitan's Board determined that the criteria for operating the SWP did not provide sufficient reliability to meet Metropolitan's overall supply reliability objectives. Most recently, DWR's estimates of SWP reliability capability show that SWP reliability under conditions similar to 1977, the driest year on record, could be significantly worse than earlier modeling indicated.

Metropolitan believes that it now has in place Central Valley/SWP storage and transfer programs capable of reaching its planning target, and it has several other programs under development.

3.2.4.2 Current Programs and Long-Term Planning on State Water Project

Metropolitan currently has several Central Valley/SWP storage programs in operation. Metropolitan is also pursuing a new storage program with Antelope Valley-East Kern Water Agency, and it is currently under development. In addition, Metropolitan pursues Central Valley water transfers on an as needed basis. Existing and planned storage and transfer programs include:

- ***Semitropic Storage Program***- Under this program, Metropolitan can store portions of its SWP entitlement water in excess of the amounts needed to meet its demands. The water is delivered to farmers in the Semitropic Water Storage District (SWSD) who use the water in lieu of pumping groundwater. During dry years, Metropolitan's previously stored water is returned by direct groundwater pumping by the SWSD and the exchange of SWP entitlement water. The maximum storage capacity of the program is 350 TAF.
- ***Arvin-Edison Storage Program***- This program was amended in 2008 to include the South Canal Improvement Project, which increases reliability and improves the quality of water returned to the California Aqueduct. Metropolitan can use the program to store excess SWP Table A supplies during wet years. The water can either be directly recharged into the groundwater basin or delivered to farmers in the Arvin-Edison Water Storage District who use the water in-lieu of pumping groundwater. During dry years, the water is returned to Metropolitan by direct groundwater pumping or by exchange of surface water supplies. The program storage capacity is 350 TAF.
- ***San Bernardino Valley MWD Storage Program***- This program allows Metropolitan to purchase a portion of San Bernardino Valley Municipal Water District's SWP supply. The program has a minimum purchase provision of 20 TAF and can deliver up to 70 TAF, depending on hydrologic conditions. The agreement also allows Metropolitan to store up to 50 TAF of transfer water for use in dry years. This agreement can be renewed until December 31, 2035. ***San Gabriel Valley MWD Exchange Program*** – This program allows for the exchange of up to 5 TAF each year. For each AF Metropolitan delivers to the City of Sierra Madre, a San Gabriel Valley MWD member agency, San Gabriel Valley MWD provides two AF to Metropolitan in the Main San Gabriel Basin, up to 5 TAF.
- ***Antelope Valley-Kern Water Agency Exchange and Storage Program*** – This program allows for every two AF Metropolitan receives, Metropolitan returns one AF to AVEK to improve its reliability. The exchange program is expected to deliver 30 TAF over ten years, with 10 TAF available in dry years. Under the program, Metropolitan will also be able to store up to 30 TAF in the AVEK's groundwater basin, with a dry year return capability of 10 TAF.
- ***Kern-Delta Water District Storage Program***- This program, currently under development, will allow Metropolitan to store up to 250 TAF of water and will be capable of providing 50 TAF of dry year supply. The water will be either directly recharged into the groundwater basin or delivered to Kern-Valley Water District farmers who use the water in-lieu of pumping groundwater. During dry years, MWDOC will return Metropolitan's previously stored water by direct groundwater pump-in return or by exchange of surface water supplies.
- ***Mojave Storage Program***- Metropolitan entered into a groundwater banking and exchange transfer agreement with Mojave Water Agency on October 29, 2003.This program will allow Metropolitan to store SWP supply delivered in wet years for subsequent withdrawal during dry years. Metropolitan can annually withdraw the Mojave Water Agency's SWP contractual amounts in excess of a 10

percent reserve through 2021 and the SWP allocation is 60 percent or less. The mount Metropolitan can withdraw increases to 20 percent when the SWP allocation is over 60 percent. Under a 100 percent allocation, the State Water Contract provides Mojave Water Agency 82.8 TAF of water.

- ***Central Valley Transfer Programs***- Metropolitan expects to secure Central Valley water transfer supplies via spot markets and option contracts to meet its service area demands when necessary. Metropolitan secured water transfer supplies in 2003-2015 to fill anticipated supply shortfalls needed to meet service area demands. Metropolitan's recent water transfer activities in have demonstrated Metropolitan's ability to develop and negotiate water transfer agreements either working directly with the agricultural districts who are selling the water or through a statewide Drought Water Bank.

3.2.4.3 Available Supplies on Central Valley/State Water Project

Metropolitan's current Central Valley/SWP storage and transfer program supply capabilities under average year, single dry, and multiple dry year hydrologies are shown below in Table 3-4. In developing the supply capabilities for the Metropolitan 2015 UWMP, Metropolitan assumed a simulated median storage level going into each of the five-year increments based on the balances of supplies and demands.

Table 3-4: Metropolitan Central Valley/State Water Project and Transfer Programs

Central Valley/State Water Project Storage and Transfer Programs
Supply Projection
Year 2035
(acre-feet per year)

Hydrology	Multiple Dry Years (1990-92)	Single Dry Year (1977)	Average Year (1922-2004)
Current Programs			
San Bernardino Valley MWD Minimum Purchase	3,000	0	20,000
San Bernardino Valley MWD Option Purchase	0	0	16,000
San Gabriel Valley MWD Exchange and Purchase	2,000	2,000	2,000
Central Valley Storage and Transfers			
Semitropic Program	50,000	49,000	70,000
Arvin Edison Program	63,000	75,000	75,000
Mojave Storage Program	2,000	0	26,000
Kern Delta Program	47,000	50,000	50,000
Transfers and Exchanges	50,000	50,000	50,000
Subtotal of Current Programs	***217,000***	***226,000***	***309,000***
Programs Under Development			
Antelope Valley/East Kern Acquisition and Storage	7,000	20,000	20,000
Subtotal of Proposed Programs	***7,000***	***20,000***	***20,000***
Maximum Supply Capability	**224,000**	**246,000**	**329,000**

3.2.5 Supply Reliability within Metropolitan

In the Metropolitan UWMP, Metropolitan evaluated supply reliability by projecting supply and demand conditions for the single- and multi-year drought cases based on conditions affecting the SWP (Metropolitan's largest and most variable supply). For this supply source, the single driest-year was 1977 and the three-year dry period was 1990-1992. The analyses also includes Colorado River supplies under the same hydrologies. Metropolitan's analyses are shown in Tables 3-5, 3-6, and 3-7. Metropolitan has concluded that the region can provide reliable water supplies not only under normal conditions but also under both the single driest year and the multiple dry year hydrologies. Because Metropolitan's projections take into account the imported demands from OC, Metropolitan's analysis will be used to determine, by virtue of MWDOC being part of Metropolitan, that demands within MWDOC can be met not only under normal conditions but also under both the single driest year and the multiple dry year hydrologies

Table 3-5: Metropolitan Average Year Projected Supply Capability and Demands through 2040

Average Year
Supply Capability[1] and Projected Demands
Average of 1922-2012 Hydrologies
(Acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
Current Programs					
In-Region Supplies and Programs	693,000	774,000	852,000	956,000	992,000
California Aqueduct[2]	1,760,000	1,781,000	1,873,000	1,899,000	1,899,000
Colorado River Aqueduct					
Total Supply Available[3]	1,468,000	1,488,000	1,484,000	1,471,000	1,460,000
Aqueduct Capacity Limit[4]	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*
Colorado River Aqueduct Capability	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Capability of Current Programs	**3,653,000**	**3,755,000**	**3,925,000**	**4,055,000**	**4,091,000**
Demands					
Total Demands on Metropolitan	1,586,000	1,636,000	1,677,000	1,726,000	1,765,000
IID-SDCWA Transfers and Canal Linings	274,000	282,000	282,000	282,000	282,000
Total Metropolitan Deliveries[5]	**1,860,000**	**1,918,000**	**1,959,000**	**2,008,000**	**2,047,000**
Surplus	**1,793,000**	**1,837,000**	**1,966,000**	**2,047,000**	**2,044,000**
Programs Under Development					
In-Region Supplies and Programs	43,000	80,000	118,000	160,000	200,000
California Aqueduct	20,000	20,000	225,000	225,000	225,000
Colorado River Aqueduct					
Total Supply Available[3]	5,000	25,000	25,000	25,000	25,000
Aqueduct Capacity Limit[4]	*0*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**63,000**	**100,000**	**343,000**	**385,000**	**425,000**
Potential Surplus	**1,856,000**	**1,937,000**	**2,309,000**	**2,432,000**	**2,469,000**

[1] Represents Supply Capability for resource programs under listed year type.
[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.
[3] Colorado River Aqueduct includes programs, IID-SDCWA transfer and exchange and canal linings conveyed by the aqueduct.
[4] Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange and canal linings.
[5] Total deliveries are adjusted to include IID-SDCWA transfer and exchange and canal linings. These supplies are calculated as local supply, but need to be shown for the purposes of CRA capacity limit calculations without double counting.

Table 3-6: Metropolitan Single-Dry Year Projected Supply Capability and Demands through 2040

Single Dry-Year
Supply Capability[1] and Projected Demands
Repeat of 1977 Hydrology
(Acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
Current Programs					
In-Region Supplies and Programs	693,000	774,000	852,000	956,000	992,000
California Aqueduct[2]	644,000	665,000	692,000	718,000	718,000
Colorado River Aqueduct					
Total Supply Available[3]	1,451,000	1,457,000	1,456,000	1,455,000	1,454,000
Aqueduct Capacity Limit[4]	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*
Colorado River Aqueduct Capability	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Capability of Current Programs	**2,537,000**	**2,639,000**	**2,744,000**	**2,874,000**	**2,910,000**
Demands					
Total Demands on Metropolitan	1,731,000	1,784,000	1,826,000	1,878,000	1,919,000
IID-SDCWA Transfers and Canal Linings	274,000	282,000	282,000	282,000	282,000
Total Metropolitan Deliveries[5]	**2,005,000**	**2,066,000**	**2,108,000**	**2,160,000**	**2,201,000**
Surplus	**532,000**	**573,000**	**636,000**	**714,000**	**709,000**
Programs Under Development					
In-Region Supplies and Programs	43,000	80,000	118,000	160,000	200,000
California Aqueduct	20,000	20,000	198,000	198,000	198,000
Colorado River Aqueduct					
Total Supply Available[3]	155,000	125,000	75,000	25,000	25,000
Aqueduct Capacity Limit[4]	*0*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**63,000**	**100,000**	**316,000**	**358,000**	**398,000**
Potential Surplus	**595,000**	**673,000**	**952,000**	**1,072,000**	**1,107,000**

[1] Represents Supply Capability for resource programs under listed year type.
[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.
[3] Colorado River Aqueduct includes programs, IID-SDCWA transfer and exchange and canal linings conveyed by the aqueduct.
[4] Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange and canal linings.
[5] Total deliveries are adjusted to include IID-SDCWA transfer and exchange and canal linings. These supplies are calculated as local supply, but need to be shown for the purposes of CRA capacity limit calculations without double counting.

Table 3-7: Metropolitan Multiple-Dry Year Projected Supply Capability and Demands through 2040

Multiple Dry-Year
Supply Capability[1] and Projected Demands
Repeat of 1990-1992 Hydrology
(Acre-feet per year)

Forecast Year	2020	2025	2030	2035	2040
Current Programs					
In-Region Supplies and Programs	239,000	272,000	303,000	346,000	364,000
California Aqueduct[2]	712,000	730,000	743,000	752,000	752,000
Colorado River Aqueduct					
Total Supply Available[3]	1,403,000	1,691,000	1,690,000	1,689,000	1,605,000
Aqueduct Capacity Limit[4]	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*	*1,200,000*
Colorado River Aqueduct Capability	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Capability of Current Programs	**2,151,000**	**2,202,000**	**2,246,000**	**2,298,000**	**2,316,000**
Demands					
Total Demands on Metropolitan	1,727,000	1,836,000	1,889,000	1,934,000	1,976,000
IID-SDCWA Transfers and Canal Linings	274,000	282,000	282,000	282,000	282,000
Total Metropolitan Deliveries[5]	**2,001,000**	**2,118,000**	**2,171,000**	**2,216,000**	**2,258,000**
Surplus	**150,000**	**84,000**	**75,000**	**82,000**	**58,000**
Programs Under Development					
In-Region Supplies and Programs	36,000	73,000	110,000	151,000	192,000
California Aqueduct	7,000	7,000	94,000	94,000	94,000
Colorado River Aqueduct					
Total Supply Available[3]	80,000	75,000	50,000	25,000	25,000
Aqueduct Capacity Limit[4]	*0*	*0*	*0*	*0*	*0*
Colorado River Aqueduct Capability	0	0	0	0	0
Capability of Proposed Programs	**43,000**	**80,000**	**204,000**	**245,000**	**286,000**
Potential Surplus	**193,000**	**164,000**	**279,000**	**327,000**	**344,000**

[1] Represents Supply Capability for resource programs under listed year type.
[2] California Aqueduct includes Central Valley transfers and storage program supplies conveyed by the aqueduct.
[3] Colorado River Aqueduct includes programs, IID-SDCWA transfer and exchange and canal linings conveyed by the aqueduct.
[4] Maximum CRA deliveries limited to 1.20 MAF including IID-SDCWA transfer and exchange and canal linings.
[5] Total deliveries are adjusted to include IID-SDCWA transfer and exchange and canal linings. These supplies are calculated as local supply, but need to be shown for the purposes of CRA capacity limit calculations without double counting.

3.2.6 MWDOC's Imported Water Supply

California Water Code requires Metropolitan to provide information to MWDOC for inclusion in its UWMP that identifies and quantifies the existing and planned sources of water available from the wholesale agency. By virtue of MWDOC being a part of Metropolitan and by virtue that imported demands from MWDOC were included in Metropolitan projections, MWDOC's supply projections have been covered by Metropolitan.

Thus, based on Metropolitan's supply projections, MWDOC will be able to meet demands under average year, single dry year, and multiple dry year scenarios. The water supply projections represent the amount of supplies projected to meet MWDOC demands, as MWDOC will only purchase the amount of water needed to meet its service area demands from Metropolitan. The current and future water supply projections are shown in Tables 3-8 and 3-9.

Table 3-8: Wholesale Water Supplies – Actual (AFY)

Wholesale: Water Supplies — Actual			
Water Supply	Additional Detail on Water Supply	**2015**	
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*
Purchased or Imported Water	Purchased from Metropolitan	158,664	Drinking Water
Purchased or Imported Water~~Other~~	GW Recharge	58,617	Untreated Water
Purchased or Imported Water~~Other~~	Surface Storage	8,227	Untreated Water
	Total	225,508	
NOTES:			

Table 3-9: Wholesale Water Supplies – Projected (AFY)

Wholesale: Water Supplies — Projected						
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*				
		2020	2025	2030	2035	2040
Imported Water for M&I	Purchased from Metropolitan	132,826	144,254	140,203	135,913	135,135
Purchased or Imported Water~~Other~~	GW Recharge	65,000	65,000	65,000	65,000	65,000
Purchased or Imported Water~~Other~~	Surface Storage	7,306	7,306	7,306	7,306	7,306
Total		205,132	216,560	212,509	208,219	207,441
NOTES:						

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3.3 Groundwater

Among all local supplies available to MWDOC's retail agencies, groundwater supplies make up the majority. The water supply resources in MWDOC's service area are enhanced by the existence of four groundwater basins, which provide a reliable local source and, additionally, are used as reservoirs to store water during wet years and draw from storage during dry years. This section describes the four groundwater basins used by MWDOC's retail agencies and provides information on historical groundwater production as well as a 25-year projection of the service area's groundwater supply.

3.3.1 Orange County Groundwater Basin

The Lower Santa Ana Groundwater Basin, also known as the Orange County Groundwater Basin underlies the north half of Orange County beneath broad lowlands. It is managed by OCWD and covers an area of approximately 350 square miles, bordered by the Coyote and Chino Hills to the north, the Santa Ana Mountains to the northeast, the Pacific Ocean to the southwest, and terminates at the Orange County line to the northwest, where its aquifer systems continue into the Central Basin of Los Angeles County. The aquifers comprising this Basin are over 2,000 feet deep and form a complex series of interconnected sand and gravel deposits. Its full volume is approximately 66 MAF although the amount of "useable storage" has been established by OCWD at a maximum overdraft of about 500,000 AF before permanent problems occur with subsidence. Figure 3-5 depicts the Lower Santa Ana Groundwater Basin.

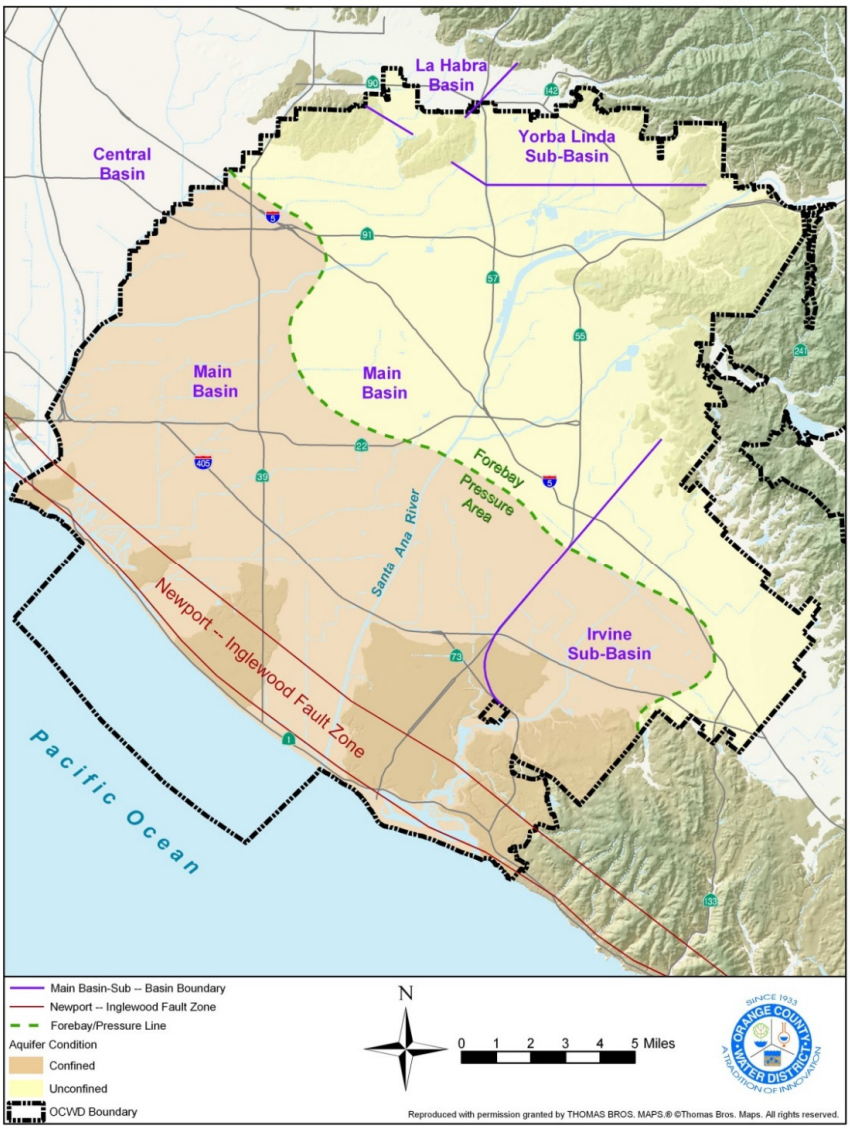

Figure 3-5: Lower Santa Ana Groundwater Basin

The OCWD was formed in 1933 by a special legislative act of the California State Legislature to protect and manage the County's vast, natural, groundwater supply using the best available technology and defend its water rights to the Orange County Groundwater Basin. This legislation is found in the State of California Statutes, Water – Uncodified Acts, Act 5683, as amended. The Orange County Groundwater Basin is managed by OCWD under the Act, which functions as a statutorily-imposed physical solution.

The Orange County Groundwater Basin is managed by OCWD for the benefit of municipal, agricultural and private groundwater producers. It meets approximately 60 to 70 percent of the water supply demand within the boundaries of OCWD. There are 19 major producers including cities, water districts, and private water companies, extracting water from the Orange County Groundwater Basin, serving a population of approximately 2.55 million.

Groundwater levels are managed within a safe basin operating range to protect the long-term sustainability of the Orange County Groundwater Basin and to protect against land subsidence. OCWD regulates groundwater levels in the Orange County Groundwater Basin by regulating the annual amount of pumping.

In an effort to eliminate long-term overdraft conditions, OCWD developed a comprehensive computer-based groundwater flow model to study and better understand the Orange County Groundwater Basin's reaction to pumping and recharge. OCWD manages the Orange County Groundwater Basin by establishing on an annual basis the appropriate level of groundwater production known as the Basin Production Percentage (BPP) as described below (OCWD, Groundwater Management Plan 2015 Update, June 2015).

3.3.1.1 Basin Production Percentage

Pumping from the Orange County Groundwater Basin is managed through a process that uses financial incentives to encourage groundwater producers to pump a sustainable amount of water. The framework for the financial incentives is based on establishing the BPP, the percentage of each Producer's total water supply that comes from groundwater pumped from the Orange County Groundwater Basin. Groundwater production at or below the BPP is assessed a Replenishment Assessment (RA). While there is no legal limit as to how much an agency pumps from the Orange County Groundwater Basin, there is a financial disincentive to pump above the BPP. Pumping above the BPP is also assessed a Basin Equity Assessment (BEA), in addition to the RA, which is calculated so that the cost of groundwater production is greater than MWDOC's full service rate. The BPP is set uniformly for all Producers by OCWD on an annual basis.

The BPP is set based on groundwater conditions, availability of imported water supplies, and Orange County Groundwater Basin management objectives. The BPP is a major factor in determining the cost of groundwater production from the Orange County Groundwater Basin for that year.

In some cases, OCWD encourages treating and pumping groundwater that does not meet drinking water standards in order to protect water quality. This is achieved by using a financial incentive called the BEA Exemption. A BEA Exemption is used to clean up and contain the spread of poor quality water. OCWD uses a partial or total exemption of the BEA to compensate a qualified participating agency or Producer for the costs of treating poor quality groundwater. When OCWD authorizes a BEA exemption for a

project, it is obligated to provide the replenishment water for the production above the BPP and forgoes the BEA revenue that OCWD would otherwise receive from the producer.

3.3.1.2 Recharge Management

The Orange County Groundwater Basin is recharged by multiple sources. These include artificial, i.e., man-made systems, and incidental or natural recharge. One of OCWD's core activities is refilling or replenishing the Orange County Groundwater Basin to balance the removal of groundwater by pumping.

OCWD currently owns and operates more than 1,000 acres of recharge facilities in and adjacent to the Santa Ana River and Santiago Creek. Historical groundwater flow was generally toward the ocean in the southwest, but modern pumping has caused groundwater levels to drop below sea level inland of the Newport-Inglewood fault zone. This trough-shaped depression encourages sea water to migrate inland, which if unchecked, could affect water quality. Strategic lines of wells in the Alamitos and Talbert Gaps inject imported and reclaimed water to create a mound of water seaward of the pumping trough to protect the Orange County Groundwater Basin from seawater intrusion. In addition to operating the percolation system, OCWD also operates the Talbert Barrier in Fountain Valley and Huntington Beach, and participates in the financing operation of the Alamitos Barrier in Seal Beach and Long Beach. The barriers help prevent seawater intrusion and also help refill the Orange County Groundwater Basin.

Sources of recharge water include Santa Ana River (SAR) baseflow and storm flow, Santiago Creek Flows, imported supplies purchased from Metropolitan, supplemental supplies from the upper SAR Watershed, and purified water from the GWRS plant.

Imported water from Metropolitan via MWDOC is one source of water for groundwater replenishment. OCWD is able to increase allowable pumping from the Orange County Groundwater Basin, above the natural safe yield, via the purchase of water for groundwater replenishment, although water for this purpose is not always available. When imported water for groundwater replenishment is not available for extended periods, OCWD continues to allow pumping above the Orange County Groundwater Basin's natural safe yield while keeping the overall overdraft of the groundwater basin below 500,000 AF. Under this operation, the Orange County Groundwater Basin draws on stored water to sustain this level of pumping. Depending on the severity of the drought and local supply conditions, this operation can be sustained for two to three years before the Orange County Groundwater Basin reaches significant overdraft (greater than 500,000 AF storage level). OCWD must then cut back pumping until refill of the Orange County Groundwater Basin occurs via heavy rainfall or when water for groundwater replenishment becomes available from Metropolitan. This close coordination of the Orange County Groundwater Basin's operation with the availability of Metropolitan supplies benefits the local service area with enhanced pumping levels in most years. Metropolitan also sells water to OCWD for injection into the Talbert Seawater Barrier. This water assists in the protection of the Orange County Groundwater Basin from seawater intrusion.

Water for groundwater replenishment is received at OCWD's recharge facilities in the Cities of Anaheim and Orange and is physically recharged into the Orange County Groundwater Basin through percolation.

3.3.1.3 Recharge Facilities for Orange County Groundwater Basin

Recharging water into the Orange County Groundwater Basin through natural and artificial means is essential to support pumping from the Orange County Groundwater Basin. Active recharge of groundwater began in 1949, in response to increasing drawdown of the Orange County Groundwater Basin and consequently the threat of seawater intrusion. The Orange County Groundwater Basin's primary source of recharge is flow from the Santa Ana River, which is diverted into recharge basins and its main Orange County tributary, Santiago Creek. Other sources of recharge water include natural infiltration and recycled water. Today OCWD owns and operates a network of recharge facilities that cover 1,067 acres. An increase in recharge capacity of greater than 10,000 AFY occurred with the addition of the La Jolla Recharge Basin which came online in 2008. The La Jolla Recharge Basin is a 6-acre recharge basin.

One of OCWD's primary efforts has been the control of seawater intrusion into the Orange County Groundwater Basin, especially via the Talbert and Alamitos seawater intrusion barriers. OCWD began addressing the Alamitos Gap intrusion by entering a partnership in 1965 with the Los Angeles County Flood Control District to operate injection wells in the Alamitos Gap. Operation of the injection wells forms a hydraulic barrier to seawater intrusion. The Alamitos Barrier consists of 43 injection wells, four extraction wells, and 226 observation wells.

The GWRS is a cooperative project between OCWD and Orange County Sanitation District (OCSD) that began operating in 2008 at a capacity of about 70,000 AFY; the Phase 2 expansion of the GWRS was recently implemented, bolstering capacity to about 100,000 AFY and is discussed in more detail in Sections 6.3 and 6.4.

3.3.2 San Juan Groundwater Basin

The San Juan Groundwater Basin is located in the San Juan Creek Watershed and is comprised of four principal groundwater basins: 1) Lower Basin, 2) Middle Basin, 3) Upper Basin, and 4) Arroyo Trabuco. A map of the four principal groundwater basins is shown on Figure 3-6. The Middle Basin, Lower Basin, and Lower Trabuco consists of approximately 5.9 square miles of water bearing alluvium. Groundwater occurs in the relatively thin alluvial deposits along the valley floors and within the major stream channels. The younger alluvial deposits within the San Juan Groundwater Basin consists of a heterogeneous mixture of sand, silts, and gravel.

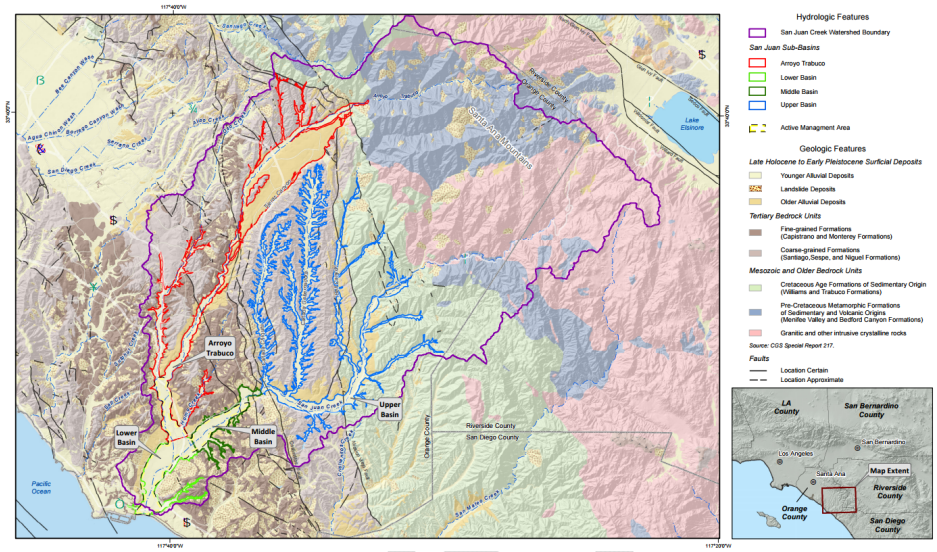

Figure 3-6: Principal Groundwater Basins for the San Juan Groundwater Basin

The physical boundaries of the San Juan Groundwater Basin include the Santa Ana Mountain to the north, sedimentary rock formations to the sides of the Upper Basin and Arroyo Trabuco, and the Pacific Ocean to the south.

San Juan Groundwater Basin is recharged through a variety of sources such as:

- Streambed infiltration in San Juan Creek, Horno Creek, Oso Creek, and Arroyo Trabuco.
- Subsurface inflows along boundaries at the head of the tributaries upstream and other minor subsurface inflows from other boundaries.
- Precipitation and applied water.
- Flow from fractures and springs.

Discharge of groundwater from the San Juan Groundwater Basin occurs from a variety of sources such as:

- Groundwater production
- Rising groundwater
- Evapotranspiration
- Outflow to Pacific Ocean

Currently, five agencies have groundwater rights to the San Juan Groundwater Basin and uses this water for either municipal purposes or for irrigation. The agencies with groundwater rights to the San Groundwater Juan Basin and their current rights are listed below:

- SCWD: 1,300 AFY
- SJBA: 8,026 AFY
- SMWD: 643 AFY
- San Juan Hills Golf Course: 450 AFY
- City of San Juan Capistrano: 3,325 AFY

The San Juan Groundwater Basin differs from many other adjudicated groundwater basins as it does not strictly follow the term “safe yield” in preventing undesirable results occurring as a result of over-production of groundwater. The basin is governed by the San Juan Basin Authority (SJBA) and is a Joint Power Agency comprised of representatives from four local jurisdictions, SMWD, MNWD, the City of San Juan Capistrano, and SCWD. The SJBA has recently adopted the concept of “adaptive management” of the San Juan Groundwater Basin to vary pumping from year to year based on actual basin conditions derived from monitoring efforts. This is due in part to the SWRCB characterization of the San Juan Groundwater Basin as a “flowing underground stream” and because the storage in the groundwater basin is small relative to recharge and production. The range of natural yield of the San Juan Groundwater Basin is 7,000 AFY to 11,000 AFY. Work is underway to construct rubber dams and increase recharge with recycled water to increase the recharge of the basin by 4,000 AFY to 7,000 AFY (SJBA, Draft Foundational Action Program Report, March 2016).

3.3.3 La Habra Groundwater Basin

The La Habra Groundwater Basin covers parts of Los Angeles County and Orange County and is part of both the Coastal Plan of Los Angeles (Central Basin) and the Coastal Plain of Orange County (Orange County Basin). The La Habra Groundwater Basin lies entirely within the Coyote Creek Watershed and is shown on Figure 3-7.

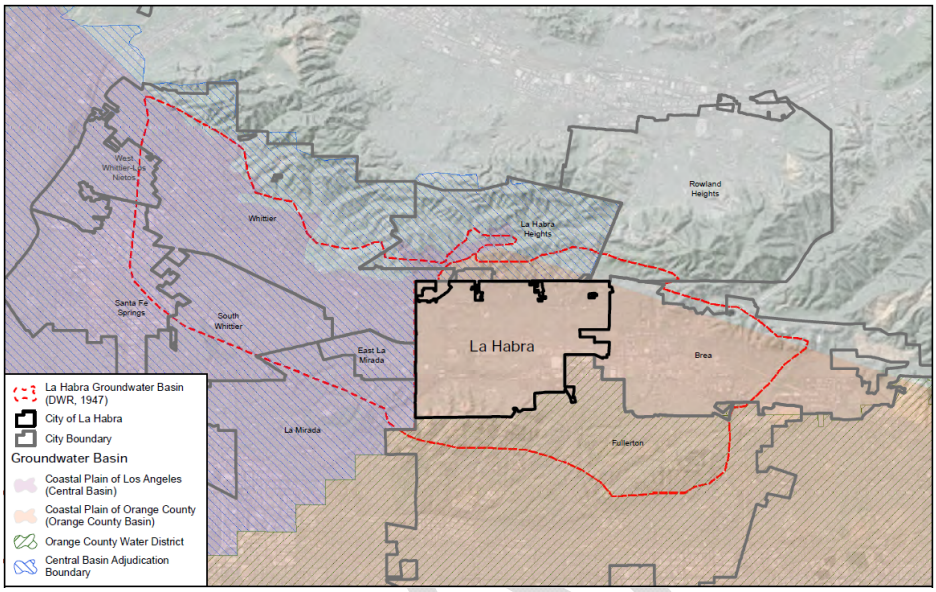

Figure 3-7: La Habra Groundwater Basin

3.3.3.1 La Habra Groundwater Basin Management Objectives

Basin Management Objectives (BMOs) are locally developed flexible guidelines for groundwater development of a particular basin. The City of La Habra has four proposed BMOs:

- BMO No. 1 is to reduce the City of La Habra's dependence on imported water. Currently, approximately 62 percent of its demand is met with imported water. This BMO intends for the City of La Habra to use more local groundwater to meet its demands in order to increase reliability. The City of La Habra's compliance with the 20x2020 program will help meet this BMO as its total water demand will decrease.
- BMO No. 2 is to maintain groundwater sustainability within the La Habra Groundwater Basin. The City of La Habra can meet this objective through the coordination of groundwater production within the estimated safe yield of the La Habra Groundwater Basin.
- BMO No. 3 is to protect and enhance the water quality of the La Habra Groundwater Basin. The City of La Habra may meet this objective through continuing and supplementing its existing water quality monitoring program.
- BMO No. 4 is to improve the understanding of the La Habra Groundwater Basin's hydrogeology, groundwater elevations, and basin yields. The City of La Habra can use and supplement its existing groundwater elevation monitoring program to review general trends in groundwater elevations in the

La Habra Groundwater Basin. The City of La Habra will also evaluate the need for additional monitoring (La Habra, Draft Groundwater Study, August 2014).

3.3.4 Main San Gabriel Groundwater Basin (California Domestic Water Company)

California Domestic Water Company (CDWC) has water rights, production, treatment and conveyance facilities in the Main San Gabriel Groundwater Basin that serve customers overlying the basin within Suburban Water Systems as well as serving the cities of Brea and La Habra in Orange County. The annual deliveries of groundwater to Brea and La Habra are estimated at about 12,000 AFY. The Main San Gabriel Basin and its operations are described below.

The Main San Gabriel Basin lies in eastern Los Angeles County and occupies most of San Gabriel Valley. The hydrologic basin or watershed coincides with a portion of the upper San Gabriel River watershed, and the aquifer or groundwater basin underlies most of the San Gabriel Valley. It is bounded on the north by the San Gabriel Mountains, on the northwest by Raymond Basin, on the southeast by Puente Basin, and on the south by Central Basin. The Main San Gabriel Basin encompasses approximately 107,000 acres and has a storage of 8.9 MAF when the groundwater elevation at the Baldwin Park Key Well is 316 feet. Generally speaking, one foot of groundwater elevation is equivalent to approximately 8,000 AF of storage.

The hydrogeological San Gabriel Basin is divided between three sub-basins, Main Basin, Puente Basin, and portions of Six Basins area. A portion of Six Basins area is tributary to the Main Basin. Each of the sub-basins are adjudicated and managed separately.

Major sources of recharge to the Main San Gabriel Basin are infiltration of rainfall on the valley floor and runoff from the nearby mountains. The Main San Gabriel Basin is the first of a series of basins to receive the water from mountain runoff. The Main San Gabriel Basin interacts hydrogeologically and institutionally with adjoining basins, including Puente Basin, Central Basin, and West Coast Basin (Main San Gabriel Basin Watermaster, Annual Report, 2015).

Figure 3-8 depicts the Main San Gabriel Basin.

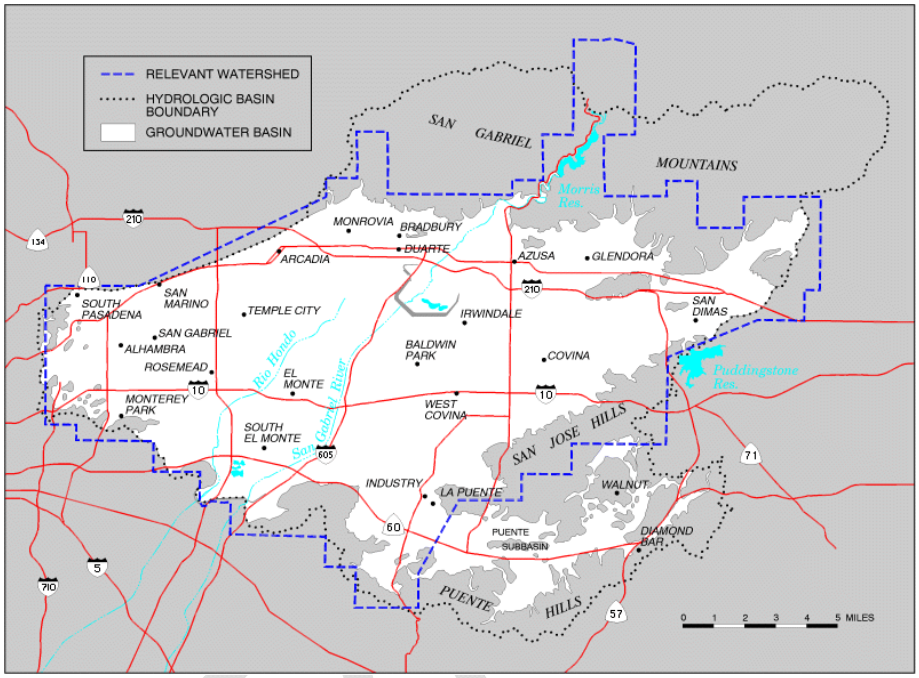

Figure 3-8: Main San Gabriel Groundwater Basin

3.3.4.1 Basin Judgment

Rapid urbanization in the San Gabriel Valley in the 1940s resulted in an increased demand for groundwater drawn from the Upper Area users in Main San Gabriel Basin. Consequently, the Main San Gabriel Basin was in a state of overdraft and the available water supply for the Lower Area and downstream users decreased. In 1968, at the request of producers, the Upper San Gabriel Municipal Water District filed a complaint that would adjudicate water rights in the Basin and would bring all Basin producers under control of one governing body. The final result was the entry of the Main San Gabriel Basin Judgment in 1973.

The Judgment defined the water rights of 190 original parties to the legal action. It created a new governing body, the Main San Gabriel Basin Watermaster, and described a program for management of water in the Basin. Under the terms of the Main San Gabriel Basin Judgment all rights to the diversion of surface water and production of groundwater within the Main Basin and its Relevant Watershed were adjudicated. The Main Basin Judgment does not restrict the quantity of water agencies may extract from the Main Basin. Rather, it provides a means for replacing with Supplemental Water all annual extractions in excess of an agency's annual right to extract water. The Main Basin Watermaster annually establishes an Operating Safe Yield for the Main Basin that is then used to allocate to each agency its portion of the

Operating Safe Yield that can be produced free of a Replacement Water Assessment. If a producer extracts water in excess of his right under the annual Operating Safe Yield, it must pay an assessment for Replacement Water that is sufficient to purchase one AF of Supplemental Water to be spread in the basin for each AF of excess production. All water production is metered and is reported quarterly to the Main Basin Watermaster. The Operating Safe yield for FY 2014 to 2015 was set at 150,000 AF.

In addition to Replacement Water Assessments, the Main Basin Watermaster levies an Administration Assessment to fund the administration of the Main Basin management program under the Main Basin Judgment and a Make-up Obligation Assessment in order to fulfill the requirements for any Make-Up Obligation under the Long Beach Judgment and to supply fifty percent of the administration costs of the River Watermaster service. The Main Basin Watermaster levies an In-lieu Assessment and may levy special Administration Assessments.

Water rights under the Main Basin Judgment are transferable by lease or purchase so long as such transfers meet the requirements of the Main Basin Judgment. There is also provision for Cyclic Storage Agreements that allow parties and non-parties to store imported supplemental water in the Main San Gabriel Basin under such agreements with the Main Basin Watermaster pursuant to uniform rules and conditions and Court approval (Main San Gabriel Basin Watermaster, Annual Report, 2015).

The Main Basin Watermaster has entered into a Cyclic Storage Agreement with three municipal water districts, Metropolitan, Three Valleys Municipal Water District (TVMWD), and Upper San Gabriel Valley Municipal Water District (USGVMWD). The first agreement with Metropolitan and USGVMWD permits Metropolitan to deliver and store imported water in the Main Basin in an amount not to exceed 100,000 AF for future Replacement Water use. The second Cyclic Storage Agreement is with TVMWD and permits Metropolitan to deliver and store 40,000 AF for future Replacement Water use. The third is with San Gabriel Valley Municipal Water District.

3.3.5 San Mateo Basin

According to information provided by City of San Clemente, approximately 118 AF of groundwater was pumped from the San Mateo basin in FY 2014-15 through the City's wells and may increase up to 500 AFY by 2040.

3.3.6 Laguna Canyon Basin

The Laguna Creek watershed lies in the San Joaquin Hills of southern Orange County. The drainage area of approximately 5,412 acres includes the Laguna Creek and Niguel Creek basins and is the largest stream basin to drain exclusively from the San Joaquin Hills into the ocean. The drainage basin is roughly 6.5 miles long and averages 1.5 miles wide between its boundaries. The upper or northern half of the Laguna Canyon Basin is relatively wide with low subdued hills, whereas the lower half is narrow, with steep slopes forming Laguna Canyon. Elevations reach 1,000 feet above sea level in parts of the drainage basin.

The average annual rainfall is about 12 inches at Laguna Beach at the mouth of Laguna Creek and, at times, rainfall in the San Joaquin Hills is sufficient to cause sharp, damaging floods along Laguna Creek. In general, however, the drainage basin is dry with only sufficient water discharge to reflect losses from groundwater sources and urban runoff.

Historically, limited groundwater was produced from this basin when the Laguna area was first settled. However, over time, the supplies could not meet demands and LBCWD (and its predecessor water company) looked first to groundwater supplies in Huntington Beach from the Orange County Groundwater Basin, and later to imported water to meet the needs of its service area. While LBCWD has conducted a review of the potential production from this area, it is not viewed as a reliable source of water into the future. In 2016, LBCWD was able to resurrect its old water rights within the Orange County Groundwater Basin by agreement with OCWD to obtain 2,025 AFY. They are in the process of developing plans to produce and import this water.

3.3.7 Impaired Groundwater

The combined yield from the seven projects described below, was 17,864 AF in 2015. This supply is expected to increase substantially to over 30,000 AF at ultimate development of these projects. Since these projects use groundwater, a similar amount must either be replenished on an average annual basis to maintain water balance or be salvaged from water that otherwise would flow into the ocean as subsurface outflow. The benefit of these projects is to provide a firm base supply, restore use of groundwater storage impaired by natural causes and/or agricultural drainage, improve conjunctive use storage operations, and provide a drought supply by the additional capacity to tap groundwater in storage.

Tustin Main Street Desalter - The City of Tustin currently operates two desalter plants. The Main Street Treatment plant began operating in 1989 with a capacity of 2 MGD (million gallons per day). The Main Street Desalter reduces nitrate levels from the groundwater produced by Tustin's Main Street wells. The untreated groundwater undergoes either Reverse Osmosis or Ion Exchange treatment.

Tustin 17th Street Desalter - The Tustin 17th Street Desalter began operating in 1996 with a capacity of 3 MGD. The Tustin 17th Street Desalter reduces high nitrate and total dissolved solids (TDS) concentrations from the groundwater pumped by Tustin's 17th Street wells. The 17th Street Desalter plant uses two Reverse Osmosis membrane trains to treat the groundwater.

Mesa Water Reliability Facility – Mesa currently owns and operates a Mesa Water Reliability Facility (MWRF) with a capacity of 5.8 MGD that removes color from the water using microfiltration.

IRWD Deep Aquifer Treatment System – IRWD's Deep Aquifer Treatment System (DATS) purifies drinking water from the lower aquifer of the Orange County Groundwater Basin. The water in this aquifer is very high quality, but has a brownish tint imparted from the remains of ancient vegetation. The DATS facility went on-line in 2002 and can treat up to 7.4 MGD from two wells that pump water from 2000 feet below ground level.

IRWD Irvine Desalter Project - The Irvine Desalter Project was completed in 2006 and purifies water found in the Irvine sub-basin of the larger Orange County groundwater basin. It is a two-part endeavor, with recycled water and drinking water components. The Irvine Desalter Potable Treatment Facility uses two reverse osmosis trains to produce 2.7 MGD by removing salts that are caused by natural geology and past agricultural use.

San Juan Basin Desalter - The Groundwater Recovery Plant (GWRP) came on-line in 2004, also known as the San Juan Basin Desalter, is a 5 MGD plant that is owned and operated by the City of San Juan Capistrano. The GWRP takes groundwater high in iron, manganese, and total dissolved solids using

reverse osmosis and makes it suitable for potable water uses. The plant has never operated continuously at the 5 MGD rate, but prior to the drought restrictions in the basin, had been producing water at the rate of about 3 MGD.

SCWD Groundwater Desalter - SCWD currently owns and operates a 1 MGD GRF that came on-line in 2007, also known as the Capistrano Beach Desalter. The plant extracts brackish groundwater from an aquifer in the San Juan Basin and goes through iron and manganese removal due to high mineral content.

3.3.8 Metropolitan Water for Groundwater Replenishment

In the past OCWD, MWDOC, and Metropolitan have coordinated water management to increase storage in the Orange County Groundwater Basin when imported supplies are available for this purpose. The "discounted" replenishment water availability was discontinued on January 1, 2013, and currently MWDOC sells replenishment water to OCWD at the firm untreated Metropolitan rate. Figure 3-9 shows MWDOC imported water sales to OCWD since FY 1989-90, which average approximately 27,000 AF per year. However, due low Santa Ana River flows as result of low precipitation and increased use along the river, OCWD anticipates to purchase 65,000 AF of imported water per year . This does not include water amounts from Metropolitan's Conjunctive Use Program (CUP).

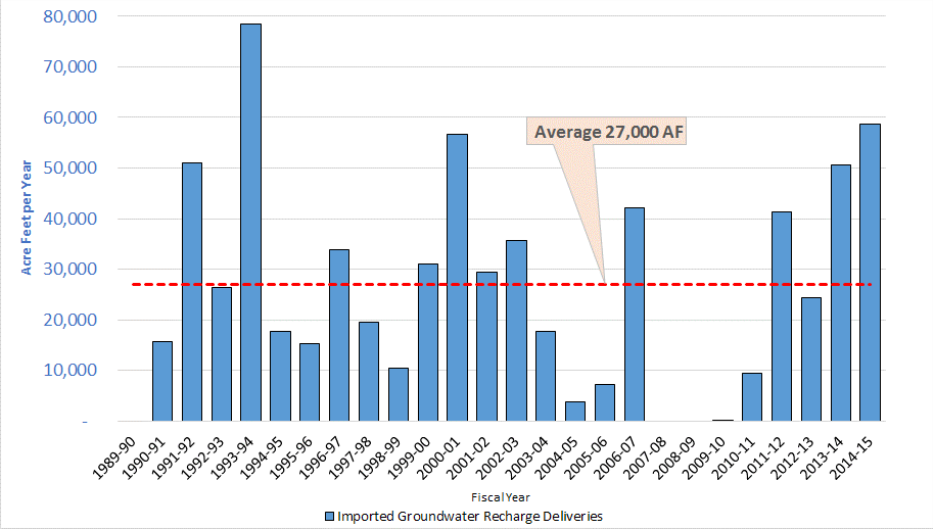

Figure 3-9: MWDOC Imported Water Sales for Groundwater Replenishment

3.3.9 Metropolitan Conjunctive Use Program with OCWD

Since 2004, OCWD, MWDOC, and certain groundwater producers have participated in Metropolitan's CUP. This program allows for the storage of Metropolitan water in the Orange County Groundwater

Basin. The existing Metropolitan program provides storage up to 66,000 AF of water in the Orange County Groundwater Basin in exchange for Metropolitan's contribution to improvements in basin management facilities. These improvements include eight new groundwater production wells, improvements to the seawater intrusion barrier, and construction of the Diemer Bypass Pipeline. The water is accounted for via the CUP program administered by the wholesale agencies and is controlled by Metropolitan such that it can be withdrawn over a three-year time period.

3.3.10 Historical Groundwater Production

MWDOC does not provide any groundwater to its retail agencies. However, its retail agencies do extract groundwater locally in order to better diversify their portfolio. Table 3-10 shows a breakdown of historical groundwater production by the retail agencies from all groundwater basins within MWDOC's service area.

Table 3-10: Groundwater Pumped in the Past 5 Years within MWDOC's Service Area (AFY)

Basin Name(s)	Fiscal Year Ending				
	2010	2011	2012	2013	2014
Orange County Basin	204,215	209,216	227,819	236,706	211,061
San Juan Basin	4,408	6,870	4,450	3,146	4,550
La Habra Basin	1,285	1,241	1,322	1,530	1,657
Main San Gabriel Basin	12,727	12,440	11,504	10,127	9,698
Total Groundwater	**222,633**	**229,767**	**245,095**	**251,510**	**226,967**

3.4 Surface Water

MWDOC does not use surface water for its water supply. However, surface water provides an additional local source to some MWDOC retail agencies, including IRWD, Serrano, TCWD, and the City of Orange. Surface water supplies in Orange County are captured mostly from Santiago Creek into Santiago Reservoir.

To help augment surface water reservoir, imported water is purchased annually. Table 3-11 shows the projected surface water yearly demand of imported water purchased from MWDOC.

Table 3-11: Current and Projected Surface Water Production within MWDOC's Service Area (AFY)

	Fiscal Year Ending					
	2015	2020	2025	2030	2035	2040
Surface Water	~~9,888~~8,227	~~4,000~~7,306	7,306~~4,000~~	7,306~~4,000~~	7,306~~4,000~~	7,306~~4,000~~

3.5 Recycled Water

Orange County is the leader in water recycling in the State of California, in both quantity and innovation. Water supply and wastewater treatment agencies in Orange County have received well-deserved recognition in the field of water reclamation and reuse.

Recycled water is widely accepted as a water supply source throughout MWDOC's service area. In the past, recycled water was mainly used for landscape irrigation. IRWD, a MWDOC retail agency, is also at the forefront of using recycled water not only for irrigation but also for other uses such as toilet flushing and commercial needs. Recycled water in MWDOC's service area is treated to various levels dependent upon the ultimate end use and in accordance with Title 22 regulation.

Recycled water programs in the region are described in greater detail in Section 6.

3.6 Transfer and Exchange

A few MWDOC retail agencies have expressed interests in pursuing transfers of water from outside of the region. MWDOC will continue to help its retail agencies in developing these opportunities and ensuring their success. In fulfilling this role, MWDOC will help its retail agencies navigate the operational and administrative issues of wheeling water through the Metropolitan water distribution system or by examining other delivery options.

Santa Margarita Water District - SMWD has actively pursued additional water supply reliability through water transfers and successfully completed water transfers in the late 1990's through the Metropolitan system. At present the future of such transfers as a reliable and cost-effective means of providing the basic supply are uncertain. However, transfer with specific purposes, such as supplementing dry year supplies can be effective. SMWD will continue to pursue water transfers as an alternative water supply and is currently working with MWDOC and other agencies to investigate possible transfers. The Supplemental Dry Year Agreements are transfer agreements that are triggered under specific conditions when supplies from Metropolitan are limited. Cucamonga Valley Water District (CVWD) and GSWC will use groundwater in lieu of taking delivery of imported water from Metropolitan. SMWD has a transfer agreement with Cucamonga Valley Water District of 4,250 AFY, both short term and long term. SMWD also has a short term transfer agreement with GSWC of 2,000 AFY.

IRWD Strand Ranch Water Banking Program - IRWD implemented their Strand Ranch Water Banking Program and initiated the first delivery of water under the program to their service territory in OC in June 2015 as a demonstration effort. The delivered water was determined by Metropolitan to meet the definition of an "extraordinary supply" meaning that IRWD received full credit for the water under Metropolitan's water supply allocation plan. The banking program has been implemented via agreements with Metropolitan to wheel the water through their system, when requested.

3.7 Supply Reliability

3.7.1 Overview

Every urban water supplier is required to assess the reliability of their water service to its customers under normal, dry, and multiple dry water years. MWDOC's service area depends on a combination of imported

and local supplies to meet its service area water demands and has taken numerous steps to ensure its member agencies have adequate supplies. Development of numerous local sources augment the reliability of the imported water system. There are various factors that may impact reliability of supplies such as legal, environmental, water quality and climatic which are discussed below. The water supplies available to the MWDOC service area are projected to meet full-service demands based on the findings by Metropolitan in its 2015 UWMP starting 2020 through 2040 during normal years, single dry year, and multiple dry years.

Metropolitan's 2015 UWMP describes the core water resources that will be used to meet full-service demands at the retail level under all foreseeable hydrologic conditions from 2020 through 2040. The foundation of Metropolitan's resource strategy for achieving regional water supply reliability has been to develop and implement water resources programs and activities through its preferred resource mix. This preferred resource mix includes conservation, local resources such as water recycling and groundwater storage, in-region groundwater storage, out-of-region banking, treatment, conveyance and infrastructure improvements.

Table 3-12 shows the basis of water year data used to predict drought supply availability.

Table 3-12: Basis of Water Year Data

Wholesale: Basis of Water Year Data			
Year Type	**Base Year** *If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000*	**Available Supplies if Year Type Repeats**	
		☐	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____
		☑	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available	**% of Average Supply**
Average Year	2015	231,000	100%
Single-Dry Year	2014	-	106%
Multiple-Dry Years 1st Year	2012	-	106%
Multiple-Dry Years 2nd Year	2013	-	106%
Multiple-Dry Years 3rd Year	2014	-	106%
(1) NOTES: Assumes M&I demand levels in 2015 of 159,000, Irvine Lake replenishment of 7,000 AF and groundwater replenishment demands of 65,000 AFY. (2) Assumes increase of demands in dry and multiple dry years of +6% based on OC Reliability Study			

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3.7.2 Factors Contributing to Reliability

The Act requires a description of water supply reliability and vulnerability to seasonal or climatic shortage. The following are some of the factors identified by Metropolitan that may have an impact on the reliability of Metropolitan supplies.

3.7.2.1 Environment

Endangered species protection needs in the Delta have resulted in operational constraints to the SWP system, as mentioned previously in the State Water Project Supplies section.

3.7.2.2 Legal

The addition of more species under the Endangered Species Act and new regulatory requirements could impact SWP operations by requiring additional export reductions, releases of additional water from storage or other operational changes impacting water supply operations.

3.7.2.3 Water Quality

3.7.2.3.1 Imported Water

Metropolitan is responsible for providing high quality potable water throughout its service area. Over 300,000 water quality tests are performed per year on Metropolitan's water to test for regulated contaminants and additional contaminants of concern to ensure the safety of its waters. Metropolitan's supplies originate primarily from the CRA and from the SWP. A blend of these two sources, proportional to each year's availability of the source, is then delivered throughout Metropolitan's service area.

Metropolitan's primary water sources face individual water quality issues of concern. The CRA water source contains higher TDS and the SWP contains higher levels of organic matter, lending to the formation of disinfection byproducts. To remediate the CRA's high level of salinity and the SWP's high level of organic matter, Metropolitan blends CRA and SWP supplies and has upgraded all of its treatment facilities to include ozone treatment processes. In addition, Metropolitan has been engaged in efforts to protect its Colorado River supplies from threats of uranium, perchlorate, and chromium VI while also investigating the potential water quality impact of emerging contaminants, N-nitrosodimethylamine (NDMA), and pharmaceuticals and personal care products (PPCPs). While unforeseeable water quality issues could alter reliability, Metropolitan's current strategies ensure the deliverability of high quality water.

The presence of Quagga mussels in water sources is a water quality concern. Quagga mussels are an invasive species that was first discovered in 2007 at Lake Mead, on the Colorado River. This species of mussels form massive colonies in short periods of time, disrupting ecosystems and blocking water intakes. They are capable of causing significant disruption and damage to water distribution systems. Controlling the spread and impacts of this invasive species within the CRA requires extensive maintenance and results in reduced operational flexibility. It has also resulted in Metropolitan eliminating deliveries of CRA water into DVL to keep the reservoir free from Quagga M~~m~~ussels.

3.7.2.3.2 Groundwater

Orange County Groundwater Basin

OCWD is responsible for managing the Orange County Groundwater Basin. To maintain groundwater quality, OCWD conducts an extensive monitoring program that serves to manage the Orange County Groundwater Basin's groundwater production, control groundwater contamination, and comply with all required laws and regulations. A network of nearly 700 wells provides OCWD a source for samples, which are tested for a variety of purposes. OCWD collects 600 to 1,700 samples each month to monitor Orange County Groundwater Basin water quality. These samples are collected and tested according to approved federal and state procedures as well as industry-recognized quality assurance and control protocols.

San Juan Groundwater Basin

Groundwater quality from the San Juan Basin was determined through the analyses of available data from production and monitoring wells. Constituents of concern within the San Juan Basin include TDS, nitrate nitrogen, manganese, and iron.

TDS consists of inorganic salts dissolved in water, with the major ions being sodium, potassium, calcium, magnesium, bicarbonates, chlorides, and sulfates under Title 22. The California secondary MCL for TDS is 500 mg/L. Four wells were tested for TDS and all of the wells exceeded the secondary MCL for TDS. The lower portion of the San Juan Basin exhibits relatively higher TDS levels due to irrigation return flows, fertilizer use, consumptive use, and dissolution of ions from weathered rock surfaces and salts.

Nitrate within groundwater can be both naturally-occurring and can also be associated with agriculture and other synthetic production. The primary MCL for nitrate in drinking water is 10 mg/L. Most groundwater wells monitored for nitrate exhibited levels below MCL except for two wells.

Manganese is a naturally-occurring inorganic constituent dissolved in water. Manganese is an essential micronutrient at low concentrations, but at higher concentrations in drinking water, manganese may lead to objectionable aesthetic qualities such as bitter taste and staining of clothes. The California secondary MCL for manganese is 0.5 mg/L. Most wells monitored for manganese exceeded the secondary MCL for manganese by as much as 40 times with the exception of two wells in the Oso and Lower Trabuco area.

Iron is a naturally-occurring inorganic constituent dissolved in water. Similar to manganese, iron in low concentrations is an essential micronutrient, but iron in higher concentrations in drinking water leads to the same objectionable aesthetic qualities as those of manganese. The California secondary drinking water MCL for iron is 0.3 mg/L. With the exception of one groundwater well in the Oso area, all wells exceeded the secondary MCL for iron by as much as 60 times (San Juan Basin Authority, San Juan Basin Groundwater and Facilities Management Plan, November 2013).

La Habra Groundwater Basin

La Habra Groundwater Basin has water quality concerns that require treatment or blending with higher quality water to meet the State's health standards. TDS, hydrogen sulfide, iron, and manganese impair La Habra Groundwater's water supply. The quality of Idaho Street Well raw water requires treatment before entering the City of La Habra's distribution system. The treatment system includes chlorination, air-stripping to remove hydrogen sulfide and ammonia that may be present, and the addition of sodium hexametaphosphate to sequester iron and manganese. Water from the La Bonita Well and the Portola Well is chlorinated and then blended with CDWC purchased water in a 250,000-gallon forebay to reduce mineral concentration (La Habra, Draft Groundwater Study, August 2014).

Main San Gabriel Groundwater Basin

VOCs and nitrates are the most prevalent contaminants found in the Main San Gabriel Basin. As a result, the location and treatment methods are generally well understood. During FY 2014 to 2015, 30 treatment plants treated approximately 78,300 AF of water from the Main San Gabriel Basin. VOC and nitrate levels throughout the Main San Gabriel Basin are shown on Figures 3-10 and 3-11, respectively.

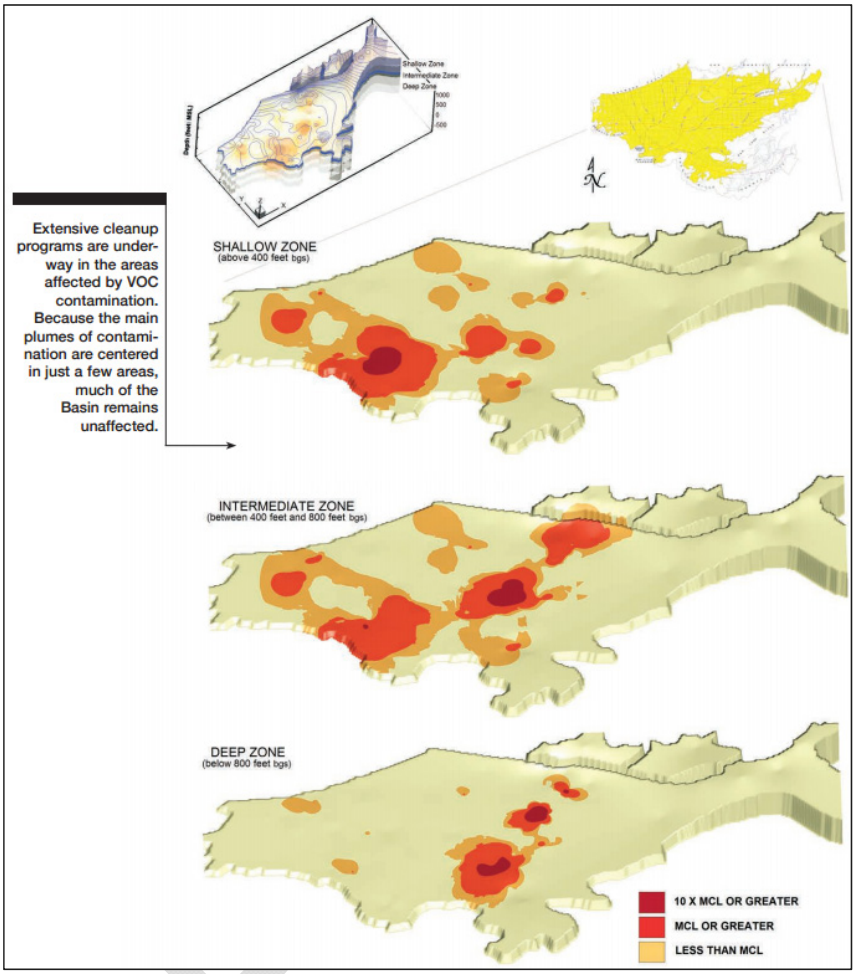

Figure 3-10: VOC levels through the Main San Gabriel Basin

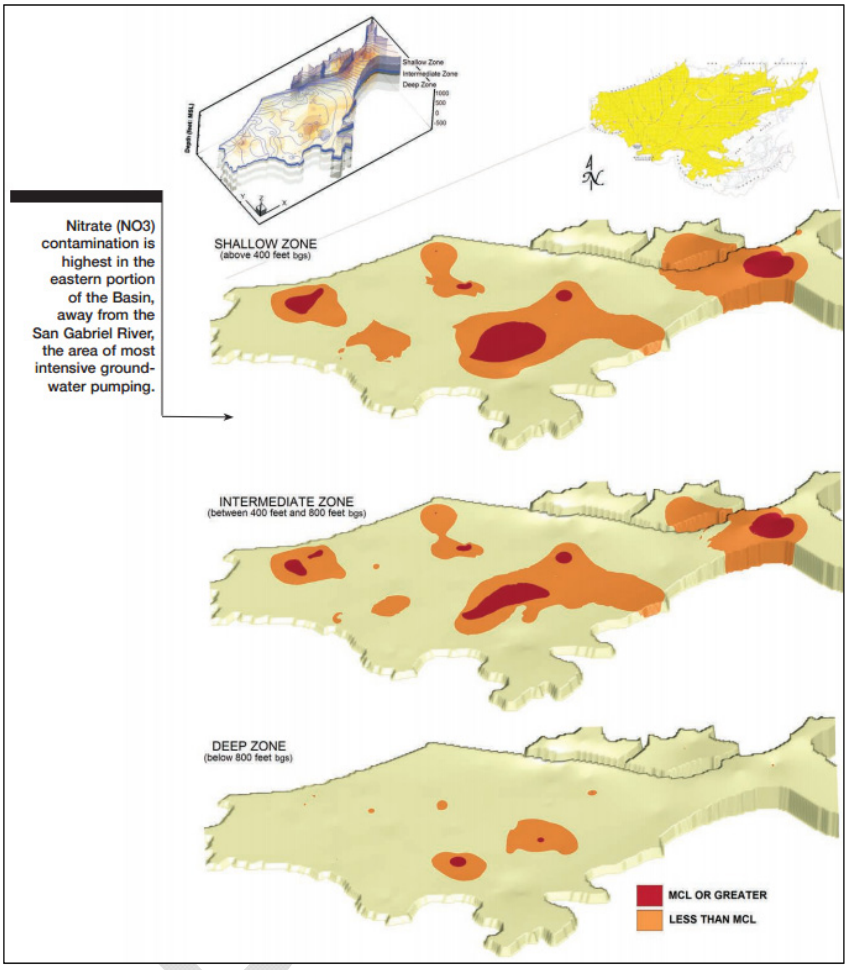

Figure 3-11: Nitrate levels throughout the Main San Gabriel Basin

The Division of Drinking water (DDW) lowered the notification level of perchlorate from 18 to 4 parts per billion (ppb) in January 2002. Subsequently, a total of 22 wells from the Main San Gabriel Basin were removed from service due to unacceptable levels of perchlorate. In October 2007, the DDW established an MCL of 6 ppb. Efforts to treat perchlorate by the Watermaster resulted in ion-exchange technology treatment facilities at five sites in the Baldwin Park Operable Unit (BPOU) and at two facilities in other parts of the Main San Gabriel Basin during FY 2014 to 2015.

During 1998, local eight local wells within the Main San Gabriel Basin were had levels of NDMA above the notification level. Three of the wells were taken off-line as a direct result of NDMA levels above notification level. The Watermaster played a key role in the construction of NDMA treatment facilities within the Main San Gabriel Basin. Five facilities were operational during FY 2014 to 2015.

1,2,3-TCP is a degreasing agent that has been detected in the BPOU during the winter of 2006. Its presence delayed the use of one treatment facility for potable purposes. The DDW determined 1,2,3-TCP is best treated through liquid phase granular activated carbon. Facilities to treat 1,2,3-TCP were operational during FY 2014-2015.

Cr VI is a naturally occurring substance that has been detected in drinking water wells through the Main San Gabriel Basin. Cr VI is also associated with industrial sources of contamination, such as metal plating. In July 1, 2014, the DDW established a new MCL for Cr VI of 10 ppb. Currently, Cr VI concentrations in all active wells are below the maximum contaminant level (MCL) (Main San Gabriel Basin Watermaster, Five-Year Water Quality and Supply Plan, 2015).

3.7.2.4 Climate Change

Changing climate patterns are expected to shift precipitation and temperature patterns and affect both water supply and demands. Unpredictable weather patterns will make water supply planning more challenging. The areas of concern for California include a reduction in Sierra Nevada Mountain snowpack, increased intensity and frequency of extreme weather events, and rising sea levels causing increased risk of Delta levee failure, seawater intrusion of coastal groundwater basins, and potential cutbacks on the SWP and CVP. The major impact in California is that without additional surface storage, the earlier and heavier runoff (rather than snowpack retaining water in storage in the mountains), will result in more water being lost into the oceans. A heavy emphasis on storage is needed in the State of California.

In addition, the Colorado River Basin supplies have been inconsistent since 2000, resulting in 13 of the last 16 years of the upper basin runoff being below normal. Climate models are predicting a continuation of this pattern whereby hotter and drier weather conditions will result in continuing lower runoff.

Legal, environmental, and water quality issues may have impacts on Metropolitan supplies. It is felt, however, that climatic factors would have more of an impact than legal, water quality, and environmental factors. Climatic conditions have been projected based on historical patterns but severe pattern changes are still a possibility in the future.

3.7.3 Normal-Year Reliability Comparison

MWDOC receives imported water from Metropolitan via connection to Metropolitan's regional distribution system. Although pipeline and connection capacity rights do not guarantee the availability of water, per se, they do guarantee the ability to convey water into the local system when it is available from the Metropolitan distribution system.

For the 2015 UWMP, MWDOC's 2015 demand was selected as the normal year demand for M&I purposes of 159,000; additional demands (10 year average) were added for refill of Irvine Lake of 7,000 AF, and the long term demands for groundwater replenishment of 65,000 AFY to get average year total demands of 231,000 AF.

A comparison between the supply and demand for projected years between 2020 and 2040 is shown in Table 3-13. As stated above, the available supply will meet projected demand due to diversified supply and conservation measures.

Table 3-13: Normal Year Supply and Demand Comparison (AFY)

Wholesale: Normal Year Supply and Demand Comparison (AFY)					
	2020	2025	2030	2035	2040
Supply totals *(autofill from Table 6-9)*	205,132	216,560	212,509	208,219	207,441
Demand totals *(autofill from Table 4-3)*	205,132	216,560	212,509	208,219	207,441
Difference	0	0	0	0	0
NOTES: Includes MWDOC Service Area Projected M&I and Surface & GW replenishment demands. Source: OC Reliability Study					

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3.7.4 Single Dry-Year Reliability Comparison

A Single-dry year is defined as a single year of minimal rainfall within a period that average precipitation is expected to occur. In accordance with Metropolitan forecasts, MWDOC has documented that it is 100 percent reliable for single dry year demands from 2020 through 2040 with a demand increase of 15.6 percent of average demands. This percentage was determined by MWDOC based on its OC Reliability which is explained in Appendix G.

A comparison between the supply and the demand in a single dry year is shown in Table 3-14. As stated above, the available supply will meet projected demand due to diversified supply and conservation measures.

Table 3-14: Single Dry Year Supply and Demand Comparison (AFY)

Wholesale: Single Dry Year Supply and Demand Comparison (AFY)					
	2020	2025	2030	2035	2040
Supply totals	213,101	225,215	220,921	216,374	215,549
Demand totals	213,101	225,215	220,921	216,374	215,549
Difference	0	0	0	0	0
NOTES: OC Reliability Study					

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3.7.5 Multiple Dry-Year Reliability Comparison

Multiple-dry years are defined as three or more years with minimal rainfall within a period of average precipitation. In accordance with Metropolitan forecasts, MWDOC is capable of meeting all retail agency demands with significant reserves held by Metropolitan in multiple dry years from 2020 through 2040 with a demand increase of 6 percent. A comparison between the supply and the demand in multiple dry years is shown in Table 3-15.

Table 3-15: Multiple Dry Years Supply and Demand Comparison (AFY)

Wholesale: Multiple Dry Years Supply and Demand Comparison (AFY)						
		2020	2025	2030	2035	2040
First year	Supply totals	213,101	225,215	220,921	216,374	215,549
	Demand totals	213,101	225,215	220,921	216,374	215,549
	Difference	0	0	0	0	0
Second year	Supply totals	213,101	225,215	220,921	216,374	215,549
	Demand totals	213,101	225,215	220,921	216,374	215,549
	Difference	0	0	0	0	0
Third year	Supply totals	213,101	225,215	220,921	216,374	215,549
	Demand totals	213,101	225,215	220,921	216,374	215,549
	Difference	0	0	0	0	0
NOTES: OC Reliability Study						

4 DEMAND MANAGEMENT MEASURES

The goal of the Demand Management Measures (DMM) section is to provide a comprehensive description of the water conservation programs that a supplier has implemented, is currently implementing, and plans to implement in order to meet its urban water used reduction targets. The reporting of DMMs were significantly modified in 2014 by Assembly Bill 2067 to streamline the DMM reporting requirements. For retail suppliers the requirements changed from 14 specific measures to six more general requirements plus an "other" category:

- Water waste prevention ordinances
- Metering
- Conservation pricing
- Public education and outreach
- Programs to assess and manage distribution system real loss
- Water conservation program coordination and staffing support
- Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented

Wholesale agencies must now provide narrative descriptions of metering, public education and outreach, water conservation program coordination and staffing support, and other DMMs, as well as a narrative of asset management and the wholesale supplier assistance programs.

4.1 Overview

MWDOC demonstrated its commitment to water use efficiency in 1991 by voluntarily signing the MOU Regarding Urban Water Conservation in the CUWCC. The California Urban Water Conservation Council was formed through adoption of this MOU and is considered the "keeper" of the BMPs, with the authority to add, change, or remove BMPs. The CUWCC also monitors implementation of the MOU. As a signatory to the MOU, MWDOC has committed to a good-faith-effort to implement all cost-effective BMPs.

An ethic of efficient use of water has been developing over the last 25 years of implementing water use efficiency programs. Retail water agencies throughout Orange County also recognize the need to use existing water supplies efficiently – implementation of BMP-based efficiency programs makes good economic sense and reflects responsible stewardship of the region's water resources. All retail water agencies in Orange County are actively implementing BMP-based programs; however, not all retail water agencies are signatory to the MOU.

As a signatory to the CUWCC MOU regarding urban water use efficiency, MWDOC's commitment to implement BMP-based water use efficiency program continues today. To help facilitate implementation of BMPs throughout Orange County, as a wholesaler MWDOC's efforts focus on the following three areas that both comply with and go beyond the Foundational BMPs of Utility Operations Programs, formerly BMP 10 - Wholesale Agency Assistance Program, requirements.

Regional Program Implementation - MWDOC develops, obtains funding for, and implements regional BMP programs on behalf of all retail water agencies in Orange County. This approach minimizes confusion to consumers by providing the same programs with the same participation guidelines, and also maintains a consistent message to the public to use water efficiently. Further, MWDOC helps build partnerships to accomplish conservation.

Local Program Assistance - When requested, MWDOC assists retail agencies to develop and implement local programs within their individual service areas. This assistance includes collaboration with each retail agency to design a program to fit that agency's local needs, which may include providing staffing, targeting customer classes, acquiring grant funding from a variety of sources, and implementing, marketing, reporting, and evaluating the program. MWDOC provides assistance with a variety of local programs including, but not limited to, Home Water Surveys, Large Landscape Water Use Reports, Drip Irrigation Pilot Program, Public Agency Water Smart Landscape Incentives, HOA and Public Information, School Education, Conservation Pricing, and Water Waste Prohibitions. Many of these local programs have also been structured through Integrated Regional Water Management Planning processes in north, central and south Orange County.

Research and Evaluation - An integral component of any water use efficiency program is the research and evaluation of potential and existing programs. Research allows an agency to measure the water savings benefits of a specific program and then compare those benefits to the costs of implementing the program in order to evaluate the economic feasibility of the program when compared to other efficiency projects or existing or potential sources of supply. Furthermore, in 2013 MWDOC published its first Orange County Water Use Efficiency Master Plan to define how Orange County will comply with, or exceed, the state mandate of a 20 percent reduction in water use by 2020, and how MWDOC will achieve its share of Metropolitan's Integrated Resources Plan water savings goal. The Master Plan is being used to achieve the water savings goal at the lowest possible costs while maintaining a mix of programs desired by water agencies and consumers throughout Orange County.

Table 4-1 summarizes BMP implementation responsibilities of MWDOC as Orange County's wholesale supplier and responsibilities of MWDOC's retail agencies.

Table 4-1: BMP Implementation Responsibility and Regional Programs in Orange County

Efficiency Measure	Former BMP No.	Applies to:		MWDOC Regional Program
		Retailer	MWDOC as a Wholesaler	
Operations Practices				
Wholesale Agency Assistance Programs	10	-	√	√
Conservation Pricing	11	√	√	√
Conservation Coordinator	12	√	√	√
Water Waste Prevention	13	√	-	√
WaterSense Specification toilets (Residential Plumbing Fixture Retrofits[1])	14	√	-	√
WaterSense Specification for Residential Development	-	√	-	-
Water Loss Control (System Water Audits, Leak Detection and Repair)	3	√	[2]	√
Metering With Commodity Rates	4	√	[2]	
Commercial, Industrial, and Institutional (CII) Programs	9	√	-	√
Large Landscape Conservation Programs	5	√		√
Residential Implementation				
Residential Assistance Program (Home Water Surveys Water Efficiency Suggestions)	1 & 2	√	-	√
Landscape Water Survey	1	√	-	√
High-Efficiency Washing Machine Rebate Programs	6	√	-	√
WaterSense Specification toilets	14	√	-	√

(Residential Plumbing Fixture Retrofits[1])				
WaterSense Specification for Residential Development	-	√	-	-
Education Programs				
Public Information Programs	7	√	√	√
School Education Programs	8	√	√	√

(1) 75% Saturation goal achieved in 2009.
(2) MWDOC does not own or operate a distribution system; water wholesaled by MWDOC is delivered through the Metropolitan distribution system and meters.

4.2 BMP Implementation in MWDOC Service Area

Successful strategies are built by leveraging opportunities and creating customer motivation to take action to begin a market transformation. For Water Use Efficiency programs specifically, this starts by selecting the highest water consuming sectors and then creating an attractive implementation package. The next step is to identify ways to break through traditional market barriers by testing out innovative technologies and/or delivery mechanisms. Last of all, any program marketing campaign needs to be launched, employing a full spectrum of varying outreach methods. The Implementation Design Steps are illustrated on Figure 4-1.

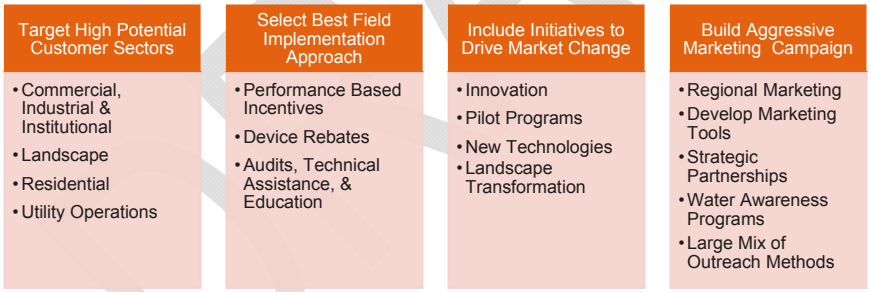

Figure 4-1: Implementation Design Steps

Table 4-2 summarizes the remaining water use efficiency potential by market sector within Orange County. Within each sector the table lists sources of conservation, the stage of programmatic development, description of how the potential is derived, and the qualitative range from low to high. This broad overview organizes the more detailed discussion of conservation potential in what follows.

Table 4-2: Remaining Water Use Efficiency Potential

Sector, Measures, End Uses	Stage	Description of Potential	Potential
Residential Indoor			
Toilets	Late	Small number 3.5gpf, ULF to HET, >HET?	Low
Faucets, Aerators, Flow Restrictors	Late	Small remaining potential	Low
Showerheads	Late	Very low flow rates, behaviour	Low
Clothes Washers	Mid	Low saturation	High
Pressure Regulating Valves	Pilot, Research	Covers all end uses	High
Surveys, Education, Outreach	Ongoing	Gateway program, behaviour	Low-Mid
Conservation Rates	Developing	Covers all end uses	High
Landscape			
Controllers	Early	SF Residential large remaining potential	High
Nozzles	Early	Large remaining potential	High
Turf Replacement, Low Water Plants	Early	Large technical potential; small economic potential	High
Artificial Turf	Early	Large technical potential; small economic potential	High
Pressure Regulating Valves	Pilot, Research	Covers all end uses	High
Landscape Management	Ongoing	Gateway program, behaviour, communication	High
Surveys, Education, Outreach	Ongoing	Gateway program, behaviour	Low-Mid
Conservation Rates	Developing	Covers all end uses	High
CII (Non-Landscape)			
Toilets	Mid	Small number 3.5gpf, ULF to HET, >HET?	Mid
Urinals	Mid	High traffic sites	Mid
Faucets, Aerators, Flow Restrictors	Late	Small remaining potential	Low
Showerheads	Mid	Sports facilities, accomodation	Mid
Food Service Equipment	Mid	Needs short pay back	Mid
Laundry	Mid	High water use is economic incentive	High
Industrial Processes and Manufacturi	Mid	Acceptance, regulatory issues, competiveness	High
Cooling	Mid	Needs short pay back	High
Pressure Regulating Valves	Pilot, Research	Covers all end uses	High
Surveys, Education, Outreach	Ongoing	Gateway program, behaviour	Low-Mid
Conservation Rates	Developing	Covers all end uses	High

MWDOC's water use efficiency programs cut across a number of market segments and differ in their delivery formats. There are intentional reasons for this varied approach. Through evaluation of past programs, it has been shown that there are three implementation approaches that are particularly effective at securing water savings in a cost-effective and persistent manner. These implementation approaches have been built into each of MWDOC's program offerings and matched up with the appropriate program sector as follows:

Performance based incentives - This payment format works especially well for the large landscape and CII sectors due to the array of site specific needs and custom processes and equipment at these sites.

Standardized device rebates - Rebates are most applicable for the more "cookie cutter" type measures where there is a limited number of products and styles and well defined water savings rates. These incentives are the predominant payment method for residential, small commercial, and small to medium sized landscape markets.

Audits, assistance, and education - All customer segments benefit from additional technical support services. This includes services such as audits for CII customers, sprinkler adjustment notices for the landscape segment and home water audits or certification programs for residential customers.

Figure 4-2 shows MWDOC's programs under each of the three implementation approaches.

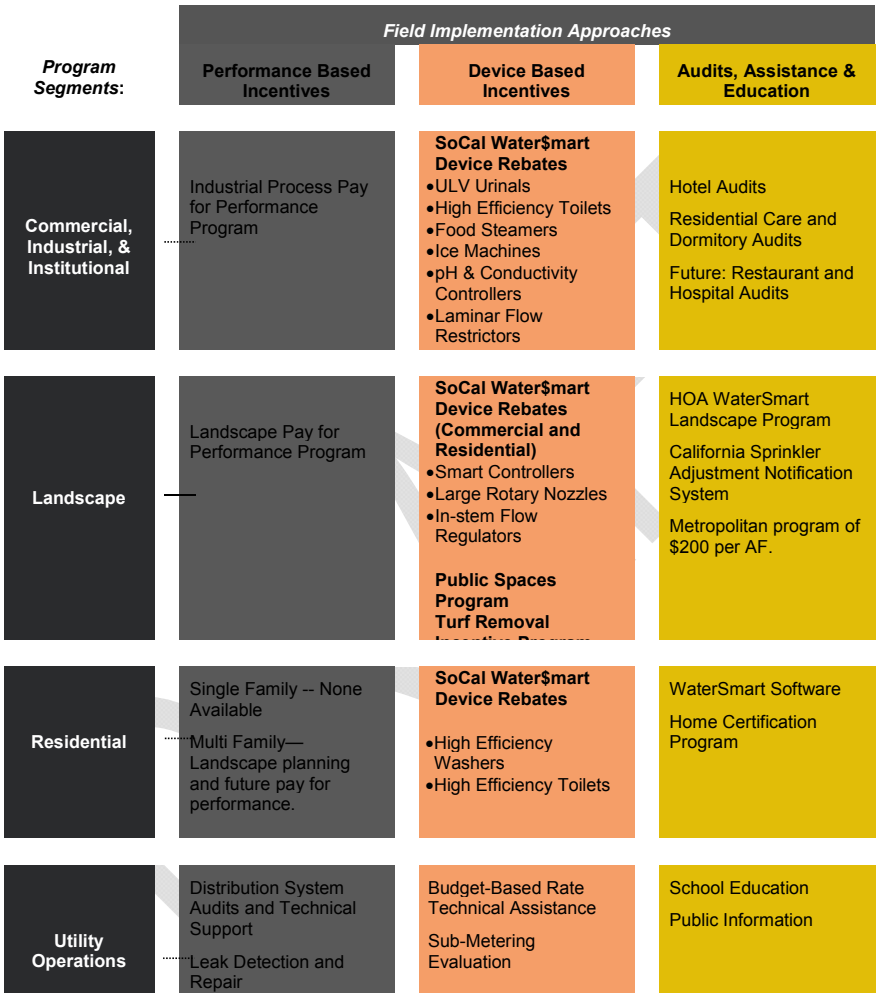

Figure 4-2: Demand Management Measure Implementation Approaches

4.3 Wholesale Supplier Assistance Programs

As described in the sections above, MWDOC provides financial incentives, conservation-related technical support, and regional implementation of a variety of BMP-based programs. In addition, MWDOC conducts

research projects to evaluate implementation of both existing programs and new pilot programs. On behalf of its member agencies, MWDOC also organizes and provides the following:

- Monthly coordinator meetings
- Marketing materials
- Public speaking
- Community events
- American Water Works Association/International Water Association (IWA) Audit Study

4.4 Landscape Ordinance

The Water Conservation in Landscaping Act (Assembly Bill 1881, Laird) was passed in 2006 to increase outdoor water use efficiency. Governor Brown's Drought Executive Order of April 1, 2015 (EO B-29-15) directed DWR to update the State's Model Water Efficient Landscape Ordinance (Ordinance) through expedited regulation. The California Water Commission approved the revised Ordinance on July 15, 2015.

This legislation required cities and counties to adopt a Water Efficient Landscape Ordinance by December 1, or adopt their own ordinance, which must be at least as effective in conserving water as the State's Ordinance. Local agencies working together to develop a regional ordinance have until February 1, 2016. MWDOC worked in partnership with the Orange County Division of the League of Cities, Orange County cities, retail water providers, building industry, landscape architects, and irrigation consultants to develop an Orange County Model Water Efficient Landscape Ordinance specific to the needs of Orange County. The foundation of the Orange County Model Ordinance was based on the State Model Ordinance.

This collaborative, regional approach has ensured that local ordinances are consistent from city to city, and has limited the cost and complexity of implementing the mandate. Based on the Orange County model ordinance, cities and unincorporated areas have adopted local ordinances that set guidelines for designing and approving landscape projects. The new ordinance imposes a lower Maximum Applied Water Allowance (MAWA) that new and rehabilitated landscapes must be designed to meet.

Through this effort, cities throughout Orange County have adopted and are implementing landscape ordinances that are consistent with the requirements of the updated Water Conservation in the Landscape Act

4.5 Metering

Metering with commodity rates by wholesale and retail agencies has been an industry standard throughout Orange County for many years. All customers are metered and billed based on commodity rates either monthly or bi-monthly.

With the sale of the Allen-McColloch Pipeline to Metropolitan in 1995, MWDOC no longer owns or operates a distribution system. Water purchased and sold by MWDOC is distributed through Metropolitan's system to the MWDOC retail agencies.

4.6 Conservation Pricing

MWDOC publishes annually the *Orange County Water Agencies Water Rates, Water System Operations, and Financial Information* survey. This survey documents the rates charged by each retail water agency, as well as the type of rate structure, i.e., a flat rate, inclined block, or seasonal rate structure. Table 4-3 provides a brief summary of the types of rates used by retail water agencies in Orange County and shows a slow progression away from uniform rates.

Table 4-3: Summary of Rate Structure Types Used in Orange County

Types of Rate Structure	Number of Agencies Utilizing Different Rate Structure Types					
	1990	1995	2000	2005	2010	2015
Declining Block	0	0	0	0	0	0
Uniform or Flat	22	23	19	16	8	9
Inclined Block	13	9	10	12	14	-
Seasonal Inclined Block	1	2	3	3	6	-
Budget Based Tiered Rate	0	1	1	1	2	-

4.7 Public Education and Outreach

MWDOC currently offers a wide range of public information programs in Orange County. Each program targets different water customer segments. For example, the O.C. Water Hero Program aims to encourage school children to use water wisely; MWDOC's electronic newsletter "eCurrents" is designed to keep residents and businesses, stakeholder groups, opinion leaders, and others apprised of MWDOC news and programs. MWDOC's current public information programs are described below.

OC Water Summit

Currently in its ninth year, the O.C. Water Summit is an innovative, interactive forum that brings together hundreds of business professionals, elected officials, water industry stakeholders, and community leaders from throughout southern California and beyond. Co-hosted by the MWDOC and OCWD, this one of-a-kind event engages participants in discussion on new and ongoing water supply challenges, water policy issues, and other important topics that impact our economy and public health. O.C. Water Summit About the Prominent authors, world-renowned experts, and distinguished speakers will deliver presentations and engage in dialogue with participants on these critical issues. By sponsoring the O.C. Water Summit, you are investing in water reliability for southern California. A variety of sponsorship opportunities are available to meet your organization's strategic goals.

Water Facility Inspection Trip Program

The inspection trip program is sponsored by MWDOC and Metropolitan. Each year, Orange County elected officials, residents, business owners, and community leaders are invited to attend educational inspection trips to tour key water facilities throughout the state of California, such as Diamond Valley Lake, a Metropolitan storage reservoir (Figure 4-3). The goal is to educate members of our community about planning, procurement and management of southern California's water supply and the issues surrounding delivery and management of this vital resource. The inspection trips are specifically designed to address various water issues affecting the state, including water supply, delivery, treatment, sustainability, environment, and water policy. All trips are hosted by a MWDOC/Metropolitan Director.

Figure 4-3: Diamond Valley Lake, Hemet, California

eCurrents

eCurrents is the monthly electronic newsletter of the MWDOC. It is designed to keep MWDOC's 28 retail agencies, residents and businesses, stakeholder groups, opinion leaders, and others apprised of MWDOC news, programs, events, and activities. The publication also serves to keep readers informed about regional, state, and federal issues affecting water supply, water management, water quality, and water policy and regulation.

Water Advisory Committee of Orange County (WACO)

WACO was formed in 1983 to facilitate the introduction, discussion, and debate of current and emerging water issues among Orange County policymakers and water professionals. It has also advocated the Orange County water community's position on issues affecting the provision and management of our water supplies with lawmakers, regulatory agencies, regional and state water organizations, and others.

The committee's membership has evolved during the past quarter century to include elected officials and management staff from Orange County cities and water districts, engineers, attorneys, consultants, and other industry professionals. The meetings are also attended from time-to-time by Orange County residents, community group members, and legislators or their staff, who share a common interest in water issues.

Monthly meetings are open to the public and are typically held on the first Friday of each month at 7:30 a.m. The meetings take place at the Fountain Valley headquarters of MWDOC and OCWD. The meetings are designed to provide attendees with an opportunity for professional networking and to receive informative presentations from water industry professionals, academics, economists, engineers, political officials, and industry experts about key water issues affecting Orange County.

School Education Programs

One of the most successful and well-recognized water education curriculums in southern California is MWDOC's Water Education School Program. For more than 30 years, School Program mascot "Ricki the Rambunctious Raindrop" (Figure 4-4) has been educating students in grades K-5 about the water cycle, the importance and value of water, and the personal responsibility we all have as environmental stewards.

Figure 4-4: Water Education School Program Mascot, Ricki the Rambunctious Raindrop

The School Program features assembly-style presentations that are grade-specific and performed on-site at the schools. The program curriculum is aligned with the science content standards established by the State of California. Since its inception in 1973, nearly three million Orange County students have been educated through the School Program.

In 2004, MWDOC formed an exciting partnership with Discovery Science Center that has allowed both organizations to reach more Orange County students each year and provide them with even greater educational experiences in the areas of water and science. Discovery Science Center currently serves as the School Program administrator, handling all of the program marketing, bookings, and program implementation. During the 2010-11 school year, more than 70,000 students will be educated through the program.

Water Education Poster & Slogan Contest - Each year, MWDOC holds a Water Education Poster and Slogan Contest to increase water awareness. To participate, children in grades K-6 develop posters and slogans that reflect a water awareness message. The goal is to get children thinking about how they can use water wisely and to facilitate discussion about water between children and their friend, parents, and teachers. Each year, more than 1,500 poster and slogan entries are received through the contest.

During a special judging event, approximately 16 posters and 10 slogans are selected as the winners. All of our winners – and their parents, teachers, and principals – are invited to attend a special awards ceremony with Ricki the Raindrop at Discovery Science Center. At the awards ceremony, the winners are presented with their framed artwork as well as a custom t-shirt featuring their poster or slogan, a trophy, a certificate, and other fun water-saving prizes. The 2015 winning poster is shown on Figure 4-5.

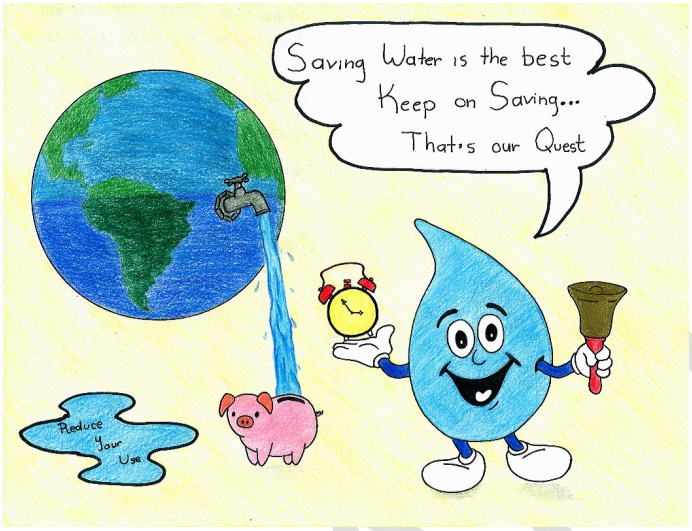

Figure 4-5: 2015 Water Education Poster & Slogan Contest, 4th Grade Winning Poster

Children's Water Education Festival

The largest water education festival of its kind is the annual Children's Water Education Festival (Festival). The Festival is presented by OCWD, the National Water Research Institute, Disneyland Resort, and sponsored by MWDOC. Each year, more than 5,000 students participate in the Festival over the course of this two-day event. The Festival is currently held at the University of California, Irvine.

The Festival presents a unique opportunity to educate students in grades four through six about local water issues and help them understand how they can protect our water resources and the environment. Students attend the Festival with their teacher and classmates, visiting a variety of booths focused on different water-related topics throughout the day. Participating organizations (presenters) engage the students through interactive educational presentations that are aligned with the science content standards established by the State of California. Since its inception, more than 80,000 children from schools throughout Orange County have experienced the Festival and all it has to offer.

O.C. Water Hero Program

The Orange County Water Hero Program is a joint offering between MWDOC and OCWD that began in 2007. The basic premise of the program is to provide education to the youngest Orange County water users and to encourage them to be more water efficient, educate them on ways to save water both inside their home and outdoors, and to encourage their families to take the same pledge. Through a variety of outreach efforts and additional grant funding, we have been able to register over 15,000 children as OC Water Heroes, and an additional nearly 4,000 Super Heroes. The current effort underway, the

development of a mobile OC Water Hero App is designed to transition the children currently enrolled and re-engage them in water saving activities and education as well as engage new users and their families.

Figure 4-6: O.C. Water Hero Program Mascots, Left to right: Aqua Joe, Filter Bob, Hydrate, and Captain Sponge

Orange County Garden Friendly

The Orange County Garden Friendly Program in spring 2014, MWDOC began teaming up with the Orange County Stormwater Program and University of California Cooperative Extension to host events on Saturdays during fall and spring, with educational booth appearances at local garden centers across Orange County to engage customers before they made landscaping decisions and purchases. Retail customers learned about WaterSense® labeled weather-based irrigation controllers and the importance of “sprucing up” irrigation systems. Attendees can learn about and purchase OC Garden Friendly-approved plants and water-efficient irrigation devices, apply for rebates, and consult with gardening experts. As a result, WaterSense labeled controller sales during the inaugural season increased by more than 225 percent compared to average daily sales activity.

A critical component of the OC Garden Friendly initiative is city and water agency cooperative involvement and public outreach at each event. Educating the retail staff’s awareness of water agency incentive and rebate programs, climate-appropriate plant material, and irrigation equipment improved over the course of events has also been a program benefit. Some retail spots display the promotional materials for months after the events.

Figure 4-7: MWDOC's 2014 Orange County Garden Friendly Booth

California Sprinkler Adjustment Notification System

The California Sprinkler Adjustment Notification System (CSANS) provides e-mail or "push" an irrigation index to assist property owners with making global irrigation scheduling adjustments, and is found at www.csans.net. Participants voluntarily register to receive this e-mail and can unsubscribe at any time. Additionally, the Base Irrigation Schedule Calculator and instructional videos were developed to enhance the system.

4.8 Programs to Assess and Manage Distribution System Real Loss

With the sale of the Allen-McColloch Pipeline to Metropolitan in 1995, MWDOC no longer owns or operates a distribution system. Water purchased and sold by MWDOC is distributed through Metropolitan's system to the MWDOC retail agencies.

However, in an effort to assist its retail agencies, MWDOC publishes annually the *Orange County Water Agencies Water Rates, Water System Operations, and Financial Information* survey. This survey facilitates a pre-screening survey that estimates the volume and percent of unaccounted-for-water for each retail water agency in the county. In 2009, the percent of unaccounted-for-water for retail water agencies ranged from a low of 1.5 percent to a high of 7.5 percent, with an average of 3.8 percent. (Waiting for info from Joe)

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In addition to the survey, MWDOC was awarded a grant to implement a study titled "Water Loss Management Program Assessment: Potable Water System Audits." This study used the American Water Works Association and International Water Association Water Audit Methodology. The following retail water agencies participated in the study: City of Brea, City of Huntington Beach, LBCWD, MNWD and City of Tustin.

The purpose of the study was to:

- Educate the agencies on the most current water loss control methods and technologies
- Perform system water audit for each agency to determine current water losses and areas for improvement
- Review each agency's leakage management program and recommend improvements
- Assist the agencies in achieving the California Urban Water Conservation Council Best Management Practice 1.2 compliance

Non-Revenue water ranged from 3 to 10 percent of volume of water supplied, which is very good and will within the range of efficient water utilities concerned about conservation and water loss management practices.

4.9 Water Conservation Program Coordination and Staffing Support

MWDOC's Water Use Efficiency Department is comprised of five (5) full time equivalent (FTE) positions and two (2) intern positions. Heading the department is the Water Use Efficiency (WUE) Director. Beneath him on the department organizational chart are Water Use Efficiency Supervisor, Water Use Efficiency Specialist, Water Use Efficiency Coordinator, and the Water Use Efficiency Analyst. The department also employs two part time student interns who function in a support role to the full time staff. The department works together in a collaborative nature, assisting one another in the implementation of the many Water Use Efficiency Programs.

MWDOC's WUE Department has a rich history of writing successful grant proposal from both State and Federal sources. State granting agencies include the SWRCB and DWR. Although there has been times when MWDOC has received federal funding from the Natural Resource Conservation Service (NRCS), the United States Bureau of Reclamation (USBR) is typically the primary federal source. Local Funding programs is considered at the center of the funding MWDOC receives for its WUE programs. This funding comes from two sources, the Metropolitan and MWDOC's retail water agencies. MWDOC, as a regional wholesaler of imported water, is one of Metropolitans member agencies and through its water rates paid to Metropolitan recoups these funds through a Metropolitan funding program under its Conservation Credits program. Metropolitan establishes a bi-yearly funding budget for both WUE programs and devices. MWDOC in turn establishes its own WUE programs using these Conservation Credits funds. MWDOC assists Orange County retail agencies by implementing an array of water use efficiency programs. These agencies elect to participate in the MWDOC programs and provide funding of their own for select devices or services.

4.9.1 Residential Implementation

MWDOC assists its retail water agencies to implement this BMP by making available the following programs aimed at increasing landscape water use efficiency for residential customers. MWDOC has implemented successful water use efficiency programs for residential customers for over 30 years. This began with our highly successful Ultra-Low-Flush Toilet Rebate Program, continued on through the High Efficiency Washer Program, and now continues with the High Efficiency Toilet Program.

Water Smart Home Survey Program

The Water Smart Home Survey Program provides free home water surveys (indoor and outdoor). The Water Smart Home Survey Program uses a Site Water Use Audit program format to perform 1,000 comprehensive, single-family home audits. Residents choose to have outdoor (and indoor, if desired) audits to identify opportunities for water savings throughout their properties. A customized home water audit report is provided after each site audit is completed and provides the resident with their survey results, rebate information, and an overall water score.

High Efficiency Clothes Washer Rebate Program

The High Efficiency Clothes Washer (HECW) Rebate Program provides residential customers with rebates for purchasing and installing WaterSense labeled HECWs. HECWs use 35-50 percent less water than standard washer models, with savings of approximately 9,000 gallons per year, per device. Devices must have a water factor of 4.0 or less, and a listing of qualified products can be found at ocwatersmart.com. There is a maximum of one rebate per home.

 High Efficiency Clothes Washers *(HECWs)*	Standard Incentive: $85 per washer Enhanced Incentive: Varies by participating agency. Market Description: Although HECWs have been incentivized heavily in recent years, the MWDOC market is far from saturated. Approximately 26% saturation rate with a potential of 650,000 units in the market that have yet to be changed out for high efficiency models. Per Unit Savings: 31 gallons per day (GPD) 15 year useful life .52 AF lifetime savings Cost per AF: **$360 with base rebate; $1,129 with enhanced rebate**

High Efficiency Toilet Rebate Program

The largest amount of water used inside a home, 30 percent, goes toward flushing the toilet. The High Efficiency Toilet (HET) Rebate Program offers incentives to residential customers for replacing their standard, water-guzzling toilets with HETs. HETs use just 1.28 gallons of water or less per flush, which is 20 percent less water than standard toilets. In addition, HETS save an average of 38 gallons of water per day while maintaining high performance standards.

 High Efficiency Toilets *(HETs)*	Standard Incentive: $50 per toilet Enhanced Incentive: Varies by participating agency. Market Description: Ultra low flush toilets, and in more recent years, high efficiency toilets have been heavily targeted over the last 20 years. 85% saturation rate with a potential of 250,000 – 350,000 residential units in the market that have yet to be changed out for high efficiency models. Per Unit Savings: 38 GPD 20 year useful life .85 AF lifetime savings Cost per AF: **$119** per AF

4.9.2 Conservation Programs for Commercial, Industrial and Institutional Accounts

MWDOC provides technical resources and financial incentives to help Orange County businesses, institutions, hotels, hospitals, industrial facilities, and public sector sites achieve their efficiency goals. Technical assistance is provided through on-site surveys, water use audits, and engineering assistance. Such projects include high efficiency commercial equipment installation and manufacturing process improvements.

Financial incentives are available for customized WUE projects at a rate of $1,500 to $1,950 per AF saved over one year. Funding is provided in part by the USBR, CA Department of Water Resources, and Metropolitan.

Water Smart Hotel Program

Water used in hotels and other lodging businesses accounts for approximately 15 percent of the total water use in commercial and institutional facilities in the United States. The Water Smart Hotel Program provides water use surveys, customized facility reports, technical assistance, and enhanced incentives to hotels that invest in water use efficiency improvements. Rebates available include high efficiency toilets, ultralow volume urinals, air-cooled ice machines, weather-based irrigation controllers, and rotating nozzles.

In 2008 and 2009, MWDOC received grants from DWR and the USBR to conduct the Water Smart Hotel Program, a program designed to provide Orange County hotels and motels with commercial and landscape water saving surveys, incentives for retrofits and customer follow-up and support. The goal of the program is to implement water use efficiency changes in hotels to achieve an anticipated water savings of 7,078 AF over 10 years.

Water Smart Industrial Program

The Water Smart Industrial Program provides engineering surveys to identify water saving process improvements in the Orange County industrial customer base. Additionally it provides Engineering Assistance and Financial incentives to help implement the recommendations from those surveys. This is done with funding from DWR, USBR, Metropolitan and MWDOC. To date the program has identified a water savings potential of 450 million gallons per year. Types of projects have included treating and reusing water in manufacturing process or for cooling towers and new wash equipment with upgraded washers, nozzles and automated control systems.

Device Retrofits

MWDOC also offers financial incentives under the Socal Water$mart Rebate Program which offers rebates for various water efficient devices to CII customers.

 Ultra Low Water / Zero Water Urinals	Standard Incentive: $200 Per Unit Savings: 110 GPD 20 year useful life 2.45 AFlifetime savings Market Description: Urinal installations are highest in public, high-traffic areas. Building managers often do not have the capital improvement budgets to change fixtures. Thus, incentives may help participation rates. Cost per AF: Standard Incentive: **$149** per AF
 High Efficiency Toilet *(HETs)*	Standard Incentive: $50 for Tank Type (this may be increased to $100) $100 for Flushometer Type Enhanced Incentive: The regular CII indoor program does not, per se, have enhanced incentives. The Hotel Program enhances some devices, and certain agencies enhance some devices. We also have new grants that will allow us to enhance some devices, but those enhanced incentives have not yet been officially set. $100 for Non-Verified Units $200 for Verified Existing 3.5 gpf Per Unit Savings: 38 GPD 20 year useful life

	0.85 AF lifetime savings Market Description: High efficiency toilets are the highest use indoor fixture in many facilities; they are also the most universal device located in just about any facility regardless of facility purpose. Cost per AF: Standard Tank Type: **$106** per AF Enhanced Tank Type: **$214** per AF Verified Tank Type: $454 per AF (if toilet is verified >=3.5 gpf)
 Connectionless Food Steamers (aka Boiler-less)	Standard Incentive: $485 per compartment Enhanced Incentive: Additional $100 per compartment Per Unit Savings: 223 GPD 10 year useful life 2.5 AF lifetime savings Market Description: The best opportunities for use of connectionless food steamers are in food service facilities with large batch cooking such as cafeterias, institutions, and large family style restaurants. Cost per AF: Standard Incentive: **$242** per AF Enhanced Incentive: **$287** per AF
 Air-Cooled Ice Machines	Standard Incentive: $1,000 per machine Enhanced Incentive: Additional $250 per machine Per Unit Savings: 137 GPD 10 year useful life 1.54 AF lifetime savings Market Description: Ice machines are located in all food service operations, bars, supermarkets, convenience stores, hotels and many other operations throughout Orange County territory. Cost per AF: Standard Incentive: **$809** per AF Enhanced Incentive: **$993** per AF

 Standard Cooling Tower Conductivity Controller	Standard Incentive: $625 per controller Per Unit Savings: 575 GPD 5 year useful life 3.22 AF lifetime savings Cost per AF: **$226** per AF.
 pH-Cooling Tower Controller	Standard Incentive: $1,750 per controller Enhanced Incentive: Additional $1,800 Per Unit Savings: 1,735 GPD 5 year useful life 9.72 AF lifetime savings Market Description: Cooling towers are located at large buildings (typically anything over three stories), industrial process operations and locations with large cooling requirement such as supermarkets. There are thousands of cooling towers in the MWDOC territory. Cost per AF: Standard Incentive: **$209** per AF. Enhanced Incentive: **$405** per AF.
 Laminar Flow Restrictors	Incentive: $10 per restrictor Per Unit Savings: 10.3 GPD 5 year useful life 0.06 AF lifetime savings Market Description: Laminar flow restrictors force water through a small opening reducing the flow while inhibiting bacterial growth. They are recommended in hospitals and other health care facilities, making them a target for program outreach. Cost per AF: **$185** per AF.

	Dry Vacuum Pumps	Incentive: $125 per 0.5 Horse Power Per Unit Savings: 81.8 GPD 7 year useful life 0.64 AF lifetime savings Market Description: Dry vacuum pumps are used at dental and medical facilities to create suction and remove excess air and byproducts. The largest opportunity is in dental offices. Cost per AF: **$235** per AF.

4.9.3 Landscape Conservation Programs and Incentives

One of the most active and exciting water use efficiency sectors MWDOC provides services for are those programs that target the reduction of outdoor water use. With close to 60 percent of water consumed outdoors, this sector has been and will continue to be a focus for MWDOC. MWDOC offers several landscape water use efficiency program aimed at both residential and commercial customers. MWDOC also offers programs within Orange County to specifically assist retail agencies and their large landscape customers and public agencies.

Turf Removal Program

The Orange County Turf Removal Program offers incentives to remove non-recreational turf grass from commercial properties throughout the County. This program is a partnership between MWDOC, Metropolitan, and local retail water agency. The goals of this program are to increase water use efficiency within Orange County, reduce runoff leaving the properties, and evaluate the effectiveness of turf removal as a water-saving practice. Participants are encouraged to replace their turf grass with drought-tolerant landscaping, diverse plant palettes, and artificial turf, and they are encouraged to retrofit their irrigation systems with Smart Timers and drip irrigation (or to remove it entirely). Through December 2015, Orange County residents and commercial properties removed 11.9 million square feet of turf, representing approximately 1,550 AFY of water savings.

Water Smart Landscape Program

MWDOC's Water Smart Landscape Program is a free water management tool for homeowner associations, landscapers, and property managers. Participants in the Program use the Internet to track their irrigation meter's monthly water use and compare it to a custom water budget established by the Program. This enables property managers and landscapers to easily identify areas that are over/under watered and enhances their accountability to homeowner association boards. There are 12,386 dedicated irrigation meter customers enrolled in the Program with water savings of more than 10,000 AF.

Water Smart Public Spaces

In 2012, MWDOC received funding from the Department of Water Resources through a three-year Integrated Regional Water Management Program grant to implement a comprehensive landscape

improvement program targeting publicly owned landscapes in south Orange County. The program encourages removing non-functional turfgrass, upgrading conventional irrigation controllers to smart irrigation timers, and converting high-volume overhead spray irrigation to low-volume irrigation. Once fully implemented, the program will reduce water use in 84 acres of existing landscape areas.

Smart Timer Rebate Program

Smart Timers are irrigation clocks that are either weather-based irrigation controllers (WBICs) or soil moisture sensor systems. WBICs adjust automatically to reflect changes in local weather and site-specific landscape needs, such as soil type, slopes, and plant material. When WBICs are programmed properly, turf and plants receive the proper amount of water throughout the year. During the fall months, when property owners and landscape professionals often overwater, Smart Timers can save significant amounts of water.

Soil moisture sensors are relatively new to MWDOC's suite of landscape water management tools. Much like a Smart Timer, soil moisture sensors determine the amount of water in the soil by way of sensors placed in the actual root zone of a given landscape area. This measurement of water is then relayed back to the controller and through the controller's programming, and the correct amount of water is then applied.

 Smart Controllers (Weather-Based Irrigation Controllers and Soil Moisture Sensor Systems)	Standard **Residential** Incentive: $80 per controller Enhanced **Residential** Incentive: Up to $300 per controller Standard **Commercial** Incentive: $35 per station Per Unit **Residential** Savings: 37 GPD (WBIC) to 41 gpd (Soil Moisture Sensor) 10 year useful life 0.41 to 0.46 AF lifetime savings Per Unit **Commercial** Savings: 11.52 GPD per station 10 year useful life 0.13 AF lifetime savings per station Market Description: The market for smart or weather based irrigation controllers has been advancing in recent years yet the market is estimated to have only a 10-20% saturation rate. Cost per AF: Residential **$1,106 to $1,408** enhanced incentive, **$586** standard incentive Commercial **$555** per AF

Rotating Nozzles Rebate Program

The Rotating Nozzle Rebate Program provides incentives to residential and commercial properties for the replacement of high-precipitation rate spray nozzles with low-precipitation rate multi-stream, multi-

trajectory rotating nozzles. The rebate offered through this Program aims to offset the cost of the device and installation.

 High Efficiency Sprinkler Nozzles (*HENs)*	Incentive: $4 per nozzle for residential, commercial and irrigation customers Market Description: The market for high efficiency spray nozzles has only emerged in recent years and has a tremendous potential. Hundreds of thousands of inefficient pop up heads are installed in the MWDOC territory. Virtually any site with irrigation will have pop up spray heads. Per Unit Savings: 3.6 GPD per nozzle 5 year useful life 0.02 AF lifetime savings Cost per AF: **$288** per AF

Spray to Drip Rebate Program

The Spray to Drip Pilot Rebate Program offers residential and commercial customers rebates for converting planting areas irrigated by spray heads to drip irrigation. Drip irrigation systems are very water-efficient. Rather than spraying wide areas, drip systems use point emitters to deliver water to specific locations at or near plant root zones. Water drips slowly from the emitters either onto the soil surface or below ground. As a result, less water is lost to wind and evaporation.

Device Retrofits

MWDOC also offers financial incentives under the SoCal Water$mart Rebate Program for a variety of other water efficient landscape devices.

 Central Computer Irrigation Controllers	Standard Incentive: $25 per station Per Unit Savings: Same as standalone smart controllers 11.52 GPD per station 10 year useful life 0.13 AF lifetime savings per station Market Description: The market for central irrigation controllers are customers with multiple sites and multiple controllers. Central controller allows for customers to remotely manage their irrigation. Part of the technology includes weather based scheduling. Typical customers are cities, school districts, universities, multi-family owners and other large landscape sites. Cost per AF: **$232** per AF

 Large Rotary Nozzles	Standard Incentive: $13 per set of two nozzles Per Unit Savings: 16 GPD per set of two nozzles 10 year useful life 0.18 AF lifetime savings per set of two nozzles Market Description: Large rotary nozzles are brass nozzle inserts for large rotary sprinkler heads. Large rotary nozzles are used at golf courses and large athletic fields, irrigating extremely large turf areas. Cost per AF: **$85** per AF.
 In-Stem Flow Regulators	Standard Incentive: $1 per flow regulator Per Unit Savings: 1.4 – 2.7 GPD per station 5 year useful life 0.015 - 0.0076 AF lifetime savings per station Market Description: *Valvette Systems* is currently the only approved manufacturer of in-stem flow regulators. There are hundreds of thousands of the pop up sprinklers in MWDOC's territory, however much of the time customers will prefer to retrofit just the nozzle. Cost per AF: **$92** per AF.

California Friendly Landscape Training (Residential)

The California Friendly Landscape Training provides education to residential homeowners, property managers, and professional landscape contractors on a variety of landscape water efficiency practices they can employ. These classes are hosted by Metropolitan, MWDOC and/or the retail agencies to encourage participation across the county. The residential training program consists of either an in person training or individual, topic-specific, online classes. The four topics presented include: 1) Basic Landscape Design, 2) California Friendly Plants, 3) Efficiency Irrigation Systems, and 4) Soils, Watering, Fertilizing.

5 WATER SHORTAGE CONTINGENCY PLAN

5.1 Overview

Recent water supply challenges throughout the American Southwest and the State of California have resulted in the development of a number of policy actions that water agencies would implement in the event of a water shortage. In southern California, the development of such policies has occurred at both the wholesale and retail level. This section describes how new and existing policies that Metropolitan and MWDOC have in place, such as shortage actions, water use restrictions, revenue changes, and reduction measuring mechanisms, to respond to water supply shortages, including a catastrophic interruption and up to a 50 percent reduction in water supply.

5.2 Shortage Actions

MWDOC is a wholesale water agency, and while it has broad powers to allocate or prohibit uses of water upon the declaration of a Water Shortage Emergency by its Board of Directors, MWDOC has not acted to directly mandate how water is used by its retail agencies in the past. However, MWDOC is responsible for how imported water will be allocated to each retail agency, which will then determine specific stages of shortage actions in accordance with local ordinances. Thus, during past shortages, MWDOC has adopted Board Resolutions urging its retail agencies to develop and implement water shortage plans, calling upon each agency to adopt and enforce regulations prohibiting the waste of water, and implementing an allocation plan for available imported water consistent with reductions, incentives, and penalties imposed on MWDOC by Metropolitan. Metropolitan's Water Shortage Stages are shown in Table 5-1.

Table 5-1: Stages of Water Shortage Contingency Plan

MWDOC Stages of Water Shortage Contingency Plan		
Stage	Percent Supply Reduction	Water Supply Condition
Baseline Water Use Efficiency	Long-term Conservation	Ongoing water use efficiency, outreach and public awareness efforts to continue water use saving and build storage reserves
Condition 1: Water Supply Watch	Variable	Call for voluntary dry-year conservation measures and use of Metropolitan's regional storage reserves
Condition 2: Water Supply Alert	Variable	Regional call for cities and water agencies in the service area to implement extraordinary conservation measures through their drought ordinance and other water use efficiency efforts
Condition 3: Water Supply Allocation	5% to 50%	Implement MWDOC's Water Supply Allocation Plan
NOTES: See discussion on Metropolitan's and MWDOC water shortage actions, such as Metropolitan's WSDM Plan and implementation of both Metropolitan and MWDOC's Water Supply Allocation Plan.		

5.2.1 Metropolitan Water Surplus and Drought Management Plan

Metropolitan evaluates the level of supplies available and existing levels of water in storage to determine the appropriate management stage annually. Each stage is associated with specific resource management actions to avoid extreme shortages to the extent possible and minimize adverse impacts to retail customers should an extreme shortage occur. The sequencing outlined in the Water Surplus and Drought Management Plan (WSDM Plan) reflects anticipated responses towards Metropolitan's existing and expected resource mix.

Surplus stages occur when net annual deliveries can be made to water storage programs. Under the WSDM Plan, there are four surplus management stages that provides a framework for actions to take for surplus supplies. Deliveries in DVL and in SWP terminal reservoirs continue through each surplus stage provided there is available storage capacity. Withdrawals from DVL for regulatory purposes or to meet seasonal demands may occur in any stage.

The WSDM Plan distinguishes between shortages, severe shortages, and extreme shortages. The differences between each term is listed below.

- ***Shortage:*** Metropolitan can meet full-service demands and partially meet or fully meet interruptible demands using stored water or water transfers as necessary.
- ***Severe Shortage:*** Metropolitan can meet full-service demands only by using stored water, transfers, and possibly calling for extraordinary conservation.
- ***Extreme Shortage:*** Metropolitan must allocate available supply to full-service customers.

There are six shortage management stages to guide resource management activities. These stages are defined by shortfalls in imported supply and water balances in Metropolitan's storage programs. When Metropolitan must make net withdrawals from storage to meet demands, it is considered to be in a shortage condition. Figure 5-1 gives a summary of actions under each surplus and shortage stages when an allocation plan is necessary to enforce mandatory cutbacks. The goal of the WSDM Plan is to avoid Stage 6, an extreme shortage.

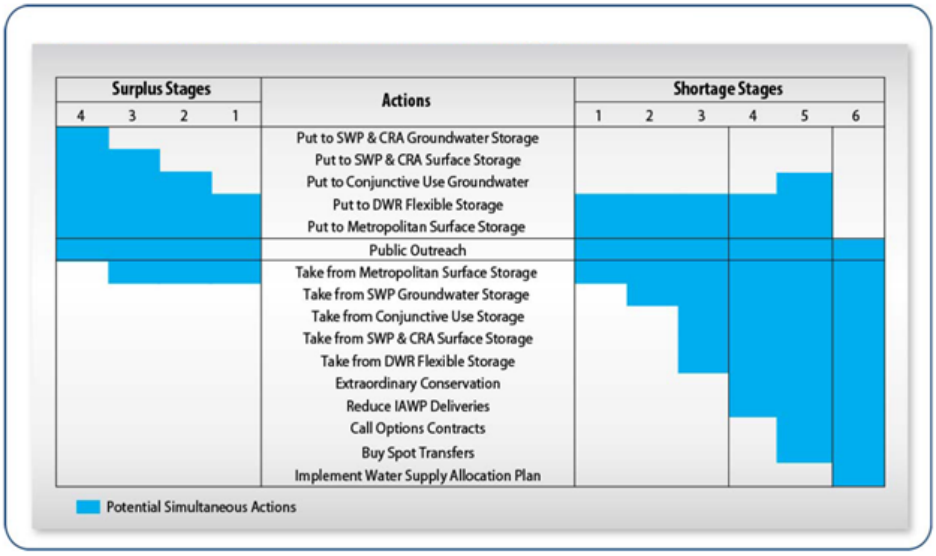

Figure 5-1: Resource Stages, Anticipated Actions, and Supply Declarations

Metropolitan's Board of Directors adopted a Water Supply Condition Framework in June 2008 in order to communicate the urgency of the region's water supply situation and the need for further water conservation practices. The framework has four conditions, each calling increasing levels of conservation. Descriptions for each of the four conditions are listed below:

- ***Baseline Water Use Efficiency:*** Ongoing conservation, outreach, and recycling programs to achieve permanent reductions in water use and build storage reserves.
- ***Condition 1 Water Supply Watch:*** Local agency voluntary dry-year conservation measures and use of regional storage reserves.
- ***Condition 2 Water Supply Alert:*** Regional call for cities, counties, member agencies, and retail water agencies to implement extraordinary conservation through drought ordinances and other measures to mitigate use of storage reserves.
- ***Condition 3 Water Supply Allocation:*** Implement Metropolitan's WSAP

As noted in Condition 3, should supplies become limited to the point where imported water demands cannot be met, Metropolitan will allocate water through the WSAP (Metropolitan, 2015 Draft UWMP, March 2016).

5.2.2 Metropolitan's Water Supply Allocation Plan

Metropolitan's imported supplies have been impacted by a number of water supply challenges as noted earlier. In case of extreme water shortage within the Metropolitan service area is the implementation of its Water Supply Allocation Plan.
Metropolitan's Board of Directors adopted the WSAP in February 2008 to fairly distribute a limited amount of water supply and applies it through a detailed methodology to reflect a range of local conditions and needs of the region's retail water consumers.

The WSAP includes the specific formula for calculating member agency supply allocations and the key implementation elements needed for administering an allocation. Metropolitan's WSAP is the foundation for the urban water shortage contingency analysis required under Water Code Section 10632 and is part of Metropolitan's 2015 UWMP.

Metropolitan's WSAP was developed in consideration of the principles and guidelines in Metropolitan's 1999 WSDM Plan with the core objective of creating an equitable "needs-based allocation". The WSAP's formula seeks to balance the impacts of a shortage at the retail level while maintaining equity on the wholesale level for shortages of Metropolitan supplies of up to 50 percent. The formula takes into account a number of factors, such as the impact on retail customers, growth in population, changes in supply conditions, investments in local resources, demand hardening aspects of water conservation savings, recycled water, extraordinary storage and transfer actions, and groundwater imported water needs.

The formula is calculated in three steps: 1) based period calculations, 2) allocation year calculations, and 3) supply allocation calculations. The first two steps involve standard computations, while the third step contains specific methodology developed for the WSAP.

Step 1: Base Period Calculations – The first step in calculating a member agency's water supply allocation is to estimate their water supply and demand using a historical based period with established water supply and delivery data. The base period for each of the different categories of supply and demand is calculated using data from the two most recent non-shortage fiscal years ending 2013 and 2014.

Step 2: Allocation Year Calculations – The next step in calculating the member agency's water supply allocation is estimating water needs in the allocation year. This is done by adjusting the base period estimates of retail demand for population growth and changes in local supplies.

Step 3: Supply Allocation Calculations – The final step is calculating the water supply allocation for each member agency based on the allocation year water needs identified in Step 2.

In order to implement the WSAP, Metropolitan's Board of Directors makes a determination on the level of the regional shortage, based on specific criteria, typically in April. The criteria used by Metropolitan includes, current levels of storage, estimated water supplies conditions, and projected imported water demands. The allocations, if deemed necessary, go into effect in July of the same year and remain in effect for a 12-month period. The schedule is made at the discretion of the Board of Directors.

Although Metropolitan's 2015 UWMP forecasts that Metropolitan will be able to meet projected imported demands throughout the projected period from 2020 to 2040, uncertainty in supply conditions can result in Metropolitan needing to implement its WSAP to preserve dry-year storage and curtail demands.

5.2.3 MWDOC's Water Supply Allocation Plan

To prepare for the potential allocation of imported water supplies from Metropolitan, MWDOC worked collaboratively with its 28 retail agencies to develop its own WSAP that was adopted in January 2009 and amended in 2015. The MWDOC WSAP outlines how MWDOC will determine and implement each of its retail agency's allocation during a time of shortage.

The MWDOC WSAP uses a similar method and approach, when reasonable, as that of the Metropolitan's WSAP. However, MWDOC's plan remains flexible to use an alternative approach when Metropolitan's method produces a significant unintended result for the member agencies. The MWDOC WSAP model follows five basic steps to determine a retail agency's imported supply allocation.

Step 1: Determine Baseline Information – The first step in calculating a water supply allocation is to estimate water supply and demand using a historical based period with established water supply and delivery data. The base period for each of the different categories of demand and supply is calculated using data from the last two non-shortage fiscal years ending 2013 and 2014.

Step 2: Establish Allocation Year Information – In this step, the model adjusts for each retail agency's water need in the allocation year. This is done by adjusting the base period estimates for increased retail water demand based on population growth and changes in local supplies.

Step 3: Calculate Initial Minimum Allocation Based on Metropolitan's Declared Shortage Level – This step sets the initial water supply allocation for each retail agency. After a regional shortage level is established, MWDOC will calculate the initial allocation as a percentage of adjusted base period imported water needs within the model for each retail agency.

Step 4: Apply Allocation Adjustments and Credits in the Areas of Retail Impacts and Conservation– In this step, the model assigns additional water to address disparate impacts at the retail level caused by an across-the-board cut of imported supplies. It also applies a conservation credit given to those agencies that have achieved additional water savings at the retail level as a result of successful implementation of water conservation devices, programs and rate structures.

Step 5: Sum Total Allocations and Determine Retail Reliability – This is the final step in calculating a retail agency's total allocation for imported supplies. The model sums an agency's total imported allocation with all of the adjustments and credits and then calculates each agency's retail reliability compared to its Allocation Year Retail Demand.

The MWDOC WSAP includes additional measures for plan implementation, including the following:

- Appeal Process – An appeals process to provide retail agencies the opportunity to request a change to their allocation based on new or corrected information. MWDOC anticipates that under most circumstances, a retail agency's appeal will be the basis for an appeal to Metropolitan by MWDOC.
- Melded Allocation Surcharge Structure – At the end of the allocation year, MWDOC would only charge an allocation surcharge to each retail agency that exceeded their allocation if MWDOC

exceeds its total allocation and is required to pay a surcharge to Metropolitan. Metropolitan enforces allocations to retail agencies through an allocation surcharge to a retail agency that exceeds its total annual allocation at the end of the 12-month allocation period. MWDOC's surcharge would be assessed according to the retail agency's prorated share (AF over usage) of MWDOC amount with Metropolitan. Surcharge funds collected by Metropolitan will be invested in its Water Management Fund, which is used to in part to fund expenditures in dry-year conservation and local resource development.

- Tracking and Reporting Water Usage – MWDOC will provide each retail agency with water use monthly reports that will compare each retail agency's current cumulative retail usage to their allocation baseline. MWDOC will also provide quarterly reports on it cumulative retail usage versus its allocation baseline.
- Timeline and Option to Revisit the Plan – The allocation period will cover 12 consecutive months and the Regional Shortage Level will be set for the entire allocation period. MWDOC only anticipates calling for allocation when Metropolitan declares a shortage; and no later than 30 days from Metropolitan's declaration will MWDOC announce allocation to its retail agencies.

5.3 Three-Year Minimum Water Supply

As a matter of practice, Metropolitan does not provide annual estimates of the minimum supplies available to its member agencies. As such, Metropolitan member agencies must develop their own estimates for the purposes of meeting the requirements of the Act.

Section 135 of the Metropolitan Act declares that a member agency has the right to invoke its "preferential right" to water, which grants each member agency a preferential right to purchase a percentage of Metropolitan's available supplies based on specified, cumulative financial contributions to Metropolitan. Each year, Metropolitan calculates and distributes each member agency's percentage of preferential rights. However, since Metropolitan's creation in 1927, no member agency has ever invoked these rights as a means of acquiring limited supplies from Metropolitan.

As an alternative to invoking preferential rights, Metropolitan and member agencies accepted the terms and conditions of Metropolitan's shortage allocation plan, which allocated imported water under limited supplies conditions. In fact in FY 2015-16, Metropolitan implemented its WSAP at a stage level 3 (seeking no greater than a 15 percent regional reduction of water use), which is the largest reduction Metropolitan has ever imposed on its member agency. Moreover, this WSAP reduction level 3 was determined when Metropolitan water supplies from the SWP was at its lowest levels ever delivered and water storages declined greater than 1 MAF in one year.

Based on analysis shown in Section 3 of this Plan, Metropolitan believes that the water supply and demand management actions it is undertaking will increase its reliability throughout the 25-year period. Thus for purposes of this estimate, it is assumed that Metropolitan and MWDOC will be able to maintain the identified supply amounts throughout the three-year period. However, assuming Metropolitan is again faced with another critically dry year as what we had face in 2014 and 2015, and water supply allocations are imposed at again at stage level 3, MWDOC estimated it can meet projected imported demands. Therefore, to estimate the three year minimum water supply, MWDOC will used the latest allocation

(MWDOC's 2015-16 imported allocation) for 2015-2018. Thus, the estimate of the minimum imported supplies available to MWDOC is ~~197,269~~224,579 AF.

Table 5-2: Minimum Supply Next Three Years (AFY)

MWDOC's Minimum Supply Next Three Years (AFY)			
	2016	2017	2018
Available Imported Water Supply	224,579~~197,269~~	224,579~~197,269~~	224,579~~197,269~~
NOTES: MWDOC Water Shortage Allocation Model March 2015			

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5.4 Catastrophic Supply Interruption

From a regional perspective, Orange County and all of southern California is heavily dependent upon imported water supplies from Metropolitan. Imported water is conveyed through the SWP and CRA, which travel hundreds of miles to reach urban southern California, and specifically to Orange County. Additionally, this water is distributed to customers through an intricate network of pipes and water mains that are susceptible to damage from earthquakes and other disasters. Regional storage for southern California and Orange County is provided by Metropolitan to mitigate an outage of either the SWP or CRA. DVL, Metropolitan's newest reservoir located in Hemet, Riverside County is an 800,000 AF reservoir, of which about 400,000 AF of water is reserved for catastrophic emergencies. In fact, protection from catastrophic events such as earthquakes was a major reason for the construction of Diamond Valley Lake. Additionally, the Orange County Water purveyors have taken significant efforts to respond to emergencies through the formation of the Water Emergency Response Organization of Orange County (WEROC).

5.4.1 Metropolitan

Metropolitan has comprehensive plans for stages of actions it would undertake to address a catastrophic interruption in water supplies through its WSAP and WSDM Plans. Metropolitan also developed an Emergency Storage Requirement to mitigate against potential interruption in water supplies resulting from catastrophic occurrences within the southern California region, including seismic events along the San Andreas Fault. In addition, Metropolitan is working with the State to implement a comprehensive improvement plan to address catastrophic occurrences that could occur outside of the southern California region, such as a maximum probable seismic event in the Delta that would cause levee failure and disruption of SWP deliveries. For greater detail on Metropolitan's planned responses to catastrophic interruption, please refer to Metropolitan's 2015 UWMP.

5.4.2 Water Emergency Response Organization of Orange County (WEROC)

In 1983, the Orange County water community developed a Water Supply Emergency Preparedness Plan that identified a need to develop a plan on how agencies would to respond effectively to disasters impacting the regional water distribution system. The collective efforts of these agencies resulted in the formation of WEROC to coordinate emergency response on behalf of all Orange County water and wastewater agencies, develop an emergency plan to respond to disasters, and conduct disaster training exercises for the Orange County water community. WEROC was established with the creation of an indemnification agreement between its member agencies to protect each other against civil liabilities and to facilitate the exchange of resources. WEROC is unique in its ability to provide a single point of contact for representation of all water and wastewater utilities in Orange County during a disaster. This representation is to the local, county, state, and federal disaster coordination agencies. Within the Orange County Operational Area, WEROC is the recognized contact for emergency disaster response for the water community.

Each local water and wastewater utility is responsible for developing its own disaster preparedness and response plan to meet emergencies within their service area. WEROC performs the coordination of information and mutual-aid requests among water and wastewater agencies. WEROC provides assistance to utilities developing their plans and facilitates working groups when new best practices need to be examined or regulations come into effect. Additionally, WEROC supports the utilities efforts with training, exercise coordination, and representation to other emergency response agencies.

In the event of a major emergency or regional disaster WEROC would perform the following functions:

- Collect damage assessment reports from Orange County water and wastewater utilities;
- Assess the overall condition of the Orange County water supply system; including treatment, storage and distribution; and assess the overall condition of the Orange County wastewater system;
- Identify the information and resource needs of the impacted water and wastewater utilities;
- Identify available resources, determine optimal use of those resources and coordinate the exchange of those resources as mutual aid;
- Determine water supply needs;
- Recommend water emergency allocations and coordinate water distribution as needed;
- Liaison with water utilities, local government, Metropolitan, the Orange County Operational Area and the California Office of Emergency Services; and
- Document remedial actions taken during the disaster operation and assist impacted agencies with the Federal Stafford Act Public Assistance process.

Two dedicated WEROC Emergency Operations Centers (EOCs) are located within Orange County. Both sites are maintained in a state of readiness in the event that they will be activated following a major disaster. WEROC EOCs are staffed by trained volunteer personnel from the water community. WEROC's Emergency Radio Communication System consists of two mountain-top radio repeaters and several

control stations. WEROC is a flexible and dynamic program that continues to make improvements to its emergency preparedness plan, emergency response facilities, and its training program to address new issues as they surface.

During a disaster, WEROC will work cooperatively with Metropolitan through their Member Agency Response System (MARS) Radio to facilitate the flow of information and requests for mutual-aid within Metropolitan's 5,100 square mile service area. WEROC also provides updated information to Metropolitan's EOC at Eagle Rock.

Day-to-day management of WEROC is provided by MWDOC. Although MWDOC is a majority contributor to the WEROC budget, the program is also supported by OCWD, OCSD, SOCWA and the three Cities of Anaheim, Fullerton and Santa Ana. Additionally, ETWD and Metropolitan provide facility and maintenance support to the WEROC EOCs on a regular basis.

Additional emergency response mutual aid plans in the State of California include the California Master Mutual Aid Agreement, and the California Water and Wastewater Agency Response Network (CalWARN), and the California Public Works Mutual Aid Plan. The California Master Mutual Aid Agreement includes all public agencies that have incorporated the Standardized Emergency Management System (SEMS) into their response plans, and is coordinated by the California Office of Emergency Services. It requires a declared disaster to be used for response. Cal WARN includes 353 (as of Dec 2015) public and private water and wastewater utilities that have signed the Cal WARN agreement, and provides the opportunity for mutual assistance regardless of a declared disaster. Cal WARN is coordinated by a State Steering Committee and can be activated by any signatory to the agreement. The California Public Works Mutual Aid Plan provides for mutual aid between public works departments at the local and county level. All Orange County Cities and the County of Orange have signed this agreement.

A summary of actions in response to a catastrophe is listed below:

- **Regional Power Outage:** Coordinate communication with So. California Edison and San Diego Gas and Electric for restoration of services. Provide contacts for vendors of rental generators and initiate mutual assistance between unaffected agencies for emergency backup power. Work with impacted utilities to determine fuel replenishment needs and coordinate fuel procurement. Consult with the impacted utilities and the California Division of Drinking Water (DDW) for water quality concerns and public notices.
- **Earthquake:** Coordinate the resources necessary for repair of the Orange County water and wastewater agencies' infrastructure. Facilitate mutual aid from outside agencies through the Orange County Operational Area using the above mentioned mutual aid agreements. Use WEROC Mutual Aid Directory and private vendor lists to identify available water haulers, temporary water lines, piping, heavy equipment, etc.
- **Tsunami:** If time allows, notify coastal agencies to take the appropriate actions for life safety. Work with impacted agencies to identify potential damages and request DDW support in evaluating suspected water contamination. Support agency efforts to restore water flow in unique conditions of flooding (safety) and potentially lack of electricity. Continue support similar to an earthquake response.

- **Malicious Act:** Such an incident typically involves a long-term response with law enforcement, sometimes causing interference with water supply verses ongoing law enforcement activities. WEROC could support the agency with staff, liaison efforts with outside agencies, and resources required for recovery of operational systems. In addition, coordination of water quality advisors, DDW, and public information officers will be critical.
- **Flooding:** Coordination with the Orange County Public Works Department, Orange County Fire Authority and DWR for flood control support. Coordination of mutual assistance for repair of infrastructure.
- **Dam Failure:** Identify impacts to water infrastructure and resource management for the county during the current weather season and conditions. Evaluate the need and ability for accelerated reconstruction and/or restoration of services. Coordinate alternate water supply as needed.
- **SONGS – Nuclear Release:** Work with the DDW and the Orange County retail water agencies that have open water sources to determine impacts to water quality and appropriate protective actions. Work with agencies within the fallout zone to determine current operational capabilities and future use of infrastructure in the affected area.
- **Wild Land Fire:** Facilitate Water Utility Representation to the Fire Unified Command Post to ensure that information and resource needs are being met. Ensure that fire protection is being provided to critical infrastructure and that responding agencies understand the impacts of losing infrastructure.
- **Water Contamination:** Contamination can be from multiple sources: malicious, sewer leak, underground contaminated plume, etc. WEROC would provide information and resource coordination support to the impacted agency if requested. The WEROC Public Information Officer will work with the agency and the media to ensure proper information is provided to the public for their health and safety.
- **Hazardous Materials Spill/Release:** Communicate with impacted agencies to determine the impact to water supply and quality. Provide coordination with responding agencies if necessary. The WEROC Public Information Officer will work with the agency and the media to ensure proper information is provided to the public for their health and safety.
- **Pandemic:** Communicate recommended health precautions from the County Public Health Officer. Advocate on behalf of the utilities for any medication that may be made available to first responders only. Assistant agencies in identifying critical functions, mandatory staffing and reduced staffing operations. Coordinate resource allocations if resources become sparse.
- **Severe Drought:** Facilitate a coordinated public information campaign. Coordinate with other government agencies on severe conservation measures and ensure understanding of the impacts.

5.5 Prohibitions, Penalties and Consumption Reduction Methods

Working in coordination and collaboration with its retail agencies, MWDOC is able to reduce demands during water shortages. Although MWDOC may actually require more imported water during water shortages to offset losses of local supplies, MWDOC is able to maintain demands at a lower level than would be possible if water reduction mechanisms were not implemented. A variety of mechanisms, such

as mandatory prohibitions, consumption reductions, and penalties and charges has been and can be implemented during water shortages.

5.5.1 Mandatory Water Use Prohibitions

Because MWDOC's does not have power to enforce restriction on the use of water, as a practical matter, mandatory use prohibitions would be difficult for MWDOC to enforce given the different sources of water accessed by end users. The establishment of mandatory prohibitions on water usage during water shortages is therefore not part of MWDOC's Plan under Water Code Section 10620 (c). However, historically MWDOC has focused its activity in developing service area shortage allocation plans that include water purchase allocations and surcharges. MWDOC has also worked with its agencies and others in communicating the conservation need to the general public and to develop unified messages. In addition, MWDOC has urged its retail agencies to develop specific shortage management plans to meet targeted reduction in total water demand during a shortage. Retail agencies of MWDOC will address mandatory prohibitions during water shortages in their individual UWMPs.

5.5.2 Consumption Reduction Methods

As mentioned in Section 5.5.1, MWDOC does not have power to enforce restriction on the use of water. Therefore, it is more appropriate for water reduction methods to be applied to the public through the retail agencies. Reductions in water consumption by MWDOC's retail agencies during water shortages will ultimately reduce MWDOC's overall demands on Metropolitan. MWDOC's Board has the authority to provide for a method of allocation for available imported water supplies, as the Board may determine necessary, through implementation of its Water Shortage Management Plan for all classes of service. Each retail agency decides how it will allocate supplies it receives from MWDOC during water shortages. Retail agencies of MWDOC will address water reduction methods during water shortages in their individual UWMPs.

5.6 Impacts to Revenue

During a catastrophic interruption of water supplies, prolonged drought, or water shortage of any kind, water agencies can experience a reduction in revenue as water sales decrease. In addition, during this period of time, expenditures may also increase or decrease with varying circumstances. However, it likely that expenditures will increase due to the need to increase water conservation measures and outreach efforts. However, this is dependent on how an agency's water rates are structured. MWDOC water rates are 100 percent fixed and are not subject to variation in water sales.

5.6.1 MWDOC Fixed Water Rate

MWDOC's operating budget is funded from a fixed annual Retail Meter Charge collected from MWDOC's retail agencies for each retail water meter in their service area. This charge provides a stable source of revenue that does not vary with weather or water sales. Therefore, to the extent a water shortage occurs, MWDOC does not see a shortfall in revenue.

5.7 Reduction Measuring Mechanism

The establishment of a method to measure water consumption reductions during water shortages is necessary to determine the effectiveness of water reduction measures. Although MWDOC, as a wholesale supplier, cannot enforce water reduction measures upon end users, MWDOC does work closely with its retail agencies to develop plans to meet targeted reductions, such as the 20x2020 and the recent Governor's emergency regulations. To monitor the effectiveness, MWDOC generally relies on monthly reading of Metropolitan's meter connections and monthly reports of local water production by the retail agencies. Monthly readings allow MWDOC to evaluate the trends of consumption at the retail agency level.

MWDOC's retail agencies will address methods to determine water consumption reductions in their individual UWMPs.

6 RECYCLED WATER

6.1 Agency Coordination

MWDOC does not produce or manage recycled water, but supports, encourages and partners in recycled water efforts within its service area. Recycled water planning within MWDOC's service area requires close coordination with multiple agencies that many times have overlapping jurisdictional boundaries, leading to institutional hurdles. As imported water supplies have decreased, the local agencies, including OCWD have continued working to identify opportunities for the use of recycled water for irrigation purposes, groundwater recharge and some non-irrigation applications.

6.2 Wastewater Description and Disposal

6.2.1 Overview

Wastewater collection and treatment within MWDOC's service area is managed by multiple agencies. Some local agencies provide wastewater collection and treatment as well as potable water services, while other agencies send their wastewater to large regional facilities. Wastewater is not collected by MWDOC and does not treat or dispose of wastewater.

6.2.2 Orange County Sanitation District

OCSD collects wastewater from residential, commercial, and industrial customers in 21 cities, three special districts, and portions of unincorporated Orange County, totaling 479 square miles serving more than 2.5 million residents. These flows include dry weather urban runoff collected from 15 diversion points and discharged into the sewer system for treatment and Santa Ana River Interceptor flows from the upper Santa Ana watershed.

OCSD operates and maintains two treatment plants: Reclamation Plant No. 1, located in Fountain Valley with a capacity of 320 MGD, and Treatment Plant No. 2 located in Huntington Beach with a capacity of 312 MGD. OCSD also operates 572 miles of collection system pipelines along with 15 offsite pump stations. Treated wastewater is discharged to the Pacific Ocean via an ocean outfall in compliance with state and federal requirements as set forth in OCSD's National Pollutant Discharge Elimination System permit. Approximately 100 MGD of secondary effluent undergoes advanced treatment at the GWRS facility operated by the OCWD and 7 MGD undergoes tertiary treatment at OCWD's Green Acres Project (GAP) facility. OCSD's ocean outfall is 120-inch diameter and extends four miles off the coast of Huntington Beach. A 78-inch diameter emergency outfall also exists that extends 1.3 miles off the coast.

OCSD Reclamation Plant No. 1 - Reclamation Plant No. 1 treats raw wastewater and has a maximum treatment capacity of 320 MGD. The plant provides primary and secondary treatment and supplies secondary effluent to OCWD for further tertiary treatment at their GAP facility and advanced treatment at their GWRS. Reclamation Plant No. 1 is the only plant that provides water to OCWD for additional treatment and recycling. An interplant pipeline allows flows to be conveyed to Treatment Plant No. 2.

OCSD Treatment Plant No. 2 - Treatment Plant No. 2 provides primary and secondary treatment to raw wastewater and has a maximum treatment capacity of 312 MGD. All secondary effluent from their plant is discharged to the ocean through the ocean outfall.

6.2.3 South Orange County Wastewater Authority

South Orange County Wastewater Authority (SOCWA) is a Joint Powers Authority created on July 1, 2001 to facilitate and manage the collection, transmission, treatment and disposal of wastewater for more than 500,000 homes and businesses across South Orange County. It was formed as the legal successor to the Aliso Water Management Agency, South East Regional Reclamation Authority, and South Orange County Reclamation Authority. SOCWA has ten member agencies that include: City of Laguna Beach, City of San Clemente, City of San Juan Capistrano, ETWD, EBSD, IRWD, MNWD, SMWD, SCWD, and TCWD. All of these service areas receive wholesale water through MWDOC. The service area encompasses approximately 220 square miles including the Aliso Creek, Salt Creek, Laguna Canyon Creek, and San Juan Creek Watersheds.

Within its service area, SOCWA operates four wastewater treatment plants, with an additional eight wastewater treatment plants operated by SOCWA member agencies. Wastewater in the service area is collected at the local and regional level through a series of interceptors that convey influent to the wastewater treatment plants. Treated effluent throughout the service area is conveyed to two gravity flow ocean outfalls operated by SOCWA, Aliso Creek Outfall and San Juan Creek Outfall. The Aliso Creek outfall has a capacity of 33.2 MGD and extends 1.5 miles offshore near Aliso Beach in the City of Laguna Beach. The San Juan Creek outfall has a capacity of 36.8 MGD and extends 2.2 miles offshore near Doheny Beach in the City of Dana Point. Full secondary treatment is provided at SOCWA wastewater treatment plants, with most plants exceeding this level of treatment when the water is beneficially reused.

SOCWA Coastal Treatment Plant - SOCWA's Coastal Treatment Plant (CTP) in Aliso Canyon, Laguna Niguel has a 6.7 MGD capacity and treats wastewater received from the City of Laguna Beach, EBSD, MNWD, and SCWD to secondary effluent standards. Effluent from the CTP is treated to secondary or tertiary levels depending on the disposal method, ocean outfall or beneficial reuse. Recycled water is treated to Title 22 standards at the Advanced Water Treatment Plant (AWTP) owned by SCWD, but operated by SOCWA, located adjacent to the CTP. During the summer months, over 2 MGD of recycled water can be produced by the AWTP. Treated effluent that is not recycled is disposed of through the Aliso Creek Ocean Outfall. Waste sludge is sent to the Regional Treatment Plant (RTP) in Laguna Niguel.

SOCWA Regional Treatment Plant – SOCWA's RTP in Laguna Niguel has a 12 MGD liquid capacity and 24.6 MGD solids handling capacity. The RTP treats wastewater from MNWD's service area to secondary or tertiary levels depending on disposal method, ocean outfall or reuse such as landscape irrigation. Recycled water is treated to applicable Title 22 standards. Secondary effluent is conveyed to the Aliso Creek Ocean Outfall via the SOCWA Effluent Transmission Main.

SOCWA Plant 3A – SOCWA's Plant 3A located in the City of Mission Viejo has a maximum capacity of 6 MGD and treats wastewater received from MNWD and SMWD. Effluent is treated to secondary or tertiary levels depending on the disposal method, ocean outfall or beneficial reuse. Recycled water is treated to applicable Title 22 standards and used to irrigate parks and greenbelts. Secondary effluent is conveyed to the San Juan Creek Outfall via the 3A Effluent Transmission Main.

SOCWA J. B. Latham Treatment Plant - SOCWA's J. B. Latham Treatment Plant located in the City of Dana Point has a 13 MGD capacity and treats wastewater from MNWD, City of San Juan Capistrano, SMWD, and SCWD to secondary effluent standards. The secondary effluent is conveyed directly to the San Juan Creek Outfall as the plant does not have tertiary treatment.

6.3 Current Recycled Water Uses

Recycled water is widely accepted as a water supply source throughout MWDOC's service area. In the past, recycled water was mainly used for landscape irrigation, but large recycled water projects including OCWD's GAP and GWRS, and IRWD's recycled water projects have significantly expanded and increased use. GWRS uses include injection for sea water barriers and percolation for groundwater recharge. IRWD is at the forefront of using recycled water not only for irrigation, but for other uses such as toilet flushing and commercial applications. Other agencies in south Orange County, such as MNWD and SMWD use a significant amount of recycled water. Recycled water in Orange County is treated to various levels depending on the end use and in accordance with Title 22 regulations as described below.

OCWD Green Acres Project – OCWD owns and operates the GAP, a water recycling system that provides up to 8,400 AFY of recycled water for irrigation and industrial uses. GAP provides an alternate source of water that is mainly delivered to parks, golf courses, greenbelts, cemeteries, and nurseries in the cities of Costa Mesa, Fountain Valley, Newport Beach, and Santa Ana. Approximately 100 sites use GAP water, current recycled water users include Mile Square Park and Golf Courses in Fountain Valley, Costa Mesa Country Club, Chroma Systems carpet dyeing, Kaiser Permanente, and Caltrans.

OCWD Groundwater Replenishment System - OCWD's GWRS receives secondary treated wastewater from OCSD and purifies it to levels that meet all state and federal drinking water standards. The GWRS Phase 1 plant has been operational since January 2008, and uses a three-step advanced treatment process consisting of microfiltration (MF), reverse osmosis (RO), and ultraviolet (UV) light with hydrogen peroxide. A portion of the treated water is injected into the seawater barrier to prevent seawater intrusion into the groundwater basin. The other portion of the water is pumped to ponds where the water percolates into deep aquifers and becomes part of Orange County's water supply.

The design and construction of the first phase (70,000 AFY) of the GWRS project was jointly funded by OCWD and OCSD; Phase 2 expansion (33,000 AFY) was funded solely by OCWD. Expansion beyond this is currently in discussion and could provide an additional 30,000 AFY of water, increasing total GWRS production to 133,000 AFY. The GWRS is the world's largest water purification system for indirect potable reuse (IPR).

OCWD's GWRS has a current production capacity of 103,000 AFY with the expansion that was completed in 2015. Approximately 36,000 AFY of the highly purified water is pumped into the injection wells and 67,000 AFY is pumped to the percolation ponds in the City of Anaheim where the water is naturally filtered through sand and gravel to deep aquifers of the groundwater basin. The Orange County Groundwater Basin provides approximately 72 percent of the potable water supply for north and central Orange County.

ETWD Water Recycling Plant – ETWD's Water Recycling Plant (WRP) located in the City of Lake Forest has a maximum influent capacity of 6 MGD. Wastewater is treated to secondary or tertiary levels depending on the disposal method, ocean outfall or beneficial reuse. Recycled water is treated to Title 22

standards with the expansion completed in 2014. Treated effluent that is not recycled is disposed of through the Aliso Creek Ocean Outfall.

SMWD Chiquita Water Reclamation Plant – SMWD's Chiquita Water Reclamation Plant (CWRP) located in Chiquita Canyon treats wastewater to a tertiary level for recycled water use meeting Title 22 standards. CWRP has a maximum design capacity of 8 MGD with plans to increase its size to 10 MGD by 2025. Effluent that is not beneficially reused is disposed via the Chiquita Land Outfall that connects to the San Juan Creek Ocean Outfall.

SMWD Oso Creek Water Reclamation Plant – SMWD's Oso Creek Water Reclamation Plant (OCWRP) located along Oso Creek. Wastewater is treated to a secondary or tertiary depending on the method of disposal, ocean outfall or beneficial reuse. Recycled water is treated to Title 22 standards. A bypass facility allows excess wastewater to be sent to SOCWA's J.B. Latham Treatment Plant as OCWRP does not have an outfall. Without the ability to discharge treated effluent, excess flows beyond recycled water demands are sent to J.B. Latham Treatment Plant. OCWRP has a maximum design capacity of 3 MGD and is considered a scalping plant as it intercepts flows from a large trunkline.

SMWD Nichols Institute Water Reclamation Plant – the Nichols Institute Water Reclamation Plant is operated by SMWD, but owned by a private company that owns property within SMWD's service area. This small facility treats approximately 34 AFY and does not have an outfall. All wastewater is treated to Title 22 standards for recycling purposes. Since this facility is remote from existing water and wastewater facilities, SMWD is not obligated to provide an alternate source of water in the event the facility becomes inoperable.

San Clemente Water Reclamation Plant - The City of San Clemente owns and operates the San Clemente Water Reclamation Plant located within San Clemente. The plant has a design capacity of 7 MGD and treats wastewater to secondary or tertiary levels depending on the disposal method, ocean outfall or beneficial reuse. Any secondary effluent in excess of the plant's recycling limit is conveyed to the San Juan Creek Ocean Outfall via the San Clemente Land Outfall. Recycling capacity is currently 4.4 MGD after the expansion was completed in 2014 and included 9 miles of pipelines, conversion of a domestic water reservoir to recycled water storage, and a pressure reducing station as well as an interconnection with SMWD.

IRWD Los Alisos Water Recycling Plant - Los Alisos Water Recycling Plant (LAWRP) is operated by IRWD and is located in the City of Lake Forest. LAWRP has a capacity of 7.5 MGD and wastewater is treated to a secondary or tertiary level depending on the method of disposal, ocean outfall or beneficial reuse such as landscape irrigation and other non-potable uses. When excess secondary effluent beyond the plant's tertiary treatment capacity is received, it is conveyed to the SOCWA Effluent Transmission Main for disposal via the Aliso Creek Ocean Outfall.

IRWD Michelson Water Recycling Plant - Michelson Water Recycling Plant (MWRP) is located in the City of Irvine and is operated by IRWD. MWRP has a maximum influent capacity of 28 MGD. Wastewater is treated to a tertiary level with advanced treatment in the form of UV disinfection meeting Title 22 standards. All effluent is conveyed to the recycled water distribution system for landscape irrigation, toilet flushing, and industrial uses.

TCWD Robinson Ranch Water Reclamation Plant - TCWD owns and operates the Robinson Ranch Wastewater Treatment Plant (RRWWTP) located in the Robinson Ranch development in Trabuco

Canyon, an unincorporated area of Orange County. RRWTP has a treatment capacity of 0.85 MGD, and the wastewater is treated to a tertiary level meeting Title 22 standards. All of the wastewater is recycled as the plant is not permitted to have stream discharges, and is infeasible to connect to the existing outfalls in the SOCWA service area.

MNWD RTP Advanced Wastewater Treatment Plant – MNWD's RTP AWTP is operated by SOCWA and is located in the City of Laguna Niguel. The AWTP has a total capacity of 11.4 MGD and the secondary effluent from RTP is treated to a disinfected tertiary level that meets Title 22 requirements for landscape irrigation use.

MNWD Plant 3A Advanced Wastewater Treatment Plant - MNWD's Plant 3A AWTP is operated by SOCWA and is located within the City of Laguna Niguel. The Plant 3A AWTP has a capacity of 2.4 MGD and the secondary effluent from 3A is treated to a disinfected tertiary level that meets Title 22 requirements for landscape irrigation use.

SCWD CTP Advanced Wastewater Treatment Plant - SCWD's CTP AWTP is operated by SOCWA and is located in the City of Laguna Niguel. The CTP AWTP has a capacity of 2.6 MGD and the secondary effluent from CTP is treated to a disinfected tertiary level that meets Title 22 requirements for landscape irrigation use.

SCWD Aliso Creek Water Reclamation Facility - SCWD completed construction on the Aliso Creek Water Reclamation Facility (ACWRF) in 2014 that intercepts and treats a portion of the urban runoff in lower Aliso Creek to supplement the advanced water treatment facility at CTP. The ACWRF has a capacity of 800 gpd and the creek water is treated using ultrafiltration and reverse osmosis to improve the quality of the recycled water supply to make it more attractive for irrigation users. The ACWRF has not been able to be used as the Aliso Creek water level is below what regulation allows.

MWDOC does not directly treat or distribute recycled water within their service area.

6.4 Potential Recycled Water Uses

Potential recycled water use within MWDOC's service area hinges upon many variables including, but not limited to, economics of treatment and distribution system extension (as well as site retrofits and conversions), water quality, public acceptance, infrastructure requirements, and reliability.

Even though demands exist, it is not necessarily economically feasible to provide recycled water to all potential users. Expansion of recycled water systems eventually reaches a point where returns diminish and higher investments for expansion are not cost effective. Water recycling projects involve collecting and treating wastewater to applicable standards depending on the end use, providing seasonal storage, pipeline construction, pump station installation, and conversions for existing potable water users or dual plumbing systems for new users. Creative solutions to secure funding, and overcome regulatory requirements, institutional arrangements, and public acceptance are required to offset existing potable demands with potential recycled water demands.

OCWD Groundwater Replenishment System Expansion - Investments beyond the Phase 2 expansion have not been approved by OCWD and require further review before proceeding. If the further envisioned phase of the project is approved and developed, it is projected that up to 130 MGD of water will be produced.

SMWD Chiquita Water Reclamation Plant Expansion - CWRP currently has a capacity of 5 MGD. SMWD plans to expand the plant to 10 MGD by 2015. The expansion will increase total production and reduce dependency on imported water. Arcadis to update once receive info from SMWD

MNWD Plant 3A Expansion - Waiting on description

6.4.1 Direct Non-Potable Reuse

MWDOC does not directly produce recycled water, but a number of its retail agencies produce recycled water and use it for direct non-potable reuse. Total direct non-potable reuse within the MWDOC service area from its retail agencies was 41,280 AFY for FY 2014-15.

6.4.2 Indirect Potable Reuse

The indirect potable water reuse produced from OCWD's GWRS system used for groundwater recharge and seawater barriers is approximately 103,000 AFY within MWDOC's service area.

6.5 Optimization Plan

Metropolitan and MWDOC support research efforts to encourage development and use of recycled water. These include conducting studies and research to address public concerns, developing new technologies, and assessing health effects. Addressing public concerns is required to gain the support of stakeholders early in the planning process. Education is required to inform the public of treatment processes. Developing new technologies is a prerequisite to help reduce the cost of producing recycled water. Health effects assessments have a two-fold purpose of alleviating public concerns and ensuring the protection of public health and the environment. Further research supported by Metropolitan and others (such as the National Water Research Institute) will have the benefit of reducing risks for MWDOC's retail agencies.

To assist in meeting projections, MWDOC plans to take numerous actions to facilitate the use and production of recycled water within its service area. However, MWDOC is a wholesaler and does not impose development requirements or enact ordinances that mandate the use of recycled water. In many cases, additional recycled water production and use is economically infeasible given the current cost of potable water supplies in comparison to recycled water costs. MWDOC has taken the following actions to facilitate further production and use of recycled water:

- Sponsoring retail agencies in obtaining Local Resources Program (LRP) incentives from Metropolitan;
- Assisting and supporting retail agencies in applications made for bond funds such as Proposition 84;
- Encouraging Metropolitan to participate in studies that will benefit recycled water production;
- Supporting Metropolitan in deriving solutions to regulatory issues;
- Participating in regional plan such as the South Orange County IRWMP;
- Working cooperatively with retail agencies, Metropolitan and its member agencies, and other Orange County water and wastewater agencies to encourage recycled water use and develop creative solutions to increase recycled water use.

Dealing with needed additional funding and other implementation barriers for recycled water at the state and regional level would assist in increasing recycled water production within MWDOC's service area.

State funding assistance could reduce the overall cost per AF of recycled water so that it is comparable to the cost of potable water and would allow the development of more expensive recycled water projects in an earlier timeframe. There are numerous barriers to increasing water recycling that could be addressed at the State level. These barriers include establishment of uniform Regional Water Quality Control Board (RWQCB) requirements for recycled water, especially in areas where water and wastewater agency jurisdictions cross RWQCB jurisdictions resulting in varying requirements; partnering in health studies to illustrate the safety of recycled water; increasing public education; and establishing uniform requirements for retrofitting facilities to accept recycled water.

7 FUTURE WATER SUPPLY PROJECTS AND PROGRAMS

7.1 Water Management Tools

MWDOC has worked closely with its retail agencies to decrease dependence on imported water and increase supply reliability by expanding local supplies and implementing water use efficiency measures. Development of additional local supplies improves both local and regional reliability as well as system (emergency reliability).

Although MWDOC is not responsible for carrying out supply development projects in the region, they are aware of their retail agencies supply opportunities.

7.2 Transfer or Exchange Opportunities

Interconnections with other agencies result in the ability to share water supplies during short term emergency situations or planned shutdowns of major imported water systems. Transfers of water can help with short-term outages, but can also be involved with longer term water exchanges to deal with droughts or water allocation situations. MWDOC helps its retail agencies develop both local and regional transfer and exchange opportunities that promote reliability within their systems. Examples of these types of projects that might occur in the future are discussed below.

Mesa Water - Mesa Water plans to expand their Mesa Water Reliability Facility. With this expansion, Mesa Water is exploring opportunities that may develop into potential transfer or exchange opportunities with neighboring agencies to convey and sell excess pumped and treated water from the expansion project.

IRWD Strand Ranch Water Banking Program – As previously noted, IRWD has begun implementation of the Strand Ranch Banking Program (including adding property to the program including the Stockdale East and West parcels) and it has about 23,000 AF stored for IRWD's benefit. By agreement, the water is defined to be an "Extraordinary Supply" by Metropolitan and counts essentially 1:1 during a drought/water shortage condition under Metropolitan's Water Supply Allocation Plan. It is possible that IRWD could decide to open up the Strand Ranch Banking Program to others in Orange County agencies in the future. Decisions regarding whether to do this and terms and conditions would have to be considered; discussions regarding this concept have not yet been initiated.

Santa Margarita Water District – As previously discussed, SMWD has actively pursued additional water supply reliability through water transfers. They are currently involved in the analysis and evaluation of the Cadiz water storage project. The Cadiz Project includes a total yield of 50,000 AF per year that could be produced and mined from the Fenner Valley Groundwater Basin. The water would require treatment for Chromium VI and would be conveyed via a pump station and pipeline about 40 miles to Metropolitan's Colorado River Aqueduct. SMWD has an option for 5,000 AF per year, expandable to 15,000 AF per year; OCWD is considering the water supply. Work is underway to develop the terms and conditions for conveying the water via the Colorado River Aqueduct into southern California. The cost of water at the Aqueduct is $960 per AF. The water would have to be wheeled through the Metropolitan system.

7.3 Planned Water Supply Projects and Programs

A list of potential future projects that could improve water supply and system reliability in Orange County were identified in 2015 during the discussions regarding the OC Water Reliability Study. The projects listed below include potential projects that could be completed by agencies in Orange County as well as by Metropolitan to improve the County's access to Metropolitan supplies. Further detail of these projects should be available in the UWMPs developed by each retail agency and/or Metropolitan. Although some of these projects do not introduce new sources of supply, they increase system reliability (emergency services).

Huntington Beach Seawater Desalination Project - 56,000 AF/yr produced by Poseidon in Huntington Beach with distribution in Orange County by OCWD and MWDOC.

Doheny Ocean Desalination Project - 16,000 AF max potential; first phase being pursued at 4,000 to 5,000 AF/year by SCWD as a demonstration project.

Prado Basin Operations with the Corps of Engineers (storage and sediment issues) - Increase conservation pool for additional capture of Santa Ana River water – 6,000 AF ±; this is part of OCWD's long term goal of capturing additional stormwater and percolating it in the groundwater basin.

Expansion of Water Recycling in Orange County - Placeholder for projects that go above and beyond the current vision for water recycling in the County; it can include expansions of purple pipe projects as well as additional elements of IPR and DPR type of projects. A separate placeholder is included for GWRS type of expansions being considered by OCWD and OCSD.

A separate listing of increased production on an agency by agency basis is provided in Table 7-1 below.

Table 7-1: Recycling Projections for Orange County (AFY)

Recycling Water Projections for Orange County (AFY)		
	Current	Future
IRWD	26,000	34,000
OCWD Green Acres	3,800	3,800
Anaheim	-	55
SMWD	5,600	13,400
Trabuco	800	1,000
San Clemente	500	1,500
San Juan Capistrano	700	2,500
South Coast	1,000	2,000
MNWD	7,000	9,500
ETWD	500	1,665
	-	-
Total Purple Pipe Recycling	45,900	69,420
	-	-
OCWD GWRS Indirect Potable Reuse	100,000	130,000
	-	-
Total Orange County	145,900	199,420

Lower San Juan Creek Groundwater Management - The project would involve construction of rubber dams on San Juan Creek to capture additional stormflow for percolation into the groundwater basin. A second phase would involve streamflow recharge with polished tertiary treated recycled water into the San Juan Creek for capture and percolation into the groundwater basin for replenishment purposes. The water would blend and commingle with native groundwater and then be fully treated by RO and Advanced Oxidation Processes (AOP) when it is pumped out for beneficial uses; the project will likely be implemented in phases with a potential of up to 7,000 AF of increased supply, in addition to the natural yield of the basin (ranges between 7,000 and 11,000 AF per year based on hydrology). The feasibility study for these efforts is just now being completed in March 2016; if desired by the local agencies, preliminary design and CEQA work would be initiated.

Production in San Mateo Groundwater Basin – Currently, the City of San Clemente pumps between 500 and 1000 AF from this source. Issues with wells and high chloride levels have hampered additional production. A project was considered in the 1990's that would have required a joint venture with the Marine Corps Base Camp Pendleton; the 1990's project anticipated a potential groundwater basin yield of about 2,000 AF ± and also considered storage of imported water for use for emergency purposes in an arrangement with the Marine Base. No current discussions or contacts have been made with the Marine Base involving this expanded opportunity. Environmentalists consider this the last pristine basin in or nearby to OC and want to protect it from outside influences.

Other Water Banking Projects (e.g., Semi-Tropic) - Semi-Tropic Water Storage District has several rate schedules for storing and retrieving water from storage when needed. Their schedules do not include the actual water or the cost of water, which needs to be secured. They have a program with a capital payment and another program without a capital payment. Without any cost of water going into storage, the program cost for storing and retrieving water runs about on the order of $600 to $800 per AF; the water must then be wheeled to get it into the Metropolitan service area. Considering the cost of central valley water at $350 per AF, the all in costs of this source for dry year supply from this source would be about $1700 to $1800 per AF for years in which drought protection would be needed.

San Diego County/Camp Pendleton Ocean Desalination - An ocean desalination plant by SDCWA at a southern Camp Pendleton location is still under consideration. Work on various types of intake facilities is still being studied. Work completed in 2009 indicated the cost of water at $1,400 to $1,500 per AF. MWDOC staff estimated an additional cost of about $500 per AF to get the water integrated into SOC.

West Orange County Enhanced Pumping Project - A conceptual project by OCWD to enhance groundwater production in the County and reduce the loss of water stored in the OCWD basin into LA County. Conceptually, additional pumping reduces basin losses by up to 40 percent to 50 percent of the additional pumping. The project concept involves four new production wells with total pumping of 10,000 AFY with the water to be conveyed to the West OC Water Board Pipelines for the benefit of the groundwater producers. This project is estimated to reduce losses of groundwater flow from OC to LA County by approximately 5,000 AFY.

Capture of Stormflows - A placeholder for all parts of the County to examine the potential opportunity for water to be captured, primarily to increase the capture and replenishment into groundwater basins where possible. In certain situations, the supplies may be able to be introduced into recycled systems to increase irrigation supplies. Stormflows in San Juan Creek, the Santa Ana River and Santiago Creek in Orange County are already mostly captured for groundwater replenishment purposes.

Extraordinary Water Supply Project in OC - A conceptual project whereby water from a non-Metropolitan source could be stored in the OCWD groundwater basin and reserved for use during Metropolitan Allocations. If the water is managed in this manner and is accessed during a WSDM allocation event, the water counts directly toward improving the reliability on a 1:1 basis, during the allocation event.

Purchase and Storage of Imported water in the OCWD Basin for Drought Protection and Enhanced Yield - Under this concept the availability of imported water, both treated and untreated, would be evaluated to enhance operations of the groundwater basin to maintain higher levels of storage.

Santa Ana River Conservation and Conjunctive Use Program (SARCCUP) – The SARCCUP program is an overall effort by a number of agencies in the SAR Watershed to coordinate on (1) Habitat Creation & Arundo Removal, (2) Water Use Efficiency efforts involving outreach & technical support for Budget-Based Rates, and (3) development of regional Water Banking opportunities. The groundwater basins involved include the Chino Basin, the Elsinore Basin, the San Bernardino Basin and the San Jacinto Basin as well as the OCWD Basin. The vision is to create 180,000 AF of total storage with 60,000 AFY Dry-Year Yield Supply (3 years out of 10), of which, each SAR Agency receives water bank capacity of 12,000 AFY Dry-Year Yield. The benefits to Orange County include:

- Dry year water supplies at a cost of approximately $991 per AF

- Use of existing recharge basins and infrastructure in upper watershed without OCWD having to pay for their capital cost
- Storage in water bank upstream of Orange County without having to pay a storage fee
- Purchasing supplies for the water bank through the combined efforts of the five agencies, including Valley District, which is a State Water Project contractor
- Approximately 50 percent of Arundo removal cost funded through the grant, for up to 640 acres of Arundo removal

System Reliability Only Projects (improve emergency response)

System reliability projects do not necessarily produce any new water but help to meet demands during emergency outages due to earthquakes or other risks. Projects that are being discussed at this time include:

Addition of Generators & Back-up Power - This program would involve working with various retail agencies around the county to improve emergency power to local production facilities for emergency events.

Expansion of the Irvine Interconnection Project to SOC - An agreement completed in 2006 resulted in an investment by SOC agencies in the IRWD system to allow exchanges of water to be delivered by IRWD into SOC under emergency situations. Capacity was provided to move up to 30 cfs; the agreement allows moving up to 50 cfs, not to exceed 3,000 AF per emergency event. The ability of IRWD was projected to decline over time and go to zero by 2030. IRWD is examining their ability to increase the exchange and conveyance of water under this arrangement or extend to extend the end date of the agreement and the capacity thereunder. Other options could also be implemented if arrangements can be worked out with OCWD and the groundwater producers.

Additional Reservoir Projects in SOC - SMWD led an effort to construct Upper Chiquita Reservoir at a capacity of 750 AF at a cost of $50 million in 2008 to provide emergency storage water in SOC. Other reservoir sites in SOC offer the ability to expand storage by an additional 1,000 to 4,000 AF. Another project that could be considered is to increase the storage capacity at Irvine Lake to allow more storage for emergency purposes.

EOCWD Treatment Plant in Peters Canyon - EOCWD has been studying the feasibility of constructing a 9 cfs water treatment plant in Peters Canyon that would treat untreated Metropolitan water via the Santiago Lateral and the Baker Pipeline. Findings to date indicate there is a long term economic benefit to the project compared to purchasing treated water from Metropolitan, but there is also a potential system reliability benefit from the project. This benefit is based on the Treatment Plant being able to continue providing potable water in the event of an outage of the Diemer Plant or other facilities in OC. A 9 cfs supply for 30 to 60 days would be equivalent to having storage in the amount of 500 to 1000 AF; based on the cost of regional storage, it provides a similar benefit equivalent to $40 to $80 million dollars if that same amount of water was held in a lined and covered emergency storage reservoir, similar to Upper Chiquita Reservoir in SOC.

Metropolitan Projects

The following list of Metropolitan Projects is not all inclusive, but provides a flavor of the types of projects within Metropolitan's IRP that will help to improve the reliability of imported supplies to southern California and to Orange County. These include:

Metropolitan Indirect Potable Reuse Project to provide water to OCWD - Metropolitan has begun investigations of a project to treat wastewater from the Carson Plant to better than drinking water standards (similarly to GWRS) and to distribute these flows through a regional distribution system for groundwater replenishment. The initial phase being investigated would provide between 20,000 and 65,000 AF per year, with OC being part of the Phase 1 project for up to 65,000 AF per year.

Metropolitan PVID Land Purchase - Metropolitan recently completed the purchase of Land in PVID that will ultimately result in an augmentation of CRA supplies in years when needed.

USBR Colorado River Basin Plan - The BOR has underway a multi-year Basin Study to examine supplies and demands for Colorado River water. Results of the supply and demand analysis included that long-term historical flow was about 16.4 MAFY, and total consumptive use and losses in the Basin averaged approximately 15.3 MAFY. Consumptive use is projected to increase to a range of 18.1 to 20.4 MAFY by 2060 (depending on the scenario), which would result in a long-term projected imbalance in future supply and demand of about 3.2 MAFY to 2060. The study also included many potential ideas and projects to resolve the supply and demand imbalance, which were organized into four groups: 1) increasing Basin supply; 2) reducing Basin demand; 3) modifying operations; and 4) institutional and governance issues. All parties will need to work together to overcome the supply and demand imbalance to maintain reliability of the Colorado River supply.

Metropolitan Emergency Water Storage South of the Tehachapi's - Metropolitan to review their ability to provide emergency water supplies out of storage in the event of a simultaneous rupture of the CRA and SWP supply systems by the San Andreas Fault. This is an issue MWDOC has asked Metropolitan to look further examine.

California WaterFix – This DWR led effort is intended to provide a NEW point of diversion for the export of water from the Sacramento-San Joaquin Bay-Delta area for conveyance to improve the reliability of supplies through the SWP and CVP Projects and for habitat restoration under EcoRestore. The purpose of this project is not to necessarily provide any NEW supplies, but to more reliably convey supplies across the Delta area in a manner beneficial to the fish in the Delta area and to protect water quality from salinity and bromide impacts from intrusion of the Bay water into the Delta waterways. Without this project, the ability to export water will likely rapidly decline. With the project, the ability to export water is intended to be restored to levels circa 2005, at pre-biops levels.

7.4 Desalination Opportunities

In 2001, Metropolitan developed a Seawater Desalination Program (SDP) to provide incentives for developing new seawater desalination projects in Metropolitan's service area. In 2014, Metropolitan modified the provisions of their LRP to include incentives for locally produced seawater desalination projects that reduce the need for imported supplies. To qualify for the incentive, proposed projects must replace an existing demand or prevent new demand on Metropolitan's imported water supplies. In return, Metropolitan offers three incentive formulas under the program:

- Up to $340 per AF for 25 years, depending on the unit cost of seawater produced compared to the cost of Metropolitan supplies
- Up to $475 per AF for 15 years, depending on the unit cost of seawater produced compared to the cost of Metropolitan supplies
- A fixed contribution per year calculated over 25 years, not based on the sliding scale

Developing local supplies within Metropolitan's service area, including supplies based on ocean desalination, is part of their Integrated Water Resource Plan (IRP) goal of improving water supply reliability in the region. Creating new local supplies reduce pressure on imported supplies from the SWP and Colorado River.

On May 6th, 2015, the SWRCB approved an amendment to the state's Water Quality Control Plan for the Ocean Waters of California (California Ocean Plan) to address effects associated with the construction and operation of seawater desalination facilities (Desalination Amendment). The amendment supports the use of ocean water as a reliable supplement to traditional water supplies while protecting marine life and water quality. The California Ocean Plan now formally acknowledges seawater desalination as a beneficial use of the Pacific Ocean and the Desalination Amendment provides a uniform, consistent process for permitting seawater desalination facilities statewide.

If the following projects are developed, Metropolitan's imported water deliveries to Orange County could be reduced. These projects include the Huntington Beach Seawater Desalination Project, the Doheny Desalination Project, and the Camp Pendleton Seawater Desalination Project.

Brackish groundwater is groundwater with a salinity higher than freshwater, but lower than seawater. Brackish groundwater typically requires treatment using desalters.

7.4.1 Groundwater Desalination

Metropolitan instituted its Groundwater Recovery Program in 1991 to provide financial incentives (up to $250 per AF) to local agencies to develop brackish groundwater impaired from either natural causes or from agricultural drainage. The purpose of the program was to increase usage of groundwater storage within the region for firm local production, conjunctive use storage, and drought supply. In MWDOC's service area, five groundwater recovery brackish water projects have contracts with Metropolitan.

Mesa Water Reliability Facility Expansion - The MWRF, owned and operated by Mesa Water, pumps colored water from a deep colored water aquifer and removes the color microfiltration. Due to increased color and bromide in the source water, Mesa Water upgraded the facility to include Nano filtration membrane treatment. The MWRF's capacity was also increased from 5.8 MGD to 8.6 MGD.

SCWD Capistrano Beach Groundwater Recovery Facility Expansion - SCWD constructed a 1 MGD Groundwater Recovery Facility (GRF) that came online in FY 2007-08 in Dana Point. SCWD plans to expand the GRF with the addition of new wells. Treating in excess of 1,300 AFY will require expansion of the GRF and agreement with SJBA or confirmation of water rights from the SWRCB.

Garden Grove Nitrate Blending Project - The Garden Grove Nitrate Blending Project was active during the years of 1990 to 2005. The project is located at the Lampson Reservoir site, where groundwater pumped from two wells is blended in order to meet the maximum contaminant level for nitrate. The

blending project was shut down in 2005, but the City retrofitted Well 28 with a variable frequency drive and reinstated the blending operation.

San Juan Desalter Groundwater Recovery Plant Expansion – The City of San Juan Capistrano has operated the GWRP since about 2005. A number of issues have impacted the reliability of production from the facility including iron bacteria in the wells, the discovery of a plume of Methyl Tert-Butyl Ether (MTBE) that required a reduction in production in half to about 2 MGD or less since the spring of 2008 until the responsible party contributed to provide Granular Activated Carbon Filter (GAC) for removal of the MTBE to allow increased production. The drought then struck, reducing the amount of water that could be pumped from the San Juan groundwater basin, requiring a large reduction in production from the groundwater basin in 2014, 2015 and initially in 2016.

Tustin Nitrate Removal Project - The Tustin Nitrate Removal Project consists of two groundwater treatment facilities that are allowed above the BPP and the charges are BEA-exempt. The first facility is the Main Street Treatment Plant, operating since 1989 to reduce nitrate levels from the groundwater produced by Wells No. 3 and 4 by blending untreated groundwater with treatment plant product water which undergoes reverse osmosis and ion exchange treatment processes. The second facility is the Tustin Seventeenth Street Desalter, operating since 1996 to reduce high nitrate and total dissolved solids concentration from groundwater produced by Wells No. 2 and 4 and the Newport well using reverse osmosis (OCWD, 2015 Groundwater Management Plan, June 2015).

7.4.2 Ocean Water Desalination

Huntington Beach Seawater Desalination Project – Poseidon Resources LLC (Poseidon), a private company, is developing the Huntington Beach Seawater Desalination Project to be co-located at the AES Power Plant in the City of Huntington Beach along Pacific Coast Highway and Newland Street. The proposed project would produce up to 50 MGD (56,000 AFY) of drinking water to provide approximately 10 percent of Orange County's water supply needs.

Over the past several years, Poseidon has been working with OCWD on the general terms and conditions for selling the water to OCWD. OCWD and MWDOC have proposed a few distribution options to agencies in Orange County. The northern option proposes the water be distributed to the northern agencies closer to the plant within OCWD's service area with the possibility of recharging/injecting a portion of the product water into the OC Groundwater Basin. The southern option builds on the northern option by delivering a portion of the product water through the existing OC-44 pipeline for conveyance to the south Orange County water agencies. A third option is also being explored that includes all of the product water to be recharged into the OC Groundwater Basin. Currently, a combination of these options could be pursued.

OCWD's current Long-Term Facilities Plan (LTFP) identifies the Huntington Beach Seawater Desalination project as a priority project and determined the plant capacity of 56,000 AFY as the single largest source of new, local drinking water available to the region. In addition to offsetting imported demand, water from this project could provide OCWD with management flexibility in the OC Groundwater Basin by augmenting supplies into the Talbert Seawater Barrier to prevent seawater intrusion.

In May 2015, OCWD and Poseidon entered into a Term Sheet that provided the overall partner structure in order to advance the project. Based on the initial Term Sheet, Poseidon would be responsible for permitting, financing, design, construction, and operations of the treatment plant while OCWD would

purchase the production volume, assuming the product water quality and quantity meet specific contract parameters and criteria. Furthermore, OCWD would then distribute the water in Orange County using one of the proposed distribution options described above.

Currently, the project is in the late-stages of the regulatory permit approval process and Poseidon hopes to obtain the last discretionary permit necessary to construct the plant from the California Coastal Commission (CCC) in 2016. If the CCC permit is obtained, the plant could be operational as early as 2019.

Doheny Desalination Project – In 2013, after five years and $6.2 million to investigate use of a slant well intake for the Doheny Desalination Project, it was concluded the project was feasible and could produce 15 MGD (16,800 AFY) of new potable water supplies to five participating agencies. These agencies consist of: SCWD, City of San Clemente, City of San Juan Capistrano, LBCWD and MNWD.

Only SCWD and LBCWD expressed interest in moving forward after work was completed, with the other agencies electing to monitor the work and consider options to subsequently come back into the project while considering other water supply investments.

More recently, LBCWD has had success in using previously held water rights in the OC groundwater basin and may elect to move forward with that project instead of ocean desalination. A final decision is pending based on securing the necessary approvals on the groundwater agreement.

SCWD has taken the lead on the desalination project and has hired a consulting team to proceed with project development for the Doheny Desalination Project. Major items scheduled over the next year include:

- Preliminary Design Report and Cost Estimate
- Brine Outfall Analysis
- Environmental Impact Report (EIR) Process
- Environmental Permitting Approvals
- Public Outreach
- Project Funding
- Project Delivery Method
- Economic Analysis

The schedule for this project includes start-up and operation of up to a 5 MGD (5,600 AFY) facility by the end of 2019. SCWD anticipates leaving the option open for other agencies to participate in a larger, 15 MGD facility, with subsequent permitting and construction of additional slant wells and treatment capacity.

Camp Pendleton Seawater Desalination Project – SDCWA is studying a desalination project to be located at the southwest corner of Camp Pendleton Marine Corps Base adjacent to the Santa Margarita River. The initial project would be a 50 (56,000 AFY) or 100 (112,100) MGD plant with expansions in 50 MGD increments to a maximum capacity of 150 MGD (168,100 AFY), making this the largest proposed desalination plant in the US.

The project is currently in the feasibility study stage and SDCWA is conducting geological surveys, analyzing intake options, and studying the effect on ocean life and routes to bring desalinated water to SDCWA's delivery system. MWDOC and south Orange County agencies are maintaining an interest in the project.

8 UWMP ADOPTION PROCESS

8.1 Overview

Recognizing that close coordination among other relevant public agencies is key to the success of its UWMP, MWDOC worked closely with many other entities, including representation from diverse social, cultural, and economic elements of the population within MWDOC's service area, to develop and update this planning document. MWDOC also encouraged public involvement by holding a public hearing for residents to learn and ask questions about their water supply.

This section provides the information required in Article 3 of the Water Code related to adoption and implementation of the UWMP. Table 8-1 summarizes external coordination and outreach activities carried out by MWDOC and their corresponding dates. The UWMP checklist to confirm compliance with the Water Code is provided in Appendix A.

Table 8-1: External Coordination and Outreach

External Coordination and Outreach	Date	Reference
Encouraged public involvement (Public Hearing)	5/18/16	Appendix E
Notified city or county within supplier's service area that water supplier is preparing an updated UWMP (at least 60 days prior to public hearing)	3/1/16	Appendix E
Held public hearing	5/18/16	Appendix E
Adopted UWMP		Appendix F
Submitted UWMP to DWR (no later than 30 days after adoption)		
Submitted UWMP to the California State Library and cities and county within the supplier's service area (no later than 30 days after adoption)		
Made UWMP available for public review (no later than 30 days after filing with DWR)		

This UWMP was adopted by the Board of Directors on ~~DATE, 2016~~ May 18, 2016. A copy of the adopted resolution is provided in Appendix F.

The 2009 legislative session requires agencies preparing UWMPs to notify any city or county within its service area at least 60 days prior to the public hearing. As shown in Table 8-2, MWDOC sent a Letter of Notification to the County of Orange and all cities within its service area on March 1, 2016 to state that it was in the process of preparing an updated UWMP (Appendix E).

Table 8-2: Notifications to Cities and Counties

Wholesale: Notification to Cities and Counties (select one)	
☑	Supplier has notified more than 10 cities or counties in accordance with CWC 10621 (b) and 10642. **Completion of the table below is not required. Provide a separate list of the cities and counties that were notified.**
Appendix E	Provide the page or location of this list in the UWMP.
☐	Supplier has notified 10 or fewer cities or counties. **Complete the table below.**

8.2 Public Participation

MWDOC encouraged community and public interest involvement in the plan update through a public hearing and inspection of the draft document on May 18, 2016. The hearing was conducted during a regularly scheduled meeting of the MWDOC Board of Directors at MWDOC's offices in Fountain Valley. Public hearing notifications were sent to retail agencies and other interested parties. Individual letters were also sent to potential stakeholders about the development of this UWMP and public review hearing. A copy of the Notice of Public Hearing is included in Appendix E. The hearing provided an opportunity for all residents and employees in the service area to learn and ask questions about their water supply. Copies of the draft plan were made available for public inspection at MWDOC's office.

A staff report and presentation reviewed the information-gathering process, the data obtained from MWDOC retail agencies and other resource planning agencies, and the conclusions that served as the basis of the Draft Plan. The President of the Board of Directors then opened the Public Hearing where all comments were recorded.

8.3 Agency Coordination

The MWDOC's water supply planning relates to the policies, rules, and regulations of its regional and local water providers. The MWDOC is dependent on imported water from Metropolitan. As such, MWDOC involved Metropolitan and other relevant agencies in this 2015 UWMP at various levels of contribution as summarized in Table 8-3.

Table 8-3: Coordination with Appropriate Agencies

	Participated in Plan Development	Commented on Draft	Attended Public Meetings	Contacted for Assistance	Sent Copy of Draft Plan	Sent Notice of Public Hearing	Not Involved / No Information
MWDOC 28 Retail Agencies	√	√	√	√	√	√	√
Cities within MWDOC service area	-	-	√	-	√	√	√
County of Orange	-	-	√	-	√	√	√
Orange County Water District	√	-	-	√	√	√	√
San Juan Basin Authority	√	-	-	√	√	-	-
Metropolitan Water District of Southern California	√	-	-	√	√	√	√
Orange County Sanitation District	√	-	-	√	√	-	-
South Orange County Wastewater Authority	√	-	-	√	√	-	-
Public Library	-	-	-	-	√	√	-
General Public	-	-	-	-	√	√	-

MWDOC Retail Agencies - MWDOC worked cooperatively with its 28 retail agencies on descriptions of any planned development of local supplies. Methodologies and assumptions underlying these projections vary from agency to agency, but all projections reflect an in-depth knowledge of the individual agencies' service areas.

Cities and County - As described earlier, General Plans are source documents for water suppliers as they assess their own water resource needs. When completed, an UWMP also serves as a source document for cities and counties as they prepare their General Plans. General Plans and UWMPs may be linked, as their accuracy and usefulness are interdependent.

Groundwater Management Agencies - MWDOC also worked with the following five agencies to obtain information for the five groundwater basin resources in its service area: OCWD for Lower Santa Ana River Basin, SJBA for San Juan Basin, City of La Habra for La Habra Basin, City of San Clemente for

San Mateo Basin, and LBCWD for Laguna Canyon Basin. Details of the basin information are described in Section 3.3.

Metropolitan - As a member agency of Metropolitan, MWDOC participated in workshops hosted by Metropolitan to facilitate the information exchange for the development of this Plan.

MWDOC also worked with Metropolitan staff to develop demand projections using data from SCAG.

Wastewater Management Agencies - To meet the requirements of the Act in the preparation of this Plan, MWDOC contacted individual wastewater collection and treatment providers and other water agencies within its service area for data on recycled water and associated projects in the region. The information MWDOC obtained was then combined with a review of several completed Orange County studies. MWDOC also reviewed operating information and interviewed staff from individual agencies. The information MWDOC obtained from wastewater collection and treatment providers allows the Plan to describe wastewater disposal methods, treatment levels, discharge volumes, and recycled use in the region.

8.4 UWMP Submittal

8.4.1 Review of 2010 UWMP Implementation

As required by California Water Code, the MWDOC summarized Water Conservation Programs implemented to date, and compares the implementation to those as planned in its 2010 UWMP.

Comparison of 2010 Planned Water Conservation Programs with 2015 Actual Programs

As a wholesaler, MWDOC did not include a specific implementation plan in its 2010 UWMP. As a signatory to the MOU regarding urban water use efficiency, MWDOC is committed to implementing BMP-based water use efficiency programs. For MWDOC's specific achievements in the area of conservation, please see Section 4 of this Plan.

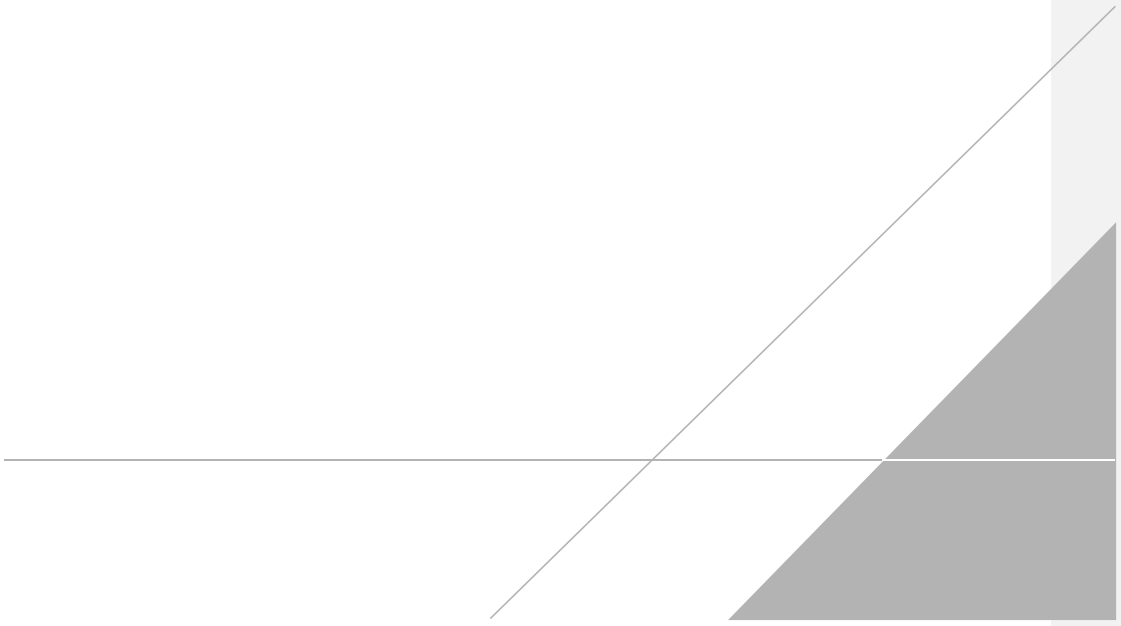
8.4.2 Adoption and Filing of 2015 UWMP

Members of the Board of Directors reviewed the Final Draft Plan in MONTH 2016 at the Planning and Operations Committee meeting. The Committee recommended that the Board of Directors approve the 2015 UWMP at its DATE, 2016 meeting. The seven-member MWDOC Board of Directors approved the 2015 UWMP at its DATE, 2016 meeting. See Appendix F for the resolution approving the Plan.

By July 1, 2016, the Adopted 2015 MWDOC UWMP was filed with DWR, California State Library, County of Orange, and cities within MWDOC's service area. MWDOC will make the plan available for public review no later than 30 days after filing with DWR

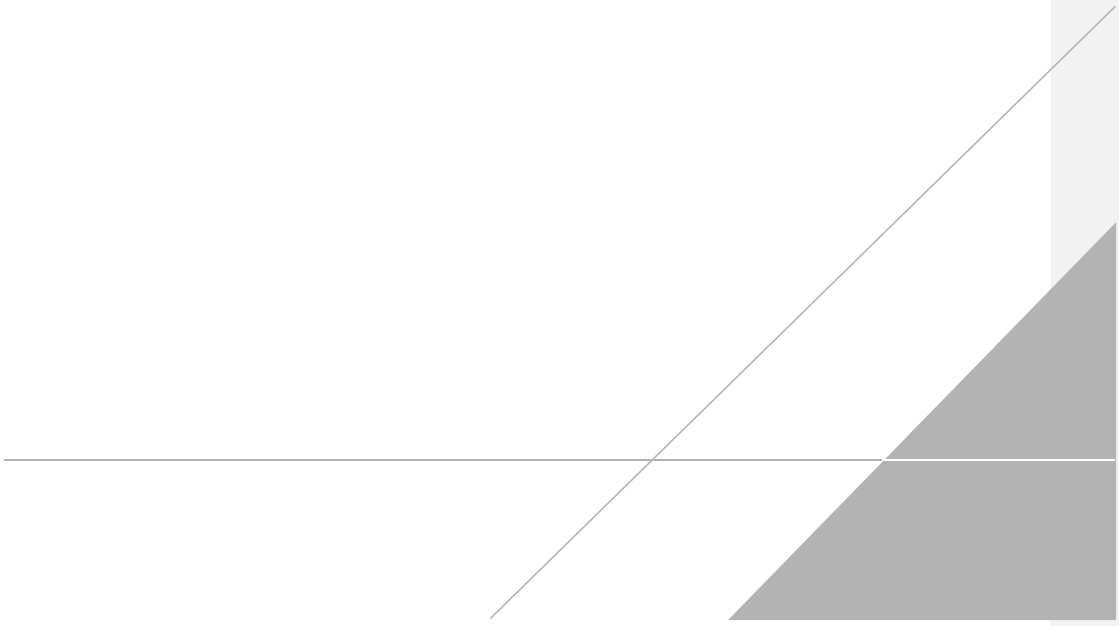
APPENDIX A

UWMP Checklist



APPENDIX B

Standardized Tables

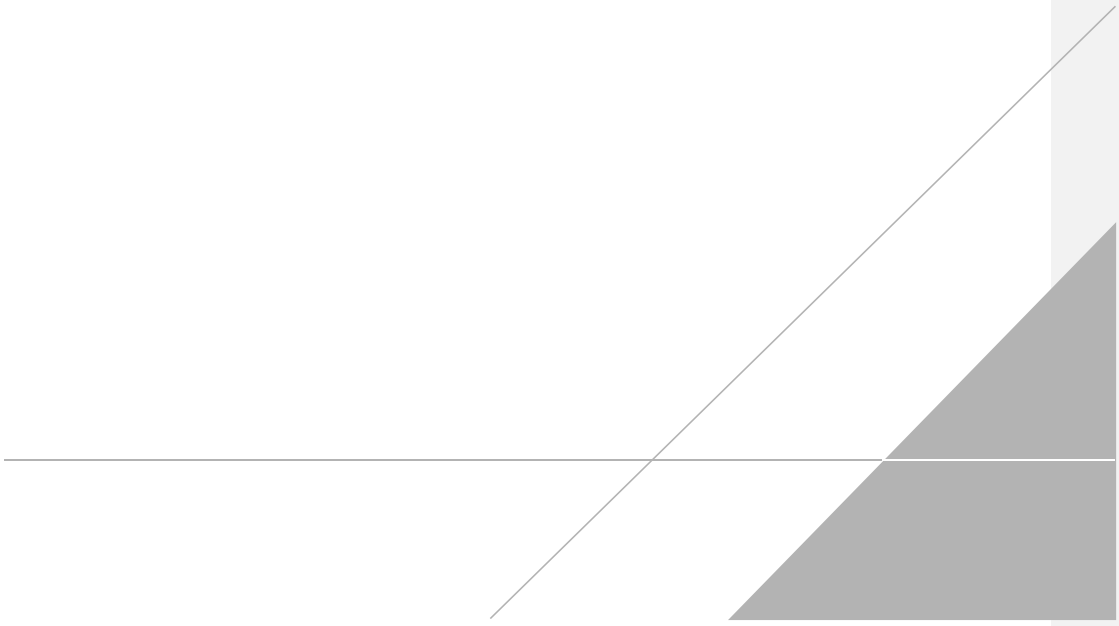


APPENDIX C

BMP Report

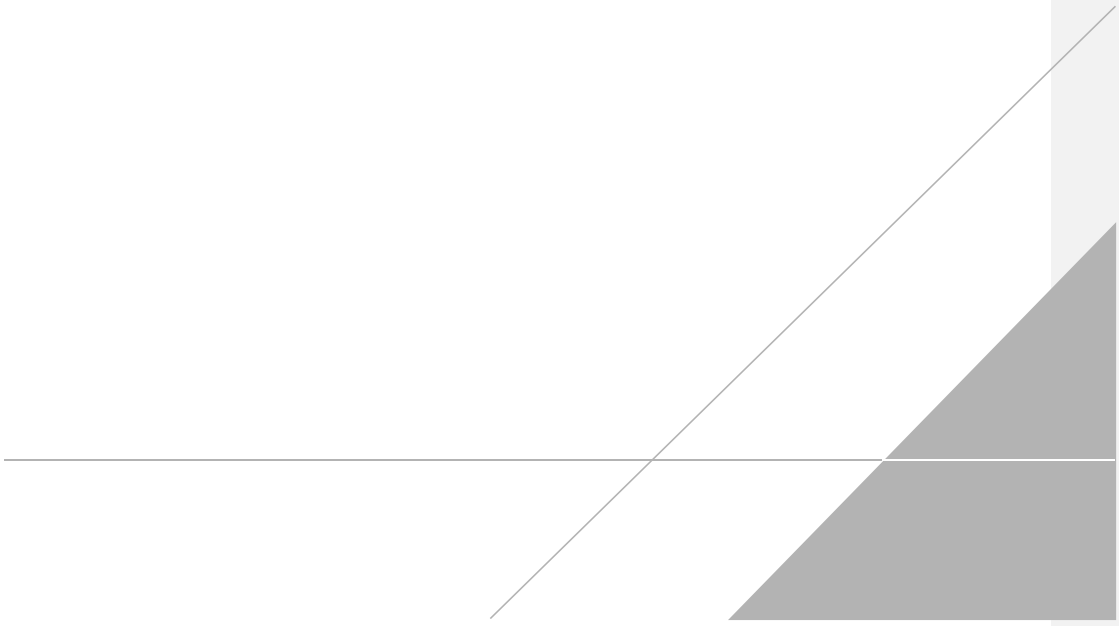
APPENDIX D

MWDOC Allocation Plan



APPENDIX E

Notification of Public and Service Area Suppliers

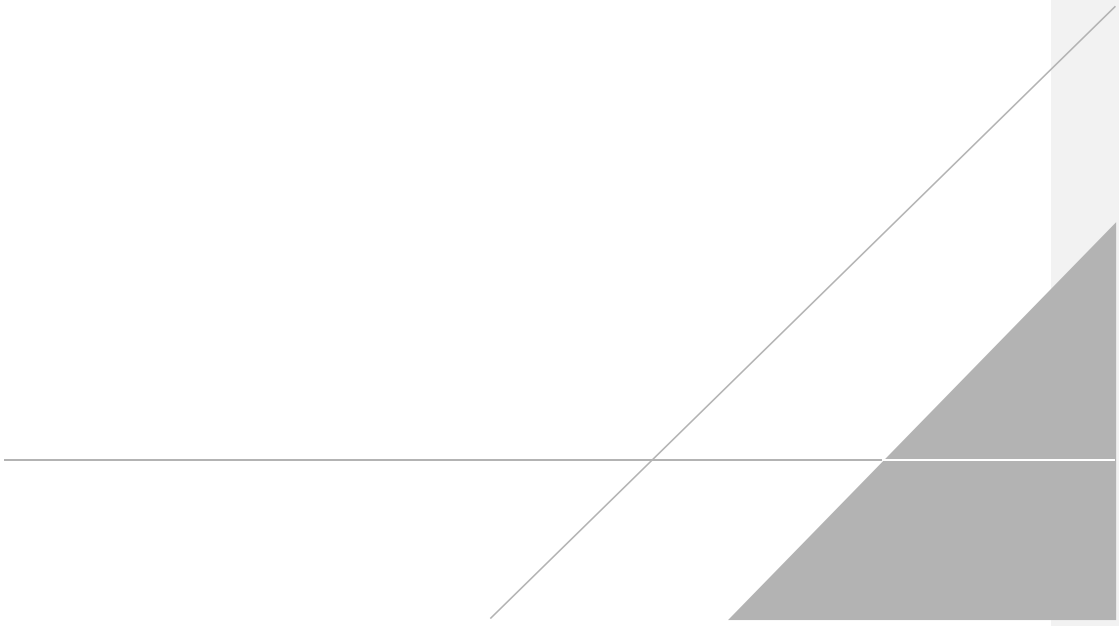


APPENDIX F

Adopted UWMP Resolution

APPENDIX G

BUMP Methodology/OC Reliability Study



ARCADIS Design & Consultancy for natural and built assets